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# JOURNAL OF SOCIOCYBERNETICS

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The **JOURNAL OF SOCIOCYBERNETICS** (ISSN 1607-8667) is an electronic journal published biannually--Spring/Summer and Fall/Winter--by the Research Committee on Sociocybernetics of the International Sociological Association.

**MANUSCRIPT** submissions should be sent electronically (in MSWord or Rich Text File format) to each of the editors: Richard E. Lee [rlee@binghamton.edu](mailto:rlee@binghamton.edu), Felix Geyer, [geyer@xs4all.nl](mailto:geyer@xs4all.nl), and Cor van Dijkum, [c.vandijkum@fss.uu.nl](mailto:c.vandijkum@fss.uu.nl). In general, please follow the Chicago Manual of Style; citations and bibliography should follow the current journal style (APA). Normally, articles should be original texts of no more than 6000 words, although longer articles will be considered in exceptional circumstances. The Journal looks for submissions that are innovative and apply principles of General Systems Theory and Cybernetics to the social sciences, broadly conceived.

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**SOCIOCYBERNETICS** traces its intellectual roots to the rise of a panoply of new approaches to scientific inquiry beginning in the 1940's. These included General System Theory, cybernetics and information theory, game theory and automata, net, set, graph and compartment theories, and decision and queuing theory conceived as strategies in one way or another appropriate to the study of organized complexity. Although today the Research Committee casts a wide net in terms of appropriate subject matters, pertinent theoretical frameworks and applicable methodologies, the range of approaches deployed by scholars associated with RC51 reflect the maturation of these developments. Here we find, again, GST and first- and second-order cybernetics; in addition, there is widespread sensitivity to the issues raised by "complexity studies," especially in work conceptualizing systems as self-organizing, autocatalytic or autopoietic. "System theory", in the form given it by Niklas Luhmann, and world-systems analysis are also prominently represented within the ranks of RC51.

The institutionalization of sociocybernetic approaches in what was to become RC51, the Research Committee on Sociocybernetics of the International Sociological Association, began in 1980 with the founding of an ISA Ad Hoc Group and proceeded with the organization of sessions at succeeding quadrennial World Congresses of Sociology. The eventual RC51 became a Thematic Group and then a Working Group. Finally, in recognition of its extraordinary success (growing from some 30 members in early 1995 to 240 in 1998), the group was promoted to the status of Research Committee at the 1998 World Congress of Sociology in Montreal.

Over these past two decades, sociocybernetics has attracted a broad range of scholars whose departmental affiliations represent the entire spectrum of the disciplines, from the humanities and the social sciences through the sciences, mathematics and engineering. Furthermore, the many countries of origin of these RC51 members attest to the wide international appeal of sociocybernetic approaches. Within this highly diverse community, there is wide agreement on some very general issues, for instance, on developing strategies for the study of human reality that avoid reification, are cognizant of the pitfalls of reductionism and dualism, and generally eschew linear or homeostatic models. Not surprisingly, however, there are also wide divergences in subject matter, theoretical frameworks and methodological practices.

Many have argued that models developed for the study of complexity can be usefully appropriated for the study of human reality. Moreover, however, the emphasis in complexity studies on contingency, context-dependency, multiple, overlapping temporal and spatial frameworks, and deterministic but unpredictable systems displaying an arrow-of-time suggest that the dividing line between the sciences and the historical social sciences is fuzzier than many might like to think. What is more, in the humanities, the uniquely modern concepts of original object and autonomous human creator have come under serious attack. The coincidence of these two phenomena substantiate the impression that across the disciplines there may be observed a new concern for spatial-temporal wholes constituted at once of relational structures and the phenomenological time of their reproduction and change.

In this context of rich history and exciting possibilities, the Research Committee on Sociocybernetics of the International Sociological Association extends an open invitation through the **Journal of Sociocybernetics** to all engaged in the common quest to explain and understand social reality holistically and self-reflexively without forsaking a concern for human values--human values not construed simply as a matter of individual ethics, but conceived as an integral part of a social science for our time.

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# **STRUCTURAL COUPLING AND CONCEPTS OF DATA AND INFORMATION EXCHANGE : INTEGRATING LUHMANN INTO INFORMATION SCIENCE**

**Bernd R. Hornung\***

**E**UROPE is getting ready for the information age and the new millennium with information highways. Computers and Information Technology (IT) are not limited to the research and business world anymore. They are becoming common accessories in schools, private homes, and the luggage of travellers as well. Formerly separate technologies and IT networks, i.e., computer, telephone, and television networks, are gradually growing together (cf. Hornung 1999). Such IT systems are no longer only the highly specialized tools of privileged scientists and technicians, but instruments to be used by the general public and supposedly easy to handle. Behind this, however, is a highly sophisticated technical infrastructure, which is inadvertently becoming the "nervous system" of the global village, the "electronic brain" of the modern world. At any rate, it is part of the very fabric of contemporary society. In spite of such enthusiastic metaphors suggesting that "cyberspace" and "cyberworld" may have a life of their own, scientific analysis has to insist on the fact that IT systems, however powerful they may be, are technical artifacts and that such large scale technical systems, by being introduced in society as well as by their operation, shape the organizations and social systems concerned. They do so, no matter whether it is a business, a hospital or a family using the Internet.

This emerging technological complex also creates new risks and provokes social and cultural reaction and change. Such a reaction was, for instance, the European data protection law, which was to be implemented by all Member States by the end of 1998. This was a kind of legal and cultural change which, in Europe and beyond, links the development and use of IT to basic human rights on the one hand (Gesellschaft... 1997) and which, on the other hand, shapes the structures and daily behaviors and working procedures in the social subsystems, organizations, and families where the use of IT has to adapt to and to comply with this European legislation.

All of this, as well as the overall recognition of information as a "factor of production" in economy, should be reason enough to look at such IT and the social systems in which it is

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used from a joint perspective of sociology, systems science, and computer and information theory.

## **INFORMATION THEORY AND SOCIOLOGICAL SYSTEMS THEORY**

In such a context--information society, information economy everywhere--it seems very surprising that prominent social theorists like Niklas Luhmann try to do without information flows. Of course, definitions, on which also Luhmann's theory is based after all, can never be true or false. They can only be useful or not useful. Nevertheless, dealing with IT nowadays a sociologist and in particular a systems scientist cannot get around the concepts used in computer and information science. This is not to deny that perhaps those concepts are "wrong" or to deny a theorist's right to redefine and use already established concepts in an idiosyncratic way. Luhmann, by the way, has made ample use of this option.

Luhmann's theory of society is based on communication and autopoiesis. Persons and psychic systems are the environment of social systems that, according to Luhmann, are pure communication systems. From this result at least two, apparent or real, paradoxes:

- a) The essence of social systems is communication, although there is no flow of information.
- b) Social systems are closed, being autopoietic systems, although they are necessarily open in the sense that they are subject to evolution and hence involved in entropic and negentropic processes.

## **COMMUNICATION WITHOUT COMMUNICATORS**

Communication in the conventional sense means exchange of information between at least two partners. A communication system in this context is a system, namely an IT system, that can be used by those partners for exchanging information. Not yet entering the issue of what "information" is, it is clear for the information scientist that an IT system strictly speaking does not do anything, including communicate, on its own. There is always at least one of the "partners" needed, either as a user who initiates processes in the electronic system or as programmer who tells the system in advance what to do under certain circumstances. Because of this latter variant, computer systems often seem to act on their own, to communicate with each other without human beings involved. But also in this case, apart from the programming, maintenance by human beings is necessary to some extent. In other words, IT systems, like any technical communication systems, are non-living systems that are set in motion only by human intervention. The same is true for conventional mail systems that remain piles of paper, i.e., letters, post cards etc., sitting in some place and suffering natural decay unless there is in addition to a sender also a receiver, and at least a mailman. Much of human communication depends on such artificial technical systems. But even where this is not the case, communication by the spoken word requires the sound waves produced by the speaker and physical action of the partners to get close enough to understand each other.

Of course, Luhmann, after all, does not say that there are no communicators. He defines the communicators, that is, the psychic systems, as the environment of communication systems. This is in line with the concept of technical communication systems. The users are the environment of the telephone system and they are the environment of a computer system or Internet. On closer inspection, however, there are clear differences. Luhmann writes about communication systems as if they could do things, as if they were autonomous "actors". In IT, however, it is usually clear that the system is a man-made and man-operated tool, a stupid machine after all. It is for this reason that much of technology studies and technology assessment, also outside the field of IT, deals with man-machine systems or socio-technical systems and not strictly technical systems. In precisely this sense we find in information science increasingly the use of the term "information system" meaning to include both the technical system and the users even along with the social/organizational infrastructure. Implementing data protection, for example, depends very much on combining both.

This all means that Luhmann starts with a concept of communication systems that is also acceptable for the information scientist. However, he does not draw the same conclusion, that is, that a communication system is an artifact, or at any rate a non-living system which cannot act or behave or do anything on its own.

## **THEORY OF LIVING SYSTEMS APPLIED TO NON-LIVING SYSTEMS**

The latter statement, however, is not completely correct. Luhmann considers social systems, i.e., communication systems, as autopoietic but non-living. He tries to apply the theory of autopoiesis, by definition a theory of the living, to non-living systems. This seems to be a contradiction in itself, which does not become much clearer when one considers that large parts of Luhmann's writings on this topic at least sound as if he were writing about living systems.

The original essence of autopoiesis as the theory of the living is that autopoietic systems consist of elements that reproduce the same kind of elements. This reproduction happens in some kind of closed circular causality. This means that an autopoietic system is closed in this respect but open in others. In Maturana's and Varela's original approach this was relatively clear. They were investigating the nervous system, which, they found, is informationally closed<sup>1</sup> but evidently energetically open, as no operation is possible without using up energy. The energy used needs to be replaced by inputs. Luhmann often says that systems are "operationally" closed without specifying the kind of operation or the relationship between the "closed" operations and other ones. While "operations" and "operational closure" seem to refer to the kind of "communication system" usually associated with IT (that is, beyond communication infrastructure), there is a second possible reading of Luhmann's "communication system". This is as a "system of communications", or of "messages" as an information scientist would express it. This interpretation, however, by no means can avoid the problems mentioned above but indeed aggravates them. All of this means that there is not only

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<sup>1</sup> Quite a different view of the brain and nervous system, which evidently reaches far beyond the brain, is professed by the well-known neurobiologist Antonio R. Demasio (1994).

a need for a precise system reference, on which Luhmann usually insists, but also for specifying which are the elements and components which are reproduced, by which circular process they are reproduced, and in which respect such a system is closed or not (Klüver 1990).

If the kind of closed processes found in autopoiesis is indeed characteristic for life, it should not be possible to find them in non-living systems. Otherwise autopoiesis can either not be considered as the essence of life, or the respective non-living systems have to be accepted as living systems after all.

## **SOCIOLOGY IN MID-AIR**

The answers to these questions are at least hard to find in Luhmann's work. In a way, his autopoietic theory of social systems may be too simple, in spite of Luhmann's great efforts and aspirations to achieve more and more abstraction and complexity in his theory. Too simple, because in his theory of "Social Systems" (1987) he tends to start in mid-air, using

- a) the concept of "distinctions" in order to discriminate between the system and its environment and
- b) communication as the essence of social systems and the level of reference for the analysis of social systems.

While "distinctions" are certainly a very valuable basic category for philosophy of science and theory building, the choice of "communication" seems to be too limited and one-sided, leading among other things to the difficulties already outlined. Certainly, much of what is going on in social life *is* indeed communication. But there is also a lot of action and very often, if not most of the time, the action and the information aspect are hard to separate. In information science, on the contrary, it is always very clear what is the carrier or the medium of information, e.g., the floppy disk or the telephone wire, and what is information itself, e.g., the contents of the present paper. Focusing on communication alone may be "theory-technically" smart, because it may permit the construction of a cleaner and more consistent theory. Besides excluding action (in ordinary understanding we communicate in order to be able to act, not vice-versa) this strategy also excludes the view at other levels of reality. Although Luhmann re-introduces action as a derived category, this does not resolve the problem. Communication using distinctions is not alone in the universe or embedded in a "complex" but vague environment. From a non-Luhmannian systems scientist's point of view it is one among several emergent layers of reality (Buckley 1998).

Although details are always disputable, the major layers (Buckley 1998; Hornung 1988, 1996; Lamb 1965; Blois 1984) we have to distinguish are the a) physical, b) chemical, c) biological, and d) sociocultural; the present author would argue for separating the sociocultural layer into a d) social and e) cultural layer.

While according to the last proposal "social" would include social action *and* communication, both in terms of process and structure, "cultural" would refer to shared knowledge, values, and skills in a population (see Hornung 1996). Making explicit this kind of layered structure consisting of different levels of emergence complicates the picture. However,

it also promises to resolve a number of difficulties arising otherwise. It may permit a more straightforward specification of system openness and inputs and outputs.

According to the theory of dissipative structures there can be no doubt that at the physical and chemical levels (energetic-material levels) inputs and outputs are indispensable. A biological system like the human organism integrates these two levels with the specifically biological level. The latter, according to Maturana and Varela, is a particular kind of circular organization, autopoietic organization. In this respect biological systems are closed systems. If this closure is broken, if this circular reproduction of components cannot continue, the system dies. Furthermore, living systems have three more properties. There are living systems that live in organized communities, social systems characterized by interaction that includes double contingency. There are also living systems which, in addition, are capable of information processing and hence communication (in contrast to mere stimulus-response reactions or instinctive reactions). Finally there are living systems capable of reflective information processing, consciousness. Although the borders between these levels are highly disputable, the categories themselves should be acceptable.<sup>2</sup>

If we follow this classification, a traditional split runs right through the middle of the "social" layer. Luhmann can avoid this, as he focuses on communication only. However, it seems more productive to face it, because it is also in the heart of autopoietic theory. It is the split between "action", understood as physical activity, and "communication" understood as symbolic, informational activity. It is at the same time the classical split between science, i.e., empirical observation and analysis, and the humanities, i.e., understanding and hermeneutics, and also the split between brain and mind, neurology and psychology (e.g., Feigl 1958; Rensch 1968; Bilder and Lefever 1998; Demasio 1994). This is important not because of these different research traditions, but because the attempts of all of these traditions to overcome this split have so far been in vain, indicating that it is a real and fundamental problem. Progress towards a solution is promised by a layered, emergent strategy that combines philosophical constructivism with "structural coupling" to obtain an autopoietic approach to understanding. This has to go along with the use of a new concept of information as proposed by Stonier (1990).

While constructivism<sup>3</sup> is an issue at the level of theory of science, which will not be discussed here for lack of space, structural coupling is an issue of autopoietic (and hermeneutic) sociology both at the level of theory of science and at the level of analysis of social systems proper. With regard to philosophical constructivism it is only to be mentioned that there are basically two criteria for maintaining or discarding a "construction":

- a) internal consistency of the (cognitive) system constructed and
- b) practical success due to the use of the construction (cf. Kuhn 1973, 1978).<sup>4</sup>

These criteria are also valid in autopoietic theory.

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<sup>2</sup> A differentiated and detailed analysis of the different levels of emergence of information processing and intelligence is presented by Tom Stonier (1992, 1997).

<sup>3</sup> See, for example, Wallner (1990), Glasersfeld (1998), Schmidt (1996).

<sup>4</sup> These two conditions are, however, sometimes conflicting.

## **STRUCTURAL COUPLING OF THE INFORMATICIAN'S SEVEN-LAYER CONCEPT OF INFORMATION TRANSFER?**

If there is no information flow between two autopoietic systems, how is communication possible nevertheless? The answer of autopoietic theory and Luhmann is "structural coupling". This means that there are two autopoietic systems, which internally may build up very complex cognitive systems. These internal cognitive systems are, however:

- a) only the result of internal activity,
- b) unknown and unknowable to the other system, and
- c) unknown and unknowable to an external observer, e.g., a scientist.

Each of the three systems, reference system, partner system, and the external observer of the other two, constructs its own exclusive "inner world", which includes internally self-produced information about the other actors/observers but without obtaining information from the outside in the sense of transferring it. What is obtained, however, just like in philosophical constructivism, is some kind of feedback about success and failure of action and survival, that is, the continuing of autopoiesis. If our three autopoietic systems survive long enough in this process, mutual adaptation and coordination, "structural coupling", will result.

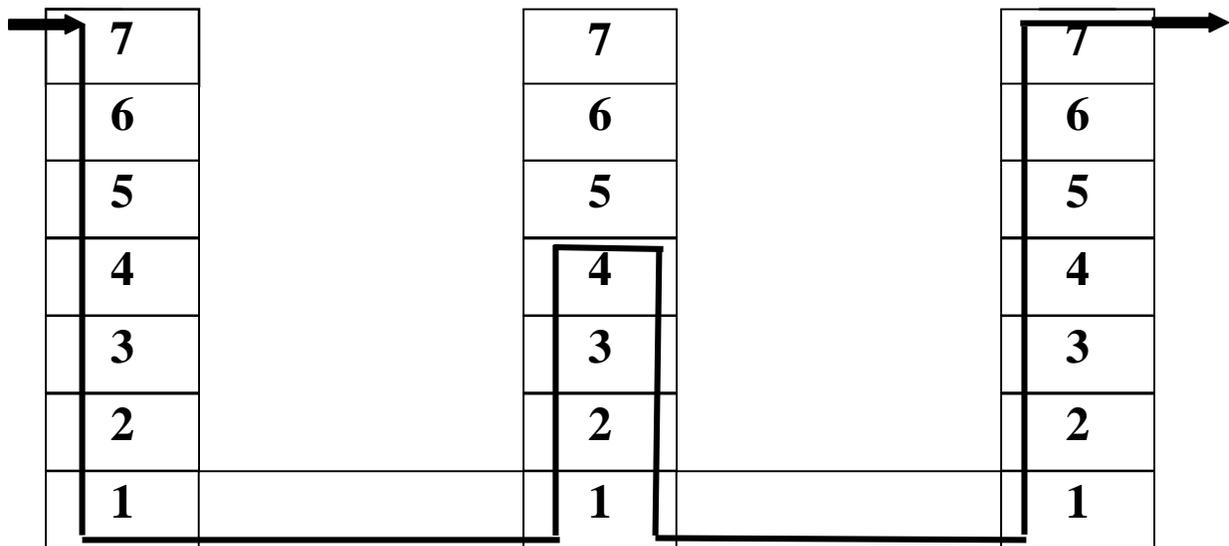
The point is that autopoietic authors insist there is no information flow. According to them, there are, however, "disturbances", "perturbations", "irritations", "noise", "resonances", and "impulses" that establish some kind of contact between system and environment. These seem to be some kind of information without being called information. The only way really to do without external (informational) contacts is probably Leibniz' concept of the pre-stabilized harmony between monads, i.e., in our case autopoietic systems. According to Leibniz (1982), such pre-stabilized harmony was established by God at the time of Creation. This latter, view, however, is hardly acceptable to contemporary systems science.

In terms of information science everything from "disturbances" to "impulses" is, of course, information. It is perhaps minimal information and yet information permitting selection of appropriate internal reactions, evolution, and in the long term coordination and understanding. At the bit level, where the information of informatics is a mere yes/no decision, it seems to meet Luhmann's "distinctions". A bit, after all, is a distinction between yes and no.

Such a concept of "disturbances" fits with an evolutionary view of the above-mentioned emergent layers. Biological systems develop information processing at increasing levels of sophistication for their evolutionary success. Evolutionary success, however, does not depend on the exchange of nice words, but on efficient and effective coordination of practical action. If the latter can be achieved while one person is speaking and thinking in English, another one in German, and a third one in Chinese, it doesn't matter what language each one is speaking. If a search in a remote database works, it doesn't matter whether one computer has a WINDOWS operating system and the other one a UNIX operating system. It is a matter of translation. Yet correct translation, after all, is structural coupling. It is a matter of trial and error which translation will provoke the appropriate practical coordination (cf. Headland, Pike and Harris 1990).

From this point of view the merit of autopoietic theory is indeed that it has made clear that "structural coupling" is much more widespread than one might have suspected. Overdoing

this point, however, also runs the risk of losing sight of the fact that "information flows" by means of "structural coupling" have been and are very successful in wide areas of application. "Understanding" for practical purposes does not generally evoke serious problems, although philosophers have not yet resolved the issue of hermeneutics in a really satisfactory manner. In a similar way we should realize that "information flow" or "information input and output" may be an extremely useful shorthand for a much more complicated process. What is astonishing, is that even informatics, focusing explicitly on information exchange and communication, is aware of this!



### Electronic Communication ISO/OSI - 7 Layers

Examined in detail, information flows in IT-systems, that is, computer networks, are very similar to what is called structural coupling in autopoietic theory. For network communication the ISO/OSI Seven Layers Concept was developed as a worldwide reference standard (Sloman and Kramer 1989). Electronic communication over a network is seen as encompassing seven different layers on top of the physical communication medium or carrier:

1. PHYSICAL LAYER transmitting bits, e.g., through a cable.
2. DATA LINK LAYER for physical network connections, e.g., Ethernet.
3. NETWORK LAYER for logical transfer, e.g., by protocols like TCP/IP used in Internet.
4. TRANSPORT LAYER establishing end-to-end connections and e.g., multiplex transmission.
5. SESSION LAYER establishing connection, e.g., between two users communicating via Internet Chat.
6. PRESENTATION LAYER organizing communication between different software systems, e.g., UNIX and WINDOWS systems.
7. APPLICATION LAYER organizing communication between different applications, e.g.,

different e-mail systems.

This looks like conventional "information flow" in seven layers. However, what goes over the line are only the bits (level 1) expressed by means of some kind of material/energetic property like electricity, electromagnetic waves, light beams etc. All that happens in the other layers is only *reconstructed* from the bits in the nodes of the networks, i.e., in the computers. Depending on the needs, this reconstruction does not always reach level 7, the highest level. This corresponds very much to the view of structural coupling. Information and information processing happen only within autopoietic systems (the computers constituting the nodes of the network) whereas between autopoietic systems there is no information flow but only some activity of "disturbances" (only material/energetic impulses representing bits are transmitted between the computers).

## **THE INTERNAL STRUCTURE OF THE UNIVERSE**

### **A new concept of information**

Ways out of the problems of autopoietic theory as described above are the awkward concepts of structural coupling and, closely related to it, interpenetration proposed both by Maturana and Varela and by Luhmann. After all, however, these are not as far from "conventional" information science as they seem to be. This becomes visible if

- a) a new concept of information is used as developed by Stonier (1990), and if
- b) the hierarchization is taken into account both of the empirical world, as outlined, for instance, by Buckley (1998), and of information itself as developed in the "seven layers model" used in technical information systems (Sloman and Kramer 1989).

The confusion raised by autopoietic theory, whether and in what way there is information exchange or not, and whether or not autopoietic systems can communicate without information exchange, is paralleled in a way by our consideration of communication in IT networks. Only, there we take information exchange for granted, whereas the Seven Layers Model tells us, that what is really exchanged is matter/energy representing bits, i.e., physical representations of YES/NO or +/- distinctions. Autopoietic theory, on the other hand, takes informational closure for granted and finds a way out of it through "structural coupling". The latter works through "disturbances", but it remains unclear, whether these are material/energetic effects of "irritations" at the level of cognition and information.

In both cases the actual processes involved look very, very similar. The difference seems to be in the use of the term "information". This is all the more surprising as both informaticians and Luhmann say that they adhere to the concept of information as developed by Shannon and Weaver. The problem seems to be that Luhmann and other theorists of autopoiesis take Shannon and Weaver's concept literally, or perhaps even as a rationalization of their own theory, so that they cannot speak about information flows. Informaticians, on the contrary, try to live with a major flaw of Shannon and Weaver's theory by not taking it too literally. In both cases the solution is to revise the concept of information advanced by Shannon and Weaver.

In their famous "Theory of Communication" (not information!), which was developed

for technical systems, Shannon and Weaver (1964) say that "information" is what reduces uncertainty in the receiver. If somebody asks his travel agent at what time the plane will be leaving for Athens, the answer will reduce the traveler's uncertainty. If, however, before leaving the agency that traveler receives a note on paper to take along with the time of departure, according to Shannon and Weaver this is not "information" anymore as that traveler already knows the time of departure. This means that Shannon and Weaver's kind of information, although theoretically and mathematically quantifiable and measurable, is only practically measurable if it is known what is already stored in the receiver. In the case of a technical system this may be possible; in the case of human beings it is not. The fundamental problem with this concept of information is that nobody can tell what information is, unless it is known which system is the receiver and, in addition, if it is also known what information the receiver has stored already.

Shannon and Weaver's kind of information is definitely useful for certain purposes. Taking it for all there is, however, creates serious problems. Therefore Stonier proposes a solution by taking Shannon and Weaver's information just as one type, i.e., "new information", and extending the concept by providing it with a much deeper ontological foundation.

Already with Shannon and Weaver we can say that information is a distinction (at the cognitive level) represented by some material/energetic medium, for instance, a (logical) bit represented by a (physical) electric charge. For Shannon, however, the distinctions are those of logical decision trees. In this way they are already at the level of cognitive systems. Stonier, on the other hand, identifies "distinctions" in matter/energy itself. A structure or a pattern in a rock is a set of distinctions. Consequently it is information, just like the mathematical structures and arguments described in a textbook. This may sound strange to a desk researcher. A geologist doing fieldwork, however, may very well "read" such patterns and thus find out what is the composition of the rock and maybe its geological history.

In this sense information is a structure or pattern, which may be new (Shannon) or redundant, which may be logical (cognitive) or substantial (material), which may be interpreted (with consequences for a receiver) or uninterpreted (unused for the time being and without consequences for a receiver). This makes possible the establishment of consistency among theories at a very fundamental level.<sup>5</sup>

One consequence of Stonier's concept of information seems to be that it is an important step towards the unity of science. According to his view, information is not something additional to the material world but, taken as a pattern or structure, part of its very fabric. It is a category with the same ontological status as matter/energy. It is, so to speak, the third side of reality, if matter and energy are the first two. In fact, already quite some time ago Jacques Attali has talked about the products created by humans as "informed matter" (1976).

While matter and energy in a way become indistinguishable at the sub-atomic level, it is meaningful and possible to distinguish them at higher, more macro, levels. Using Stonier's concept of information, the same is true also for information. At the borders of contemporary physics, the world consists only of events in the space-time continuum. On this ontological basis "processes" and "structures" result from the differentiation and distinction along the four

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<sup>5</sup> Note that Luhmann (1987) also refers to relativity theory, yet apparently without drawing deeper conclusions.

dimensions of space-time. "Processes" are irregular (variable) and structures are regular (invariable) sequences of events along the time dimension. However, as the invariability of structures is only relative, already some time ago Przeworski and Teune (1970) talked about structures as being "slow" variables.

Nevertheless, as in the case of matter and energy, it makes sense at the more macro levels (dependent on the time frame) to talk about structures and processes. The aspect of relative invariance links the concept of structure, which is valid both at the material and at the cognitive level, to the concept of "pattern" widely used in informatics and cognitive science.

The concept of information as a structure or pattern, the way it is proposed by Stonier, makes sense from the informatics perspective. Indeed, informatics and technical information science are all about bit patterns. It also makes sense from an autopoietic point of view, as it has to be suspected that autopoietic systems cannot do anything with "disturbances" unless the "disturbances" show a minimum of regularity or pattern. Furthermore, order from noise is not possible, if indeed noise is perfectly random disturbance. This is what both the theory and the empirical study of evolution show us.

The argument also fits with entropy theory, but it goes beyond it, entropy being an essentially physical concept. As such it is inadequate to deal with what we call "information processing systems". Even if the closure of autopoietic theory can be "softened" and made more realistic by using Stonier's concept of information, still a number of problems remain with Luhmann's theory.

Building bridges to other disciplines to widen our horizons after a detailed examination of autopoietic theory may prove very useful and productive for integrating this "exotic" theory with a unified systems science and contribute to making autopoietic theory more manageable for practical use, although probably less exclusive. This is essential in particular with regard to theorizing about social systems where the Luhmannian approach risks leading to a sociology camped in mid-air. Closure and openness via structural coupling and Stonier's concept of information do not only concern the horizontal level of coexisting social systems, but also the emergent levels of reality. Of course, Luhmann never denied the existence of those other levels, but at the point of dealing with social systems as pure autopoietic and informationally closed communication systems there is the danger of losing sight of this.

Buckley (1998), on the contrary, insists very much on the interplay of the physical, chemical, biological, and socio-cultural (or social and cultural) levels, and not only in the ordinary sense where everybody agrees that the lower levels influence the higher ones and are even indispensable for their existence. Being a true systems scientist, he also points to the existence and possibility of opposite influences, e.g., changes in the biological basis of society due to effects from the socio-cultural level (co-evolution). The effects of culture on lifestyle--nutrition, smoking, drinking alcohol, using cars, watching TV, etc.--and their consequences for the average health status of the population are evident.

Note also that in the dimension of the emerging layers there is "structural coupling" which, using Stonier's concept of information, we are permitted to call "information".

Putting the social system into the context of the emergent layers of reality also sharpens the eye for two other crucial questions, which we cannot follow in the present paper for lack of space. One concerns the units of autopoietic systems that are the components of the system that

create the system (Klüver 1990). This leads to the more general question of what are, after all, the units of social systems.

The other question concerns how autopoiesis originates in the overall evolutionary process (cf. Teubner 1990). While autopoiesis may be an answer to the question of what is life, it is not yet an answer to the question about the origin and emergence of life. This has to be seen in the context of the different emergent layers of reality. The view, also confirmed by Luhmann, that life goes on as long as autopoiesis goes on and that it stops once autopoiesis stops, is not satisfactory in this respect.

These questions lead away from communication to the other layers and to their emergence in an evolutionary process. They also lead away from autopoiesis as a particular kind of circularity to other (and older) concepts like self-reference, self-organization, hypercycles, circular causality, and feedback. Feedback, as is well known, was one of the original cornerstones of contemporary systems science.

## WORKS CITED

- Attali, Jacques. 1976. *La parole et l'outil*. Paris: PUF.
- Bilder, Robert M. and Lefever, F. Frank, eds. 1998. *Neuroscience of the Mind on the Centennial of Freud's Project for a Scientific Psychology*. Annals of the New York Academy of Sciences. Volume 843. New York: New York Academy of Sciences.
- Blois, Marsden S. 1984. *Information and Medicine: The Nature of Medical Descriptions*. Berkeley: University of California Press.
- Buckley, Walter. 1998. *Society - A Complex Adaptive System, Essays in Social Theory*. New York, London, Tokyo: Gordon & Breach Science Publishers.
- Demasio, Antonio R. 1994. *Descartes' Error: Emotion, Reason, and the Human Brain*. New York: Putnam.
- Feigl, Herbert. 1958. "The 'Mental' and the 'Physical'." In Feigl, H., Scriven, M. and Maxwell, G., eds. *Concepts, Theories, and the Mind-Body Problem*. Minnesota Studies in the Philosophy of Science, vol. II. Minneapolis: University of Minnesota Press, 370-497.
- Gesellschaft für Datenschutz und Datensicherheit e. V., Hrsg. 1997. *EU-Datenschutz-Richtlinie*. Textausgabe deutsch/englisch/französisch/spanisch, 1. Aufl., GDD-Handausgabe. Frechen: Datakontext Verlag.
- Glaserfeld, Ernst von. 1998. *Radikaler Konstruktivismus, Ideen, Ergebnisse, Probleme*. 2. Aufl. (Orig.: Radical Constructivism). Frankfurt/Main: Suhrkamp Verlag.
- Headland, Thomas N., Pike, Kenneth L., and Harris, Marvin, eds. 1990. *Emics and Etics: The Insider/Outsider Debate*. Frontiers of Anthropology, vol. 7. London, Newbury Park, New Delhi: Sage Publications.
- Hornung, Bernd R. 1988. *Grundlagen einer problemfunktionalistischen Systemtheorie gesellschaftlicher Entwicklung*. Bern, New York, Paris: Verlag Peter Lang.
- 1996. "Sociocultural Evolution, Towards the Merging of Material and Informational Evolution." In *Proceedings, 14th International Congress on Cybernetics, Namur (Belgium), August 21-25, 1995*. Edited by Association Internationale de Cybernetique

- (AIC), Namur.
- , 1999. "Smart Cards, Possibilities and Impossibilities of Electronic Communication and EDI in Health Care." In *Setting Priorities in Health Care*. Edited by A. H. M. Kerkhoff. Twente: Universiteit Twente, Faculteit Bestuurskunde, 43-65.
- Klüver, Jürgen. 1990. "Auf der Suche nach dem Kaninchen von Fibonacci oder: Wie geschlossen ist das Wissenschaftssystem?" In *Selbstorganisation, Aspekte einer Wissenschaftlichen Revolution*. Edited by Wolfgang Krohn and Günter Küppers. Braunschweig, Wiesbaden: Friedrich Vieweg Verlag, 201-229.
- Kuhn, Thomas S. 1973. *Die Struktur wissenschaftlicher Revolutionen*. Frankfurt/Main: Suhrkamp Verlag.
- , 1978. *Die Entstehung des Neuen*. Frankfurt/Main: Suhrkamp Verlag.
- Lamb, Matthew L. 1965. "Towards a Synthetization of Science." *Philosophy of Science* 33, 2, 182-91.
- Leibniz, Gottfried Wilhelm. 1982. Vernunftprinzipien der Natur und der Gnade, Monadologie, Französisch - Deutsch, 2. verbesserte Auflage, Philosophische Bibliothek, Bd. 253. Hamburg: Felix Meiner Verlag.
- Luhmann, Niklas. 1987. *Soziale Systeme: Grundriß einer allgemeinen Theorie*. Frankfurt/Main: Suhrkamp Verlag.
- Przeworski, Adam and Teune, Henry. 1970. *The Logic of Comparative Social Inquiry*. New York: Wiley-Interscience.
- Rensch, Bernhard. 1968. *Biophilosophie auf erkenntnistheoretischer Grundlage*. Stuttgart, New York: Gustav Fischer Verlag.
- Schmidt, Siegfried J., Hrsg.. 1996. *Der Diskurs des Radikalen Konstruktivismus*, 7. Aufl. Frankfurt/Main: Suhrkamp Verlag.
- Shannon, C. E. and Weaver, W. 1964. *The Mathematical Theory of Communication*. Urbana, IL: University of Illinois Press.
- Sloman, Morris and Kramer, Jeff. 1989. *Verteilte Systeme und Rechnernetze (Org.: Distributed Systems and Computer Networks)*. München, Wien: Carl Hanser Verlag.
- Stonier, Tom. 1990. *Information and the Internal Structure of the Universe: An Exploration into Information Physics*. Berlin, Heidelberg, New York, Tokyo: Springer-Verlag.
- , 1992. *Beyond Information: The Natural History of Intelligence*. Berlin, Heidelberg, New York, Tokyo: Springer-Verlag.
- , 1997. *Information and Meaning: An Evolutionary Perspective*. Berlin, Heidelberg, New York, Tokyo: Springer-Verlag.
- Teubner, Gunther. 1990. "Hyperzyklus in Recht und Organisation, Zum Verhältnis von Selbstbeobachtung, Selbstkonstitution und Autopoiese." In Krohn, Wolfgang and Küppers, Günter, eds. *Selbstorganisation, Aspekte einer Wissenschaftlichen Revolution*. Braunschweig, Wiesbaden: Friedrich Vieweg Verlag, 231-263.
- Wallner, Fritz. 1990. "Acht Vorlesungen über den Konstruktiven Realismus", 3. überarbeitete Auflage. *Cognitive Science* 1 (Wien: Universitätsverlag).

## **SOCIETY AS A SELF-REPRODUCING SYSTEM**

**Pavel O. Luksha\***

**T**HE MAINSTREAM approach of the social sciences, a heritage of a reductionist mechanistic paradigm, remains to build theories bottom-up by starting from individuals with given properties and individual interactions and aggregating them on a collective level. This framework has long been criticized for its inadequacy, as in order to understand the mechanism and the origin of any type of social activity, interaction or decision, it is crucial to model a system in which these activities and interactions are performed, that is, model a society. This is where the approaches and achievements of the system sciences, and of social cybernetics in particular, are of value. Among the most important implications of systems approach is a requirement for system unity and a holistic point of view (Mulej et al. 1999).

### **SOCIOCYBERNETIC RESEARCH**

The ultimate purpose of social studies is to comprehend the laws of a system that is a society in order to explain and predict its micro and macro-dynamics. Because there is much more resemblance between biological and social systems than between social and mechanical systems, the tradition and the logic of cybernetics as drawn by Wiener and his followers, is doubtfully applicable (at least, unless serious revisions are made). Indeed, this has been the thrust of the work of some well-known sociocyberneticians, such as Heinz von Foerster and Niklas Luhmann, to name two. It has been widely accepted by cyberneticians, since von Foerster first proposed it (1974), that one of the primary differences between mechanical systems and the complicated objects of biological and social sciences is the property of self-reference in the latter. On this basis sociocybernetics emerged, and many sociocybernetic studies focus on the description of self-referencing individuals that constitute a society or on self-referential properties of societies themselves (Geyer and van der Zouwen 1992). While

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\* Direct correspondence to Pavel O. Luksha, Higher School of Economics, Moscow, Russia; email: [pluksha@yahoo.com](mailto:pluksha@yahoo.com). The author wishes to acknowledge that this article is one of the results of an interdisciplinary seminar on the analysis of systems with memory and would especially recognize Alexander Plekhanov, without whom it would never have appeared, and Dr. Evgeny Sataev, who supported some of the mathematical aspects of the concept and also helped to develop a cognitological map of a basic social system.

self-reference by itself is a powerful concept, a recent review of sociocybernetic studies (Geyer 1995) shows that there is a very broad understanding of what self-reference can mean: from a system's ability to operate on itself to conscious representations of one's beliefs and expectations. Applications of a self-reference are dispersed; and yet the self-referential approach can be taken to build a structured social theory.

This path of research can be handled in the following way. A society can be considered as a system with an internal unity and able to reproduce this unity in a sustainable way. Thus, cybernetic work on biological reproduction, starting with the conceptual work of John von Neumann (von Neumann and Burks 1966), can be judged as a suitable model for social analysis. The need to consider social reproduction and self-production has also been emphasized in sociocybernetic research (Burns et al. 1985). By all means, self-reproduction *must be* self-referential, because it (a) requires a system to operate on itself, (b) requires a system to maintain a representation (or some kind of description) of itself.

The primary intention of this paper is to offer an alternative point of view on structural and functional organization in the hope stimulating a discussion among sociocybernetic scholars. I will therefore attempt to sketch some conceptual ideas of a cybernetic analysis of societies as self-reproducers. Certainly, the line of analysis I intend to pursue is not altogether new to the social sciences. The systematic approach (once called the organismic approach), in some sense, has been discussed since the origin of sociology (Spencer 1901). It has been (in form of the analysis of economic cycles) independently proposed by Karl Marx in his study of capital circulation (Marx 1976), as well as by macroeconomists throughout the twentieth century; John M. Keynes and Vassily Leontieff can be mentioned as two of the most significant characters in this tradition of contemporary economic science (Blaug 1991). This line was also developed by Emile Durkheim in his treatment of society as an objective entity (Durkheim 1982). The structural-functional analysis of Talcott Parsons (Parsons and Shils 1951) identified the organizational components and institutions that are regularly reproduced in a society,<sup>6</sup> and the functional relationship among them.

A society can be broadly defined as a group (or a number of groups) of individuals linked by a network of communication (more precisely, a network of material and energy flows, including informational flows) into a sustainable system. An autonomous society, to extend this, is a society that is much more dependent on its internal components and links rather than on its links with other societies. A Greek polis, a traditional tribal organization or an isolated country (examples include the Soviet Union, Northern Korea, and Japan prior to its opening) can be considered autonomous, while, for instance, a scientific community cannot (because each of its members is extremely dependent on external links and objects outside of the society). Due to increasing globalization, most countries are becoming more and more integrated into the world economy and thereby more dependant on their trading counterparts. Thus, while most countries today cannot be considered autonomous, any economically and culturally closed areas can (in a long-term perspective, the entire Earth may possibly become a single, or rather, the only autonomous society).

It is natural to speak of autonomous social systems as sustainable. A social individual in

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<sup>6</sup> Although Parsons does not explicitly use this wording, he speaks about institutional sustainability.

such a system is a biological organism (of *Homo Sapiens*) which (a) is socialized (i.e., is capable of functioning as a normal member of a given society) and (b) performs a number of social functions assigned to it by a society. A social individual has basic needs determined by his/her biological nature (e.g., need for rest and sleep, food and drink, sex, safety), as well as needs implied by his/her social nature (e.g., need for status). A ranking of these needs and means to pursue them creates individual value systems. Individual actions are driven primarily by these needs and through value systems (Ellis and Hall 1994).

It is generally agreed (see, for instance, Osipov et al. 1998) that a sustainable society can be considered as:

- a) a system of regularly performed communications and reproduced activities;
- b) a system that is stable despite periodic external perturbations (although it has no constant physical "shape" like a mechanical device, a social structure can maintain itself for periods that exceed the lifespan of any such devices);
- c) a system that retains its structure and organisation despite changes of its physical basis (e.g., despite ageing and death of individuals that constitute this system).

Let us look more attentively at these properties and their implications.

## **STRUCTURAL MODEL OF A SUSTAINABLE SOCIETY**

Due to the regular and sustainable reproduction of the organization, structure, and functions of a society, one can claim that a society "remembers" itself, and thus that it has some kind of memory. The memory of a society can be identified in the following ways:

- a) There exists a basis of communication between members of a society: common language, signs, symbols, rituals, etc. In other words, a central neural system of any social individual contains (in whatever form) skills and knowledge, social samples and standards, which allow one to interact with other individuals efficiently and on a regular basis. These skills and knowledge are far more advanced than those that could have been inherited through genetic memory, and thus they are acquired socially (Vygotsky 1978).
- b) Newborn humans, being purely biological creatures after their birth, become social individuals through the process of socialization and social adaptation as they demonstrate, and master, standards and patterns of behavior. Two main mechanisms are utilised:

"demonstration-and-imitation" relationships and rituals. This phenomenon is found largely even in the animal kingdom, being the major mode of non-verbal education and especially important in early socialization (Meltzoff 1990). An important case, arising when socially critical skills cannot be imitated but are inherited, is discussed by Noam Chomsky (1994).

"teacher and student" relationships and rituals (various types of direct education in a society (Leontieff 1975).

All kinds of human knowledge, skills, cultural samples, and such that are not transferred genetically but are acquired via socialization and social adaptation, can be called a memory of

society, or a social memory (Kolevator 1984). The concept of a social memory is quite close to David Bohm's concept of a "pool of knowledge" (Bohm and Hiley 1993), though it rests on more sociological and material grounds.

The very similar notion of "memes", introduced by Richard Dawkins (Dawkins 1989), identifies social memory units, although the Dawkins' concept focuses mainly on the replication of memes and not on the function of social memory. While memes, much like genes, are minimal units of a self-reproducing memory, it is social memory, much like a set of chromosomes, that is responsible for reflecting all the properties of a self-reproducing system. Therefore, it can be suspected that a study of memes will not reveal the properties and functions of a social memory as a whole.

Social memory content is distributed among, and shared by, individual members of a society. Distribution is determined by social stratification, including gender and age stratification. In primitive societies, gender and age may be the only factors of stratification and thus of social memory distribution--for instance, social roles, knowledge and rituals of an adult male in a tribe would differ from those of an elder female, but within sub-groups these roles and habits are maximally homogenous (Turner 1969). In more advanced societies, due to a larger number of sub-groups and sub-communities, social memory content is far more diversified (e.g., professional strata would possess profession-specific social memory).

Because social memory contains all aspects of social communication and co-operation, one may claim that it is social memory that steers the society (Levada 1969). However, social memory content can dynamically change through acquisition and replication of individual experience and knowledge of society members (e.g., through innovations and rationalizations recorded into a social memory) (Platonov 1975). A social memory therefore is a bridging mechanism between macro-level dynamics of a society as a whole and micro-level dynamics of individual actions and interactions.

The concept of a social memory facilitates structuring of a society. It is evident that any society contains:

- a) individual members that share social memory, or steering elements of a society passively stored in the neural networks of individuals and activated in social actions and communications and communicate and perform social activities on an individual or cooperative basis,
- b) an artificial, or internal, environment<sup>7</sup>--all available results of collective human productive activities of the present and the past (including means of production and objects of consumption<sup>8</sup>), and

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<sup>7</sup> This name seems to be most appropriate in denoting a concept of external objects utilized in social activities. First of all, these objects are obviously an environment to humans and human groups. Second, they are artificial in a sense they have been either created socially or modified within a social action, and through this have been given some social meaning (e.g., coal mined or oil pumped is no longer a "natural" resource--it has been extracted through a social action and has been made a social commodity). Finally, there is an obvious difference between artificial and natural environment: the former may exist and be reproduced regularly only inside a society, while the latter may be impacted by a society (which extracts resources and disposes wastes) but perfectly exists and reproduces itself even when there is no society.

<sup>8</sup> A concept of artificial environment is, however, much broader than its economic synonyms. Results of productive effort may not necessary become a part of economic turnover (such as, for instance, items made for a

- c) a natural, or external, environment of a society--a pool of resources and a sink for the disposal of wastes.

Here, a social system is thought of as a network of individuals, and individuals, then, are by definition a necessary component of a society. In the paragraphs above, I have attempted to show that social memory, distributed in a society, is a necessary component of any group of social individuals.

An artificial environment (material culture, or material basis), however, should also be considered as an important part of a social system. It can be pointed out that only through the process of socialization and social adaptation can individuals learn to master a material culture, strictly the same way as they learn how to communicate. Furthermore, if (in some wicked experiment) a newborn child were not allowed to socialize, he or she obviously would not be able to use and reproduce the artificial environment of a society. Finally, there is no doubt that many components of an artificial environment are society-specific, even society-unique (think of porcelain dolls from Hong Kong or masks from Venice).

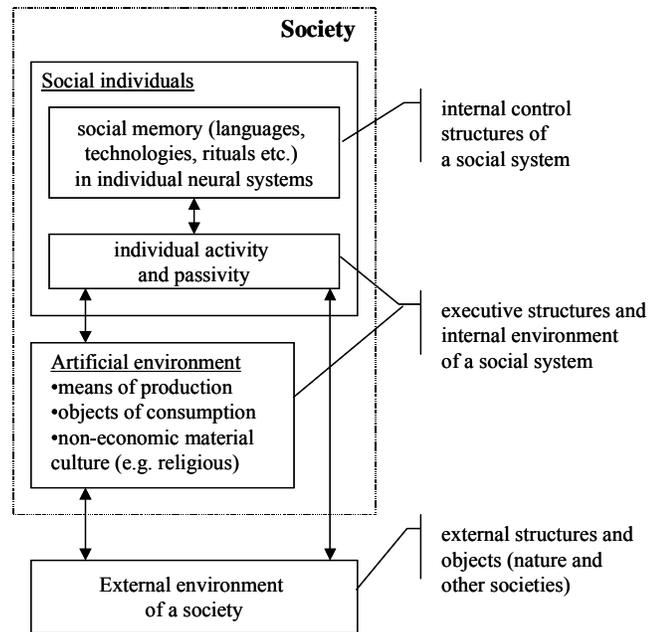
The relationship between artificial environment and social memory could be discussed. Since modes to use and reproduce an artificial environment are a part of acquired social memory, there obviously exists some kind of homomorphism between a variety of social memory content and a variety of artificial environment objects; not only artificial environment objects, but also relationships between them are represented in a social memory.

While only the first two subsystems (social individuals and artificial environment) constitute a society itself, the third one is also a crucial component. Being an open system, a society cannot sustain itself without a regular inflow of energy and material resources, as well as without the outflow of wastes (so, any ancient city *had* to construct sewers, as do modern ones). Obviously, the external environment is one of the most important determinants that shape the organization and functions of a society. A variety of resources and their scarcity or abundance will delimit possible and best technologies, norms and rituals (there is certainly a great difference between Polynesian fishermen, Mongolian nomads and Eskimo seal-hunters).

A basic structure of a society is represented below (Figure 1). While forms for each of these components, as well as relations among them, can vary significantly, this minimal structure is universal to any society.

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hobby, or religious constructions), but still they are a part of individual artificial environment. Domestic animals should also be treated as a part of artificial environment, since it is only due to efforts of past and present social individuals, and only inside a society, that they can exist and reproduce as domestic animals.

**Figure 1: Basic (minimal) Structural Model of a Society**

Any physical system undergoes obsolescence of its components. A social system, being a part of the material world, suffers from ageing and death of individuals (and thereby, the elimination of social memory possessed by these individuals) and deterioration of the artificial environment. Sooner or later, any social system would degrade and disappear--unless it somehow reproduces itself.

Only complex systems that are self-reproductive can exist consistently for a substantial period of time--this is an underlying principle of evolution. It is possible to hypothesize that there may have been autonomous societies that were not self-reproducing, but any such society would vanish with the death of its last individual member. Thus, self-reproduction is a universal property for sustainable social systems, as it is for biological systems. This consideration merges two major traditions:

- a) The fact that humans have to reproduce their material culture in order to replace deteriorated and obsolete material objects was explicitly stated by some nineteenth century economists. For instance, Marx's concept of capital accumulation (Marx 1976) centers primarily on the reproduction cycle. However, this approach, to a notable degree, ignores "the social in social systems", namely, a priority on the material basis of replication was over-emphasized, while the role of social communications and social memory was understated.
- b) One of the first authors to look at the social communications network as the self-reproducing system also, was probably Niklas Luhmann (1995). Following the autopoietic approach of Humberto Maturana and Francisco Varela (1980), he noted that a society constantly reproduces a system of communications, much as an organismic system reconstructs and replaces its material structure. However, an important fact

probably overlooked by this author is that any society reproduces its material structure *as well as* its system of communications; humans do reproduce and they do replace depreciated artificial items produced inside their society.

The works produced during a quarter-of-a-century in the Novosibirsk seminar on social normative systems, led by Michael Rozov (Rozov 1997), were among the first to analyse the mechanics of social memory reproduction. This approach, although completely independent, has a number of similarities to Luhmann's: a society is considered a constantly reproduced network of communications, and the main mechanism of this obviously non-biologic reproduction is a demonstration-and-imitation process.<sup>9</sup>

It is accepted by self-reproduction scholars that in order to self-reproduce successfully, it is sufficient for a system to reproduce only those components participating in further reproduction. Similarly, analyzing the minimal structure of a society, one may point out that in order to function successfully all its basic components should be reproduced. Accordingly, the sustainable self-reproduction of a society is equivalent to

- a) Reproduction of technological basis (or artificial environment),
- b) Reproduction of social individuals, including self-production or self-recovery,<sup>10</sup> and
- c) Replication of social memory.

This is a minimal set of social functions.<sup>11</sup> It is a strictly material phenomenon aimed at compensating for the inevitable natural outflow of components due to their obsolescence and destruction. Correspondingly, the functions (and the corresponding social institutions) that reproduce and have to be reproduced are (Plekhanov 1980):

- a) Production of artificial environment components for self-recovery, self-reproduction, and replacement of deteriorated elements of material culture;
- b) Recreation (restoration and "self-recovery") of social individuals performed through "consumption" of artificial objects used for these purposes (food, medicines, etc.);
- c) Self-reproduction of social individuals (biological reproduction) and reproduction of social memory content (socialization, education, and training).

These activities constitute the minimal necessary functional components of a self-reproducing society. Worth noting, these activities are mass performed (i.e., performed by a major part of, if not all, individuals that constitute a society). Since actions of any individual are driven by his or her internalized needs and values (conscious or unconscious), a major part of population must have needs that either support society's self-reproduction or are induced by a society's reproduction process. While basic biological needs (such as the need for food, rest, and sex) support recreation and biological reproduction of social individuals, a significant part of the needs of a social individual is only socially necessary. In order for a social system to maintain its self-reproduction, these social needs and values must be reproduced within a frame of social

<sup>9</sup> This thought can be traced back to Gabriele Tarde's famous statement that "society is imitation" (Tarde 1962).

<sup>10</sup> Self-recovery can also be considered a specific case of self-reproduction, in which case a system reproduces itself onto itself (this, namely, has been called autopoiesis by Maturana and Varela).

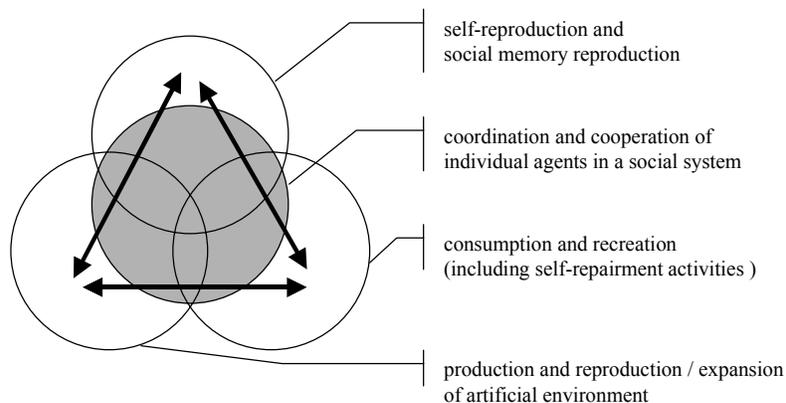
<sup>11</sup> A minimal self-reproducing structure, such as a von Neumann self-reproducing automat, included a production unit (for production of a physical structure of a new automaton), a control unit and memory (a tape) with reproduction instructions, and an instruction replication unit (a copying machine). Correspondingly, it had to reproduce its physical structure and a set of reproduction instructions into a new automat (von Neumann and Burks 1966).

memory reproduction (Schepansky 1967).

The social functions identified cannot be performed without social co-ordination and co-operation, which is therefore a fourth function necessary for the self-reproduction of society. Starting perhaps with Neolithic tribes, co-ordination and co-operation has been performed as an explicit separate function, such as in the form of tribal councils, juries, and courts (Alexeev 1984).

One can represent the set of activities within a society as an Euler-Venn diagram, where circles represent a set of individuals performing a given type of activity (Figure 2). The intersections refer to individuals performing "poly-functional" activities (activities that correspond simultaneously to a number of functions). For instance, education and production can be performed simultaneously in "learning-by-doing", consumption and reproduction are not distinguished for a pregnant woman. Arrows indicate that, periodically, individuals change their type of activities (e.g., each one has working hours and leisure hours).

**Figure 2: Minimal Set of Functions within a Society**



Of course, other social functions can also be considered, such as magic and religion, politics and war, sports and contests. While these functions are important to developed societies, they are not absolutely necessary for social self-reproduction. Most such activities can be called non-reproductive, in the sense that they are not intended (at least directly) to reproduce any component of a social system.

One may further expand this representation into a more structured model of flows and activities inside a social system, which can be consequently analyzed as a dynamic model with particular applications in economic growth theory and thermodynamic representation.

## **ANALYTIC REPRESENTATION OF A SUSTAINABLE SOCIETY**

A society can be represented as a sustainable open system, with a number of sub-blocks (time-and-space intervals in which a specific type of social activity is performed) that constitute it. According to the logic presented in the previous section, a minimum of three

major blocks can be identified:

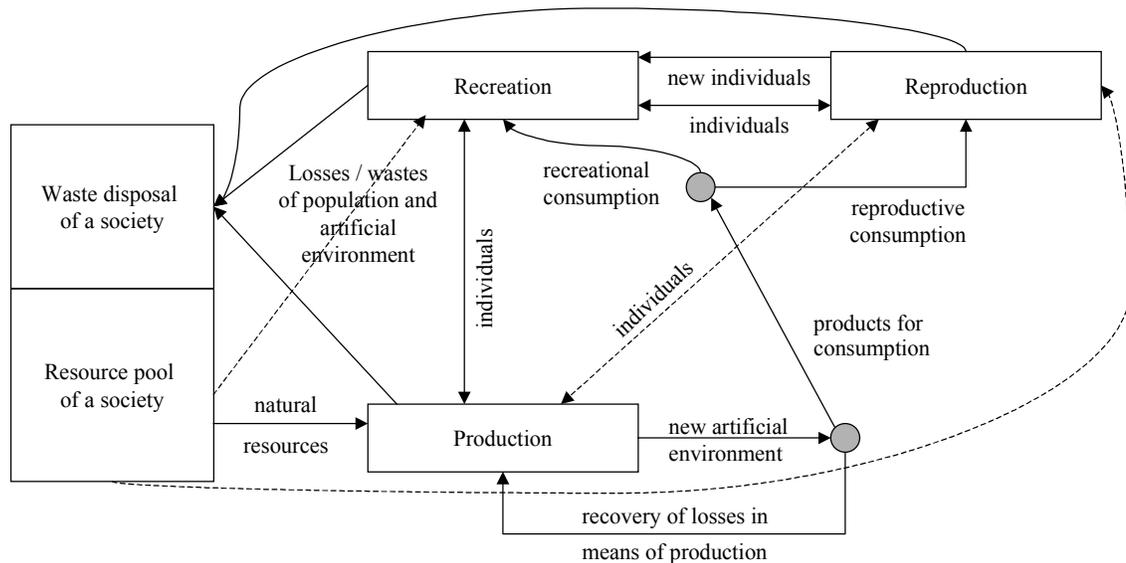
- a) a block of Recreation and Self-recovering activities, its primary output being the biological and psychological restoration of social individuals;
- b) a block of Reproduction activities (including social memory reproduction), with reproduction of new social individuals as a major output, and
- c) a block of Production activities, with the aim of reproducing material culture (artificial environment), where output (new artificial environment) is produced for the purpose of recreation, reproduction or production activities.

In each of these three blocks, human activity (and thereby human energy) and artificial environment objects are utilized to perform a block’s specific social function and the activity is steered by the social memory of individuals. Accordingly, each of the three structural blocks can be represented in the same way as a whole society (see Figure 1.).

Being an open system, any society has an external environment, with two functionally distinguishable sub-blocks:

- d) a Resource Pool, from which valuable resources flow into a system. It is suitable to assume that this interaction occurs primarily within production activity, although certain valuable resources, such as air and solar energy, may flow directly into other blocks.
- e) a Disposal Site, which accepts all losses and wastes from all blocks (since a social system is still a material system and therefore must obey the Second Law of Thermodynamics, it always produces a positive entropy in all of its subcomponents<sup>12</sup>).

**Figure 3: Minimal Structural and Functional Model of a Society**



<sup>12</sup> The Second Law (in its general form) is applied throughout this text: (1) no work can be performed at 100% ratio; (1') accordingly, there is always a waste of resources and energy in any transformation; (2) any dynamic material system degrades and deteriorates, and (2') it must perform work to remove this deterioration.

A basic structure of a social system, including flows of artificial environment objects and individuals between functional blocks, is represented in Figure 3. Given the functional dependencies of inputs and outputs in each of the blocks, the mass social decision nodes regarding distribution of social product for production, reproduction, and recreation are represented by alternation points marked by gray spots.

The functional interdependency between the blocks is obvious--each of these utilizes inputs from, and supplies outputs to, other blocks. Because all the blocks identified are absolutely necessary for a sustainable operation, this scheme represents a minimal structural and functional model of a society. Intra-flows of individuals and material objects among the three blocks unify them into a sustainable self-reproducing system.<sup>13</sup>

A sustainable social system must possess three sub-blocks (production, recreation and reproduction) distributed in space and time. They can be defined as points for allocation of social resources, and their interaction and mutual transformation. It is obvious that there are two major types of social resources (energy and matter flows) in any society:

- a) socially active energy and matter, or social individuals performing goal-directed actions, and
- b) socially passive energy and matter (artificial environment, natural resources and wastes).

In order to describe social dynamics, let us use the following notions:

N--social individuals,

P--artificial environment of a society,

F--natural resources,

W--wastes and losses (as it has been pointed out already, any action and transformation inside a society will inevitably produce wastes and losses),

A target transformation of the "Production" sub-block is to convert natural resources F of external environment into a social product P. This process is accomplished by applying social individual activity N and artificial environment components P (such as tools and instruments):

$$k_1F + k_2N + k_3P \rightarrow P + W \quad (1.1)$$

A target transformation of the "Recreation" sub-block is to convert a part of social product P into social individual energy N in order to restore losses, whereas a target transformation of the "Reproduction" sub-block is to utilize part of a social product P to reproduce new individuals N. For both transformations, some fraction of existing social individual energy N is needed.<sup>14</sup>

These two transformations have a similar description and thus can be added:

$$k_4N + k_5P \rightarrow N + W \quad (1.2)$$

It is also possible to assume that a spontaneous (or rather, not socially induced) transformation

<sup>13</sup> This model has a clear resemblance to a heterocatalytic reaction of DNA-RNA-protein reproduction in a cell. DNA is a cell "memory" which is either duplicated by active "agents" (ferments, or proteins), or is decoded by these "agents" to construct "tools" (t-RNA, m-RNA, and r-RNA). "Agents" further "use" the "tools" to reproduce other "agents" (r-RNA and proteins form a ribosome "shaping" new proteins, t-RNA transports amino-acids to construct this protein, and m-RNA acts as a source of instructions). This analogy is not a mere coincidence, since both systems are self-organising, self-reproducing products of evolution.

<sup>14</sup> In fact, in any human action, even in energy acquisition, there is always an energy loss; even in the process of nourishment, the human organism takes energy to operate its digestive system, from jaws to intestines.

of natural resources into products (such as in a berry-picking economy) may happen:

$$k_6F \rightarrow P \tag{1.3}$$

A stable loss of population not impacted socially may also occur (e.g., death due to aging):

$$k_7N \rightarrow W \tag{1.4}$$

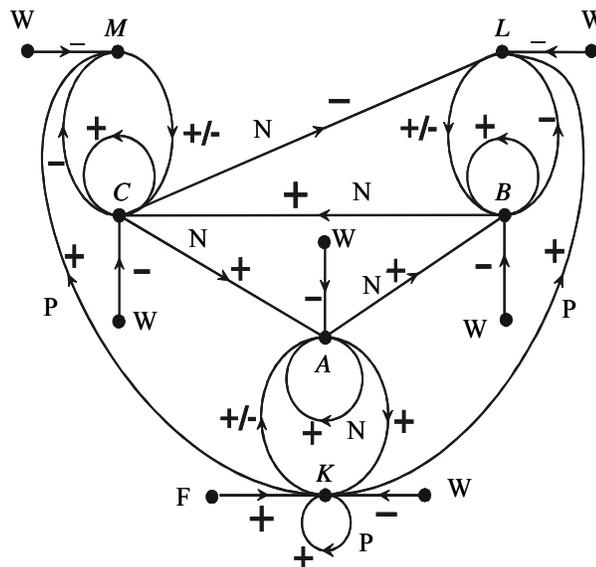
This set of dynamic transformations can be summarized as in Table 1.

**Table 1: Locations, Target Products, and Transformations of Social Activities**

Location	Production	Recreation	Reproduction
Target product of transformation	New artificial environment (P)	Recovered population (N)	New population (N)
Transformation	$k_1F + k_2N + k_3P \rightarrow P + W$ $(k_6F \rightarrow P)$	$k_4N + k_5P \rightarrow N + W$	$(k_7N \rightarrow W)$

This set of transformation equations corresponds to a cognitological mapping of society as represented in Figure 4 (Plekhanov et al. 2001), which is a graph representing system dynamics. Its nodes correspond to locations in which individuals interact with the artificial environment while massively performing certain social actions. Accordingly, branches of the graph represent flows of social individuals and of artificial environment from one location to another; each branch can be assigned a positive or a negative sign, depending on whether it is an inflow or an outflow. Transformation (1.1) takes place in Production nodes A and K. Transformation (1.2) occurs in Recreation nodes B and L and Reproduction nodes C and M. Additional outflow from the node C indicates that certain "by-products" of human reproduction may become part of the artificial environment in node L. Transformation (1.3) may take place in node K. Transformation (1.4) may happen in nodes A, B, and C.

**Figure 4: Cognitological Mapping of a Society**



This dynamic set of transformations can be studied as a non-equilibrium dynamic model. It has certain similarities to a Brusselator and other hetero-catalytic reaction systems: there is some initial substance to be transformed (F), intermediate transformation substances (N and P) with auto- and hetero-catalytic properties, and a final substance (W) which cannot undergo further transformations.<sup>15</sup> However, in real social life (unless a homeostatic society is considered), transformation coefficients  $k_i$  ( $i=1,\dots,7$ ) will not remain constant (as technological development and adaptation to resource availability will certainly alter them).<sup>16</sup>

A social system is a material system, and therefore any external or internal interaction in it is also a flow and/or transformation of energy and matter. A system of humans, a society, much like a human himself, can be represented as a thermodynamic system. First considerations of this kind were made by Nicholas Georgescu-Roegen (1971). In accordance with Figure 1, Figure 3, and Figure 4 it is possible to derive the components of this system:

- a) an *inflow* of energy and matter from the resource pool is performed primarily through a production process. In fact, some of this matter and energy really *flows* into a system (e.g., fresh air may flow into a room without external "enforcement"), while a substantial part of it is actually *extracted* from the external environment, that is, certain social effort is applied to establish this inflow;
- b) the *inner flows* of matter and energy are related to (accomplished by, and targeted to) two principle distinct types of a society's structural components: social individuals and artificial environment;
- c) the *outflow* (loss/waste of matter and energy due to inefficiencies, degradation, etc.) will happen within any transformations of a society (it is possible to assume that everything that is not used by a society, and is not intended to be used further on, is in fact wasted).

In order to analyze the thermodynamics, the basic model of social dynamics (1.1)-(1.4) may be slightly revised. The existing artificial environment shall be denoted by K, while newly produced artificial product (both elements to renovate the artificial environment and to be consumed by social individuals) shall be denoted by P. This denotation will facilitate a consideration of the process of social product distribution.

In every period of a social life cycle, P is produced with a contribution of energy and matter from social individuals N and artificial environment K. P is delivered (or, distributed) as an inflow for social individuals and artificial environment immediately afterwards.<sup>17</sup> It is then used to support energy and matter needs for the restoration and reproduction of N and K. Thus,

<sup>15</sup> Brusselator is a model perfectly suited for chemical kinetics analysis (Nicolis and Prigogine 1977). It is represented as a set of auto- and hetero-catalytic reactions, for molecule types A, B, X, Y, D, E:  $A \rightarrow X$ ,  $B+X \rightarrow Y+D$ ,  $2X+Y \rightarrow 3X$ ,  $X \rightarrow E$ . It has been shown that this model has a particularly interesting behaviour in non-equilibrium state, where it has a set of "switches" (bifurcation points) between steady-dynamics states. I would hypothesise that basic model of social dynamics may exhibit a similar behaviour.

<sup>16</sup> This model will not be examined in details here, since my objective is to outline a conceptual framework. In Appendix 1 a basic growth model is presented, derived on the basis of the cognitive map outlined.

<sup>17</sup> More precisely, it is possible to say that different types of P are produced for N and K, and therefore P is distributed already in the course of production. A human cannot eat screws, and a machine most likely will not feed on sandwiches. And, there are rare examples when sane people would produce something intended neither for social individuals N nor for artificial culture K (an item without any purpose).

the thermodynamic balance of a society can be represented as in Table 2.

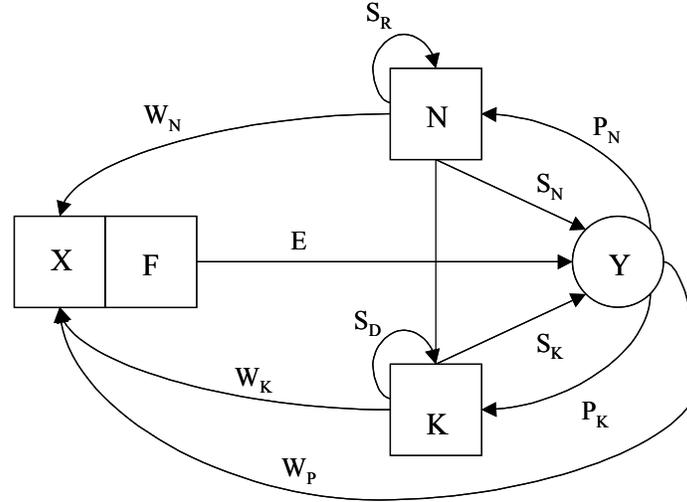
**Table 2: Thermodynamics of a Social System**

<i>functional component</i>	<i>Inflow</i>	<i>outflow</i>	<i>balance residual</i>
social product (P)	external energy and matter inflow(E) energy of social individuals used for production purposes ( $S_N$ ) energy and matter of artificial environment used for production purposes ( $S_K$ )	product used for population recreation/reproduction ( $P_N$ ) product for artificial environment restoration ( $P_K$ ) production loss/waste ( $W_P$ )	0 (no stock of undistributed product is assumed, i.e. no product is produced without purpose)
social individuals (N)	product “assigned” for population ( $P_N$ ) energy/matter used for recreation/reproduction activities less losses for inefficiency ( $S'_R$ )	energy/matter used for production activities ( $S_N$ ) energy/matter used for recreation/ reproduction activities <sup>18</sup> ( $S_R$ ) population loss/waste( $W_N$ )	increment/ decrement in population ( $\pm\Delta N$ )
artificial environment (K)	product “assigned” for artificial environment ( $P_K$ ) energy/matter used for restoration less losses for inefficiency ( $S'_D$ )	energy/matter used for production activities ( $S_K$ ) energy/matter used for restoration ( $S_D$ ) artificial environment losses/wastes ( $W_K$ )	increment/ decrement in artificial environment ( $\pm\Delta K$ )

An important implication of this balance is the following: because it primarily represents flows of energy and matter, every inflow must be "distributed" (either utilised socially, or wasted) and every outflow must be "supported" (i.e., there can never be an outflow of energy and matter that is not there!). However, N and K are not flows; they are stocks. Therefore, imbalance in inflow and outflow related to N and K results in a corresponding increment or decrement of N and K.

The thermodynamic balance of a society can also be represented as a flowchart as in Figure 5. This flowchart is apparently an alternative representation of a cognitological mapping (Figure 4), where, instead of natural flows of N, K and P, energy and matter flows *related* to them are presented.

<sup>18</sup> Because there is  $S_R$  on the side of outflow, and  $S'_R$  on the side of inflow, and, by definition,  $S_R > S'_R$ , it is possible to represent this as a *net* outflow of energy/matter for self-reproductive activities:  $S''_R = S_R - S'_R$ . A similar logic can be applied to  $S_D$  and  $S'_D$  in artificial environment inflow/outflow.

**Figure 5: Representation of a Social System Thermodynamics**

Because a society transforms external energy into "useful work", its thermodynamic efficiency can be estimated. For a thermodynamic engine (such as combustion engine), the efficiency ratio is defined as its net productive work per unit of external energy absorbed, equal to its overall "effort" generated per unit less "effort" to bring an engine back to its initial state (to commence a new cycle).

Similarly, the efficiency ratio for a social system will be social product less product spent on restoration of losses, per unit of absorbed external energy:

$$\lambda = \frac{\underbrace{P - S_N - S_K}_{\text{production efforts}} - \underbrace{[S_R - S'_R] - [S_D - S'_D]}_{\text{restoration efforts}} - \underbrace{W_N - W_K}_{\text{losses due to N and K activity}}}{E} \quad (2.1)$$

It is also possible to represent this "net productivity" as per unit external energy inflow less waste and loss outflows:

$$\lambda = \frac{E - W_P - W_N - W_K}{E} \quad (2.2)$$

This ratio is a dynamic indicator, and it may have different values, and even a different sign, for various periods of time. In the periods of expansion,  $\lambda > 0$ , while during reduction periods,  $\lambda < 0$ .

One example of the implications of the above modeling is provided by the important case from anthropology and historical economics of so-called steady state societies, which we may also call homeostatic societies. The following is based on the fact-finding in primitive economies by Marshall Sahlins (1972) and other anthropologists analysing a stone-age mode of production (e.g., Nadel 1957).

Most homeostatic societies exist in flourishing regions of the Earth: Central Africa, Oceania, and tropical South America. Yet, the economic productivity of these societies is extremely low--they gather food only sufficient to meet their daily needs and they never store excesses. The material culture is underdeveloped, too, and tribals treat it extremely wastefully, as they never repair their craftworks nor transport them as their tribe moves to a new mooring. The amount of time allocated for work is also very low, no more than three to four hours per day. The rest of spare time is taken by non-productive activities, often constituting well-elaborated myth-and-ritual complexes; in some societies, social memory for such rituals has been lost, so the majority of adult tribals' spare time is taken by mere recreation.

Based on the balance and the flowchart, it is possible to analyze the condition of homeostatic social dynamics. The social dynamic will remain stable (a society will exhibit basic reproduction behavior) in case quantities of all deteriorated components of a society are replaced by exactly the same quantities of newly produced components. In other words, for each of three components, social individuals  $N$ , artificial environment  $K$  and social product  $P$ , the outflow should match the inflow. In case all three components are homogenous (in the sense that they do not have variety), this is a *sufficient* condition for social homeostasis. In case they are diversified (which is common), this is a *necessary* condition. Correspondingly, the balance equations will be:

a) for social product

$$E + S_L + S_K = P_L + P_K + W_P \quad (3.1)$$

b) for social individuals

$$P_L + S'_R = S_L + S_R + W_L \quad (3.2)$$

c) for artificial environment

$$P_K + S'_D = S_K + S_D + W_K \quad (3.3)$$

For a social homeostasis to take place, equations (3.2)-(3.3) should hold (equation (3.1) holds by definition). There may exist statistical deviations over a short interval of time; however, over a substantial span of time, inflows and outflows must be balanced. If balance equations hold (i.e., if the homeostasis condition is fulfilled), then, always, the efficiency indicator (as given by equation (2.2)) is zero:  $\lambda=0$ .

It is evident that a steady-state society cycle is organized in a way to maintain social (thermodynamic) homeostasis: productivity is low to delimit external energy inflow ( $E$ ) and spare time is taken by non-productive activities to increase wastes and losses (of population and material culture,  $W_L$  and  $W_K$ ). Any extra resources (e.g., high crops) are wasted immediately (for instance, harvest feasts are initiated) as to return to a regular level of inflow. This is by no means a conscious decision of tribe members--such behavior has been introduced into social memory and is followed as a social norm.

As Gregory Bateson has pointed out, the value system of a homeostatic society is organized so as to maintain its balance state. Individuals do not demand items they physically do not need; furthermore, there is a social "soft punishment" for individuals that try to disrupt a balance state (Bateson 1949).<sup>19</sup> The particular importance of non-productive activities (which,

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<sup>19</sup> To quote Bateson himself: "It is immediately clear to any visitor of Bali that the driving force for any cultural activity is not either acquisitiveness or crude physiological need. ... There are very few Balinese who have the

on one hand, waste extra resources, and on the other hand, do not generate extra product) should be emphasized.<sup>20</sup>

I may end up with a remark that non-productive activities also take a substantial amount of recreational time in "television democracies" of contemporary developed countries; the energy of individuals is delimited and canalized (by encouraging "watching a game", "having a beer" and, more generally, a "live to consume" life-style), which can be considered a tendency to restrict creativity and prevent social changes.

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idea of steadily maximizing their wealth or property; those few are partly disliked and partly regarded as oddities" (1949: 43).

<sup>20</sup> In Appendix 2, I present a basic social homeostasis model, based on the framework introduced in Appendix 1.

**APPENDIX 1****Representation of a basic socio-economic model as a growth model**

A consideration of internal and external flows, as conducted in Chapters 3.1 and 3.2, allows for a basic model of a socio-economic life dynamics.

Consider that social individuals and artificial environment are homogenous (or are measured in some universal units), and that a society consists of an equivalent of  $N$  fully capable (adult) individuals. These individuals utilize a technological environment (tools and instruments) of  $K$  units for production activities.

The production function of a social system is generally described as

$$Y = P(N, K) \quad (4.1)$$

i.e., it depends on two factors--amount of labor force, or the energy of adult social individuals ( $N$ ), available in the system, and amount of technological environment objects ( $K$ ) that can be utilized by this labor force.

A decision is taken regarding the distribution of production ( $Y$ ) between technological environment objects ( $I$ ) and consumption objects ( $C$ ). Similarly, consumption items can be used for reproduction ( $C_1$ ) and for recreation/leisure ( $C_2$ ).

$$Y = I + C = iY + (1-i)Y, \quad i = i_t \quad (4.2)$$

$$C = C_1 + C_2 = \alpha C + (1-\alpha)C, \quad \alpha = \alpha_t$$

A dynamics of technological environment is then given as

$$\begin{aligned} \dot{K} &= \Delta K_1 - \Delta K_2 \\ \Delta K_1 &= I \end{aligned} \quad (4.3.1)$$

$$\Delta K_2 = \delta(K, Y), \quad \frac{\partial \delta}{\partial K} > 0, \frac{\partial \delta}{\partial Y} > 0 \quad (4.3.2)$$

$$(4.3.3)$$

where  $\Delta K_1$  is the amount of new technological items produced and  $\Delta K_2$  is the amount of deteriorated (or depreciated) existing objects of technological environment.

Correspondingly, the dynamics of the population of social individuals can be described as

$$\dot{N} = \Delta N_1 - \Delta N_2 \quad (4.4.1)$$

$$\Delta N_1 = R(N, C_1), \quad \frac{\partial R}{\partial N} > 0, \frac{\partial R}{\partial C_1} > 0$$

$$\Delta N_2 = L(N, C_2, Y), \quad \frac{\partial L}{\partial N} > 0, \frac{\partial L}{\partial C_2} < 0, \frac{\partial L}{\partial Y} > 0 \quad (4.4.2)$$

$$(4.4.3)$$

where  $\Delta N_1$  is a number of newly reproduced social individuals (given by some function  $R$  positively depending on population size  $N$  and on a number of consumption objects  $C_1$  delivered to this block) and  $\Delta N_2$  is the number of social individuals leaving a social system due to death or migration (given by some function  $L$  positively depending on population size  $N$  and negatively depending on a number of consumption objects  $C_2$  delivered to this block, i.e., the larger is the volume of consumption, the fewer individuals die or migrate from the society).

The dynamics of a social system can then be described as

$$\begin{aligned}\dot{K} &= iP(N, K) - \delta[K, P(N, K)] \\ \dot{N} &= R[N, \alpha(1-i)P(N, K)] - L[N, (1-\alpha)(1-i)P(N, K), P(N, K)]\end{aligned}\quad (4.5)$$

Particular properties of this system will depend on a representation of functions  $P$ ,  $R$ , and  $L$ . One of the simplest cases of this dynamic system is a neoclassic economic growth model, which has become known as the Solow-Swan model (Solow 1956):

$$\begin{cases} \dot{K} = iN^{\gamma_1} K^{\gamma_2} - \delta K \\ \dot{N} = \beta N \end{cases}\quad (4.6)$$

The environmental aspect of society dynamics can further be considered in this model. Assume that  $F$  is a pool of available natural resources, and that a society has a consumption of natural resources in proportion to the volume of production. The dynamics of this resource pool is given by

$$\begin{aligned}\dot{F} &= \Delta F_1 - \Delta F_2 \\ \Delta F_1 &= \lambda F \\ \Delta F_2 &= \zeta Y\end{aligned}\quad (4.7)$$

where  $\xi$  is some requirement of external resources per unit of production. The production function is modified to consider a resource limitation:

$$Y = \min\left[P(N, K), \frac{F}{\xi}\right]\quad (4.8)$$

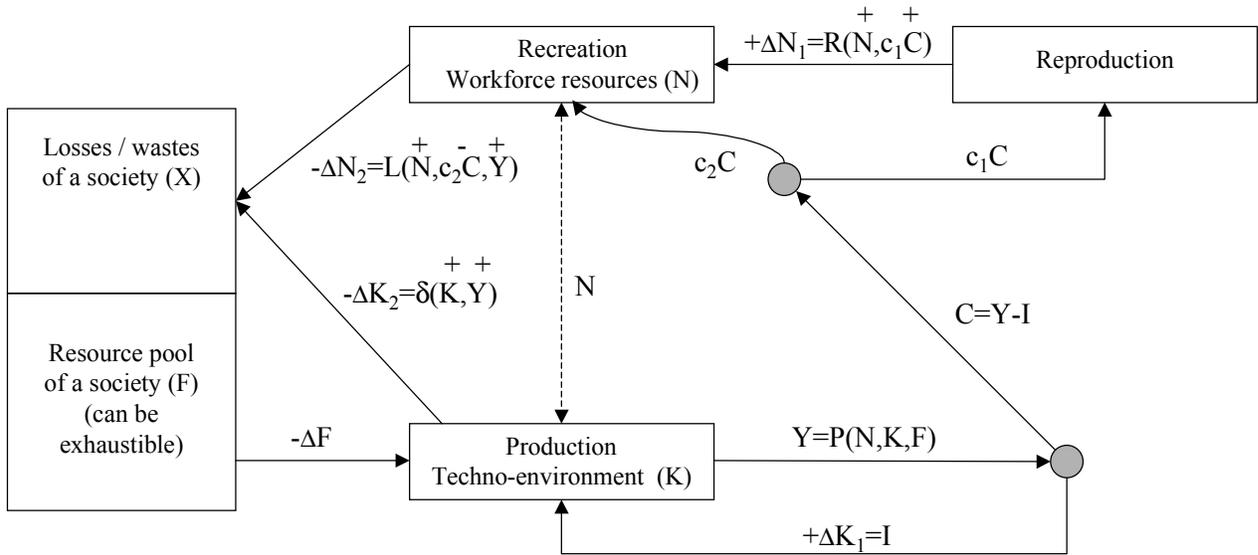
The dynamics of a disposal site can be correspondingly represented as

$$\begin{aligned}\dot{X} &= \Delta X_1 - \Delta X_2 \\ \Delta X_1 &= \Delta N_2 + \Delta K_2 \\ \Delta X_2 &= \vartheta X\end{aligned}\quad (4.9)$$

It is then possible to model a negative impact of growth of disposals on natural pool recovery ( $\Delta F_1$ ), as well as on the dynamics of population ( $\Delta N_1$ ).

Thus, the model outlined in Figure 6 represents a general framework of society dynamics analysis.

**Figure 6: Analytic Representation of a Socio-Economic System**



This approach allows for the development of a variety of growth models, however detailed. Its most important features are the endogenous representation of population dynamics and the consideration of an external environment as a delimiting factor (and, accordingly, consideration of environmental dynamics).

## APPENDIX 2

### Basic reproduction of a socio-economic system

Within a framework of the model introduced in Appendix 1, analysis of a steady state socio-economic system can be accomplished. As it has been pointed out, a steady state society exhibits homeostatic properties: its outflows are exactly matched by its inflows and social individuals seem to avoid any incremental production activity that may create abundant social product.

Effort expended for production activities, mode of product distribution, and level of product consumed in a steady society are all determined by a long tradition. This tradition, however, is by itself an outcome of the work of generations that fine-tuned the mechanics of production and distribution to serve a steady-state purpose. For all extra resources that may occasionally appear in a society (e.g., extra harvest, successful catch) there typically exist rituals and traditions that result in their waste (e.g., harvest feasts).

Since social individuals typically produce no more social product than needed to recover the losses of a society, it is possible to say that steady state is *driven* by losses. The amount of new artificial environment produced and consumed is only sufficient:

- a) to restore the energy of the existing population,
- b) to reproduce approximately the same number of new individuals as the population usually loses (so the total quantity of population is kept at a constant level), and
- c) to replace artificial environment which has been deteriorated during the production cycle.

The basic social homeostasis will therefore be described as:

$$\begin{cases} \Delta N_1 - \Delta N_2 = 0 \\ \Delta K_1 - \Delta K_2 = 0 \end{cases} \quad (5.1)$$

which means that inflows are only sufficient to compensate outflow of population and to compensate loss in artificial environment. Using definitions of Appendix 1, this can be rewritten as

$$\begin{cases} R(N, C_1) - L(N, C_2, Y) = 0 \\ I - \delta(K, Y) = 0 \end{cases} \quad (5.2)$$

or, in more explicit form,

$$\begin{cases} R[N, \alpha(1-i)P(N, K)] - L[N, (1-\alpha)(1-i)P(N, K), P(N, K)] = 0 \\ iP(N, K) - \delta[K, P(N, K)] = 0 \end{cases} \quad (5.3)$$

This system can be represented as

$$\begin{cases} G_1(N, K, i, \alpha) = 0 \\ G_2(N, K, i) = 0 \end{cases} \quad (5.4)$$

Given a fixed level of population,  $N=N^*$ , this system has three degrees of freedom. Therefore, by varying  $K$ ,  $i$  and  $\alpha$ , it is always possible to reach a steady-state in a society. If artificial environment is at its homeostatic level,  $K=K^*$ , then basic social homeostasis can be maintained automatically by keeping  $i$  and  $\alpha$  constant.

This basic homeostasis, however, is not a secure state for a society, because even in this equilibrium, society can plunder the external environment, extracting more resources than an environment can breed during the given period; to my knowledge, this was first pointed out by Georgescu-Roegen (1975). An ideal homeostasis, therefore, must hold an additional condition that

$$\Delta F_1 - \Delta F_2 \geq 0, \quad \text{or} \quad \lambda F - \zeta Y \geq 0 \quad (5.5)$$

In addition, availability of external resources shall be considered in a production function, as in (4.8). Then, an ideal homeostasis will be a set of solutions to a following system:

$$\begin{cases} G_1(N, K, F, i, \alpha) = 0 \\ G_2(N, K, F, i) = 0 \\ G_3(N, K, F) \geq 0 \end{cases} \quad (5.6)$$

### APPENDIX 3

#### Modeling social memory

A formal modeling of social memory faces the same difficulties as human knowledge scholars have faced: the fact that social memory is intangible delimits our ability to quantify and measure it. A possible path, however, lies in modeling the impacts of social memory on social dynamics.

Within the framework of a model of Appendix 1, two types of social memory impacts can be considered:

First, social decisions regarding the distribution of social product are, as has already been pointed out, determined by traditions, norms, and beliefs distributed in a society. Therefore, changes in distribution structure, as described by equations (4.2), pre-supposes changes in social memory. Minor socio-economic innovations introduced in this way (e.g., consume less grain and leave more for the next season's seeding) may increase overall productivity of a socio-economic system. These innovations may be accomplished consciously, especially, if there is a single social planner that can make decisions regarding product distribution. For instance, during the early 1930s, a great leap in industrialization was performed by the Soviet Union as a result of government-enforced "iron hand" redistribution of social product to industrial investment (Kuznets 1966). However, in the general case, these are mass decisions. But, even if a society attempts to follow certain traditions, deviations may arise. Such spontaneous innovations can be represented as a 'random-walk' process:

$$\begin{cases} i \sim D_1(0, \Omega_i) \\ \dot{\alpha} \sim D_2(0, \Omega_\alpha) \end{cases} \quad (6.1)$$

where  $D_1$ ,  $D_2$  are some probability distribution functions. I may also emphasize (see Bagchi 1988) that, for an in-depth study of the effects of social distribution, one must consider additionally

- a) the sector organization of the economy (e.g., distinguish between agriculture and industry, which one may call primary and secondary consumption), and
- b) the differences among groups of social individuals, engaged in and attributed to various types of social activity (i.e., consider not only a distribution of social product, but also a distribution of population).

Second, the social production function, as described by equation (4.1), can be generalized to include a technological progress factor  $A$  (Zhang 1991):

$$Y = P(N, K, A), \quad \frac{\partial Y}{\partial A} > 0 \quad (6.2)$$

Innovations may impact this factor in the following ways. Spontaneous innovations can be considered as minor improvement to a production process, which can be performed at virtually no costs (e.g., a better way to handle a certain tool can appear as a result of someone's mistake, and it then can be easily imitated by others). It should be noted, however, that every given mode of production has only a limited improvement capacity through such innovations. Real technological advancement requires a substantial social effort. It requires research, probes,

tests and design to be conducted before innovative technology is created, and even after it is created additional efforts are required to implement it and to replace old technologies. This fact was disregarded by the first scholars of economic growth, which have treated technological progress as a free good. However, in recent models, technical progress has been represented endogenously, based on investment in the research sector (Lucas 1988).

## WORKS CITED

- Alexeev, V. 1984. *Becoming Human*. Moscow: Politizdat.
- Bagchi, A.K. 1988. Industrialisation. In *The New Palgrave: A Dictionary of Economics* 2, 797-803. New York: Macmillan.
- Bateson, G. 1949. "Bali: The Value System of a Steady State." In *Social Structure: Studies Presented to A.R. Radcliffe-Brown*. New York: Russel and Russel [1963], 35-53.
- Blaug, M. 1991. *Economic Theory in Retrospect*. Cambridge University Press
- Bohm, D. and Hiley, B. 1993. *The Undivided Universe: An Ontological Interpretation of Quantum Theory*. New York: Routledge.
- Burns, T., Baumgartner, T. and DeVillé, P. 1985. *Man, Decisions, Society: The Theory of Actor System Dynamics for Social Scientists*. New York: Gordon and Breach.
- Chomsky, N. 1994. "Pieces of Mind in Psycholinguistics: Pinkler, Wexler, and Chomsky." *International Journal of Psychology* 29, 1, 85-104
- Dawkins, R. 1989. *Selfish Gene*. New York: Oxford University Press.
- Day, R. 1994. *Complex Economic Dynamics*. Cambridge, MA: MIT Press.
- Durkheim, E. 1982. *The Rules of the Sociological Method*. New York: The Free Press.
- Ellis, R. and Hall, M. 1994. "Systems and values: an approach for practical organizational intervention." In *ISSS 94 Conference Proceedings*. Asilomar.
- Geyer, F. 1995. "The Challenge of Sociocybernetics." *Kybernetes* 24, 4, 6-32.
- Geyer, F. and van der Zouwen, J. 1992. "Sociocybernetics." In *Handbook of Cybernetics*. New York: Marcel Dekker, 95-124.
- Georgescu-Roegen, N. 1971. *The Entropy Law and Economic Process*. Cambridge: Harvard University Press.
- Georgescu-Roegen, N. 1975. "Energy and Economic Myths." *Southern Economic Journal* 41, 3.
- Kolevatov, V. 1984. *Social Memory and Cognition*. Moscow: Mysl.
- Kuznets, S. 1966. *Modern Economic Growth: Rate, Structure and Spread*. New Haven, CN: Yale University Press.
- Leontieff, A. 1975. *Activity, Consciousness, Personality*. Moscow: Politizdat.
- Levada, Yu. 1969. "Lectures on Sociology." *Information Bulletin of Applied Social Research Institute*, 5, 20.
- Lucas, R. 1988. "On the Mechanics of Economic Development." *Journal of Monetary Economics* 22, 3-42.
- Luhmann, N. 1995. *Social Systems*. Stanford, CA: Stanford University Press.
- Marx, K. 1976. *Capital: Critique of Political Economy*. 3 vols. New York: Penguin Press.

- Maturana, H. and Varela, F. 1980. *Autopoiesis and Cognition*. Dordrecht.
- Meltzoff, A. 1990. "Towards a Developmental Cognitive Science." *Annals of NY Academy of Science* 608,1-25
- Mulej, M., Vezjak, M., Kajzer, S. and Mlakar, P. 1999. "Applied Systems Thinking and the Law of Requisite Holism." In *Proceedings of IDIMT*. Zadov.
- Nadel, S. 1957. *The Theory of Social Structure*. New York: Free Press
- Nicolis, G. and Prigogine, I. 1977. *Self-organisation in Non-equilibrium Systems*. New York: Wiley.
- Osipov, G., Ionin, L. and Kultygin, V., eds. 1998. *History of Sociology in Western Europe and the USA*. Moscow: NORMA.
- Parsons, T. and Shils, E., eds. 1951. *Toward a General Theory of Action: Theoretical Foundations for the Social Sciences*. New York: Harper Torchbooks.
- Platonov, K., ed. 1975. *Collective and Personal*. Moscow: Nauka.
- Plekhanov, A. 1980. "Flowchart of Society and Culture Reproduction Macro-Cycle." In *Proceedings of SEMC*. Novokuzentsk.
- Plekhanov, A., Sataev, E., Plykin, R. and Luksha, P. 2001. "Model of Reproduction Cycles and Evolutionary Dynamics of Socio-Economic and Socio-Cultural Systems." Preliminary report. Obninsk.
- Rozov, M. 1997. "Social relay theory and knowledge analysis problems." In *Theory of Social Relays: History, Ideas and Perspectives*. Novosibirsk, 3-27.
- Sahlins, M. 1972. *Stone Age Economics*. Chicago: Aldine-Atherton.
- Schepansky, J. 1967. *Elementary Concepts of Sociology*. Novosibirsk: Nauka, Siberian Department.
- Solow, R. 1956. "A Contribution to the Theory of Economic Growth." *Quarterly Journal of Economics* 70, 65-94.
- Spencer, H. 1901. *Essays: Scientific, Political, and Speculative*. London: Williams and Norgate, <http://www.lib.ru/FILOSOF/SPENSER/opyty1.txt> (Rus. trans. ed. Ya. Rubakin).
- Tarde, G. 1962. *The Laws of Imitation*. Gloucester, MA, Peter Smith.
- Turner, V. 1969. *The Ritual Process*. Chicago: University of Chicago Press.
- Von Foerster, H., et al, eds. 1974. *Cybernetics of Cybernetics*. BCL Report 73.38. Urbana, IL: University of Illinois Press.
- Von Neumann, J. and Burks, A. 1966. *Theory of Self-Reproducing Automata*. Urbana, IL: University of Illinois Press.
- Vygotsky, L. 1978. *Mind in Society: The Development of Higher Psychological Processes*. Cambridge, MA: Harvard University Press.
- Zhang, W.B. 1991. *Synergetic Economics*. Berlin: Springer-Verlag

## NEWSLETTER 12

### 1. PRESIDENT'S LETTER

Dear Members of RC 51,

This new issue of our Journal of Sociocybernetics appears in a troubled world, a world which may have changed more deeply within the past few months than we really yet know. New lines of global conflict have come to the fore violently. These require new kinds of solutions, perhaps sociocybernetic solutions, if we want to protect and to further develop the foundations of a humanistic civilization: basic human rights, individual liberty and equality, and democracy.

In this, I am convinced, our Research Committee 51 on Sociocybernetics also has a vocation of promoting involved, participatory, constructive, and, in good sociological tradition, critical science and approaches to social reality and contemporary social life.

In a way, it appears to me, we have begun to move in the direction of such an approach in a very down-to-earth process of continuity and change within the work of our RC itself. This has become particularly apparent since preparations began last fall for the World Congress of Sociology in Brisbane. We have used some well-tested components in a new combination and now find ourselves the new situation of having, in spite of the high costs of traveling to Australia, many more paper proposals for our sessions than we can accommodate.

This gives us the opportunity to select high quality papers and to put together an attractive program, which will be of interest not only to our own members. This includes for the first time sessions on sociocybernetics in all three official languages of the ISA, English, Spanish, and French. Moreover, we are, again for the first time, planning to organize a set of tutorials on sociocybernetics for this World Congress.

This has all become possible thanks to a well-established and dedicated team of members of our Board. To maintain this level of activity, however, we urgently do need much more support from you, our members. Such support, whether in the form of a few short pages of a book review for our journal or in the form of the full organization of one of our intermediate "Conferences on Sociocybernetics", will always be highly appreciated. Such contributions from many of our members are essential if our research committee is to live and flourish and hopefully, as expressed above, to contribute not only to science but also to practical life.

Much of this will have to be discussed in Brisbane. As you may be aware, a new Board will also have to be elected this year. In this, as well, we hope to see both continuity and change: continuity, to pass along precious experience and to follow lines of action that have

turned out to be successful; change, to open the way for necessary innovation and new goals and directions. Much has gone very well, and personally I am always an optimist, but it is also very clear that there are deficits and problems that remain to be resolved. I therefore ask all of you to please reflect on nominating promising colleagues you might know, certainly not excluding yourself, as candidates for the next Board.

I am very much looking forward to meeting many of you soon in Brisbane, old friends as well as new colleagues, who will, hopefully, rapidly begin to feel at home in our Research Committee. It will be a great chance to give Cyberspace faces!

Bernd R. Hornung  
President, ISA RC 51

## **2. MESSAGE FROM THE SECRETARY**

The RC51 annual meeting, hosted by the Universidad Iberoamericana, was held in León, Mexico, 24 June through 1 July. On behalf of the membership and Board of RC51, the Research Committee on Sociocybernetics of the International Sociological Association, I want to express the profound appreciation we all felt for the exquisite reception and meticulous organization with which the Organizing Committee (Héctor Gómez Vargas and his colleagues) welcomed this Third International Conference on Sociocybernetics. The high level of intellectual exchange is evident from the program that follows in this Newsletter. On a personal note, I also want to add how struck I was with the opening speeches given by the Dean, Sebastián Serra Martínez, and the Academic Director, Arturo Mora Alba. We seem to agree on the importance of the relationship between knowledge and human values and how this relationship will be a major influence on knowledge-producing institutions in the twenty-first century.

As I write, work is progressing on the organization of RC51 participation in the ISA World congress of Sociology to be held in Brisbane, Australia, 7-13 July 2002. This promises to be an event filled with intellectual challenge and leavened with possibilities for renewing old friendships and forming new bonds. The present state of preparations is featured further on in this Newsletter.

Over the past four years, RC51 membership has grown steadily and soon, all ISA members of RC51 will receive copies of ISA statutes relevant to the election in Brisbane of Board members for the new term. Please (as our President, Bernd Hornung, has exhorted above) give serious consideration to possible nominations. The overall success of the activities undertaken by our Research Committee, indeed its survival as a functioning entity, depends on the active involvement of the Board.

I sincerely look forward to the satisfaction of meeting many of you in Brisbane, or, if not there, in another future RC51 venue.

Richard E. Lee  
Secretary, ISA RC51

### 3. THIRD INTERNATIONAL CONFERENCE ON SOCIOCYBERNETICS Universidad Iberoamericana, León, Guajajuato, Mexico, 24 June – 1 July 2001

#### 3.1 Conference Program

This program can also be viewed in somewhat more detail at <http://www.unizar.es/sociocybernetics/progleon.html>; at <http://www.unizar.es/sociocybernetics/abstractsleon.html>, the abstracts of all the papers presented can be downloaded.

#### Monday, June 25

- 10.00-10.30: Welcome speeches by *Bernd R. Hornung*, President RC51, *Sebastián Serra Martínez*, Dean, and *Arturo Mora Alba*, Academic Director, of the Universidad Iberoamericana
- 10.30-11.00: Sesión Inaugural (Inaugural Address) by *Richard E. Lee*, Secretary RC51
- 11.30-12.30: Morning session (chair: Bernd R. Hornung):  
Informal presentations by participants of their research interests
- 14.00-17.30: Afternoon session (chair: Chaime Marcuello)  
*Vessela Misheva* The World of the ICT User  
*Michael Paetau* Sustainability Networks and the Emergence of Knowledge  
*Dario Menanteau* The Possible Worlds of Hispanics in the United States: Issues of System Acceptance and Exclusion
- 19.00: Get acquainted dinner in a private dining room in the penthouse restaurant "Platino". Recommended by our Mexican organizers, the restaurant affords a spectacular view of the city.

#### Tuesday, June 26

- 10.00-12.30: Morning session (chair: Felix Geyer)  
*Chaime Marcuello* Evaluating the Social Efficiency of Non-Profit Organizations: Towards a Sociocybernetic Model of Social Audit  
*Richard E. Lee* Cases of Classes, Instances of Processes: On Methodological Individualism, Systems and Historical Social Science
- 14.00-16.00: Afternoon session (chair: Bernard Scott)  
*Czeslaw Mesjasz* Images of Organisation and Development of the Information Society: Moving into Metaphors  
*Kenneth D. Bailey* Insiders versus Outsiders: An Application of the Dichotomy Theory of Niklas Luhmann

21.00-23.00: Evening session (chair: Bernard R. Hornung)  
Business meeting

### **Wednesday, June 27**

10.00-12.30: Morning session (chair: Richard E. Lee)

*Bernd Hornung* Towards a Sociology of Process and Information  
*Arne Kjellman* Sociocybernetics: The Path to a Science of Becoming?

14.00-17.30: Afternoon session (chair: Vessela Misheva)

*Felix Geyer* The March of Self-Reference  
*Bernard Scott* Learning Environments for Learning Communities: A Report on the University for the Highlands and Islands Project

*Evelyne Andreewsky*  
and *Geneviève Kouby* Complex Collective Responses as Specular Phenomena

21.00-23.00: Evening session (chair: Richard Lee)

The Subject-Oriented Approach to Knowledge, moderated by *Arne Kjellman*

### **Thursday, June 28**

10.00-12.30: Morning session (chair: Bernard Scott)

*Diane Laflamme* The Capacity to Distinguish Distinctions According to Niklas Luhmann

*José Luis Piñuel* and  
*José I. García Lomas* Autopoiesis and Communication

14.00-17.30: Afternoon session (chair: Vessela Misheva)

*Klaus Anders* Sex as Indicator in the Observation of Social Phenomena: Observation - Report - Influence

*Mike Byron* Designing Simulations  
*Imtiaz Hussain* Morgue, Museum, Or Mainstream Society? Indigenous Groups and Exit Options Under Democracy

21.00-23.00: Evening session (chair: Felix Geyer)

Democratization and Globalization, a discussion with Imtiaz Hussain of the Universidad Iberoamericana, Mexico City and member of DEMOGLO (Democratization and Globalization group)

### **Friday, June 29**

10.00-12.30: Morning session (chair: Chaime Marcuello)

*Dolores G. de Landa* New Community, New Order, New Civilization  
*Alejandro Guzmán* Work Team Management. The Challenge of an Endless Race in Organization Development

14.00-18.00: Afternoon session (chair: Dario Menanteau)

<i>Ricardo Mansilla</i>	Algorithmic Complexity in Real Financial Markets
<i>Juan Soto Ramírez</i>	Cognitive Complexity: A Reflection Center for Social Psychology
<i>Jesus Galindo</i>	Ecologies and Information and Communication Systems: Configurations, Paths, Situational Matrixes and Possibility Contexts: The Social Investigation Event

17.30-18.00                      Farewell speech by Professor *Héctor Gómez Vargas*  
 Conference Summary by RC51 President *Bernd R. Hornung*

19.00                                Farewell dinner for all participants

**Saturday, June 30**              Excursion to San Miguel de Allende

**Sunday, July 1**                 Departure

Other participants, not presenting papers:

Monika Arndt-Anders, Jo Bailey, Mona Byron, Danièle Bourcier, Dorine Eijkman, Hector Gomez Vargas, Mary de Lourdes Hernández Castañeda, Concepción de Landa, Robert Martinez

### **3.2 Opening Address by RC51 President, Bernd R. Hornung**

Muy estimado Señor Serra Martinez (Dean of the Iberoamerican University),  
 Muy estimado Señor Mora Alba (Academic Director of the Iberoamerican University),  
 Dear conference participants:

Bienvenidos a la Tercera Conferencia Internacional de Sociocibernética en León, Mexico. Esta es la primera conferencia en America Latina y es una gran alegría verlos a todos Uds. aquí. No solamente porque el Español es una de las tres lenguas oficiales de la Asociación Internacional de Sociología, de lo cual somos parte, pero tambien porque tenemos en el programa de nuestro grupo RC 51 de Sociocibernética un objetivo especial, lo que es promover sobre todo en America Latina la Sociocibernetica, es a decir la teoría de sistemas aplicada a los fenómenos sociales y establecer relaciones especiales con el mundo latino.

Nuestra conferencia aquí en León sera sin duda un gran paso inicial a fines de realizar estos objetivos. No hay que olvidar que en America Latina, y en Mexico en particular, ya existe una tradición sistémica.

Welcome to the 3rd International Conference on Sociocybernetics in Leon, Mexico. This is the first conference in Latin America, and it is a great pleasure to see all of you here. This is not only because Spanish is one of the three official languages of the International Sociological Association (ISA), of which we are part, but also because we have on the program of our group, RC 51 on Sociocybernetics, the special goal to promote in particular in Latin

America Sociocybernetics, i.e. systems theory applied to social phenomena, and to develop a special relationship with the Latin American world.

Our conference here in Leon will be without any doubt a first big step towards these objectives. Let us not forget that Latin America, and in particular Mexico, already has a notable tradition in systems science. This tradition may hopefully fertilize our presentations and discussions here at Leon.

Those of you who have been to our 1st and 2nd conference will already have realized a change. We are not, this time, in a remote and solitary place, closed in on ourselves. We are, this time, far away from Europe, in the middle of an industrial area, a regional capital that is moving ahead. We are also hosted, this time, by a university and are in principle willing and ready to open up our conference to all those from the local community who have an interest in our work.

Not quite as visible, but just as important, is a gradual development inside our Research Committee. This is a development towards more cross-referencing between our members and more substantial dialogue and exchange between them.

No quiero decir much más. Estamos listos y abiertos para discutir nuestros trabajos con todos los científicos mexicanos que tengan interés. Agradecemos mucho a la Universidad Iberoamericana y a sus autoridades, quienes nos han dado esta oportunidad.

También quiero agradecer a los miembros del Comité de Organización Local que nos han ayudado con mucho trabajo hasta este momento para hacer posible esta conferencia.

I declare open the 3rd International Conference on Sociocybernetics: “The 21st Century and Possible Worlds” and pass the word to the Dean of the Iberoamerican University, Mr. Serra Martinez. Paso la voz al Dean de la Universidad Iberoamericana. Señor Serra Martinez.

### **3.3 Inaugural Address by RC51 Secretary, Richard E. Lee**

The following address was delivered in Spanish; the English translation is given in parallel text. The author particularly thanks Chaime Marcuello for his work on the Spanish version of this talk.

Tercera Conferencia Internacional de Sociocybernetica.  
León, México  
10:30, Lunes, 25 de Junio 2001

## SESIÓN INAUGURAL

**Richard E. Lee**

Buenos días a todos. En primer lugar, quiero dar las gracias al Comité Organizador, por su duro trabajo. En segundo lugar, por la oportunidad que me brindan de compartir el honor de participar en esta cálida bienvenida tanto a ponentes como a invitados a la Tercera Conferencia Internacional de Sociocybernetica organizada por el Comité de Investigación en Sociocybernetica de la Asociación Internacional de Sociología.

"Socio" indica una preocupación por la estructura y desarrollo de las relaciones humanas. Y, efectivamente, me formé como sociólogo. Enseñé en un Departamento de Sociología, y de hecho, la genealogía de mi formación académica por vía de mis mentores se remonta, por un lado, a Paul Lazarsfeld y Robert K. Merton y, por otro lado, a C. Wright Mills y Karl Polanyi. Sin embargo, mi asociación, aunque distante y muy crítica, con la corriente nomotética de la disciplina y la perspectiva primordialmente orientada al presente resumida en la escuela de Columbia de los años 50 y sus acólitos modernos ha sido mitigada por mi prolongada afiliación al Centro Fernand Braudel en la Universidad de Binghamton. Ahí, mi trabajo se ha fundamentado en la indisoluble unidad de las regularidades de las relaciones sociales, sus estructuras, y el cambio, su historia. Este punto de partida intelectual y de lealtad institucional connota un colapso de la antinomia universal/particular, y si se quiere, de las ciencias/humanidades. El divorcio entre lo Verdadero y lo Bueno, que sustenta polaridades análogas, ha caracterizado las estructuras intelectuales e institucionales del conocimiento a lo largo de más de cinco siglos. Durante la segunda mitad del siglo XIX, las ciencias sociales nacieron de las tensiones de este

Good morning everyone. I want to thank the organizing committee, first, for all of their hard work and, second, for giving me the opportunity to share in the honor of extending a warm welcome to participants and guests alike to this Third International Conference on Sociocybernetics organized by the Research Committee on Sociocybernetics, RC51, of the International Sociological Association.

"Socio" indicates a concern for the structure and development of human relationships and, indeed, I was trained as a sociologist. I do teach in a department of sociology and, in fact, the genealogy of my academic formation by way of my mentors, goes back, on one hand, to Paul Lazarsfeld and Robert K. Merton and, on the other hand, to C. Wright Mills and Karl Polanyi. However, my association, albeit distant and highly critical, with the nomothetic current of the discipline and the primarily present-oriented perspective epitomized in the Columbia school of the 1950's and its latter-day acolytes has been mitigated by my long-time affiliation with the Fernand Braudel Center at Binghamton University. There, my work has been premised on the indissoluble unity of the regularities of social relations, their structure, and change, their history. This intellectual point of departure and institutional allegiance connotes a collapse of the nomothetic-idiographic, and if you like, science-humanities antinomy. The divorce of the True from the Good, which underpins these analogous binaries, has characterized the intellectual and institutional structures of knowledge as a whole over the past five

divorcio. Estas tensiones se reprodujeron entonces, tanto en las distintas disciplinas como entre ellas mismas, mientras se amalgamaban. La arena del estudio científico de la realidad humana, se situó entre la esfera del orden absoluto —la cual podría ser "explicada" en el sentido de las determinaciones pasadas, vía leyes universales, con un futuro predecible— y un mundo totalmente caótico de acción libre y de relativismo de los valores humanos.

Con todo esto en mente, recuerdo que Ludwig von Bertalanffy, —hace ya unos años—, sugería que el enfoque de sistemas que estaba abogando negaba esta escisión en el estudio de las relaciones sociales. Volveré más adelante a este punto, pero ahora permítanme decir algo del Comité de Investigación en Sociocybernetica. La Sociocybernetica ha atraído a una amplia serie de académicos cuyas vinculaciones departamentales representan el espectro completo de disciplinas, quiero decir con esto, desde las humanidades y las ciencias sociales hasta las ciencias, matemáticas e ingenierías. Es más, el gran número de países de origen de estos académicos atestiguan al amplio atractivo internacional de los enfoques sociocyberneticos. En esta comunidad remarcadamente diversa, hay un acuerdo compartido sobre asuntos muy generales, por ejemplo: desarrollar estrategias para el estudio de la realidad humana que eviten la reificación, que son conscientes de los riesgos del reduccionismo y del dualismo, y generalmente evitan modelos homeostáticos o lineales. Tampoco es sorprendente, sin embargo, que existan divergencias importantes en las materias de estudio, los marcos teóricos y las prácticas metodológicas.

La historia institucional de la organización que finalmente llega a ser el RC51 de la ISA comenzó en 1980 con la fundación de un Grupo Ad Hoc por el Profesor Francisco Parra-Luna, y continuó con la organización de las sesiones cuatrienales en los Congresos Mundiales. Como reconocimiento a su extraordinario crecimiento, el grupo fue promovido al *status* de Comité de Investigación en el Congreso Mundial de 1998 en Montreal. Por esto tenemos que dar las gracias a los infatigables esfuerzos organizacionales del entonces secretario Felix Geyer. Desde Junio de 1998

centuries or more. During the second half of the nineteenth century, the social sciences were born of the tensions of this divorce. These tensions were then reproduced within and among the various disciplines as they coalesced. This arena, of the social scientific study of human reality, was situated between the sphere absolute order, of that which could be "explained" in the sense of past determining, via universal laws, a predictable future and a totally chaotic world of free agency and the relativism of human values.

With all of this in mind, I recall that Ludwig von Bertalanffy, so many years ago, suggested that the systems approach he was advocating rendered moot this very divide in the study of social relations. I will return to this point later, but now let me say something about the Research Committee on Sociocybernetics. Sociocybernetics has attracted a broad range of scholars whose departmental affiliations represent the entire spectrum of the disciplines, and I mean by that, from the humanities and the social sciences through the sciences, mathematics and engineering. Furthermore, the many countries of origin of these scholars attest to the wide international appeal of sociocybernetic approaches. Within this highly diverse community, there is wide agreement on some very general issues, for instance, on developing strategies for the study of human reality that avoid reification, that are cognizant of the pitfalls of reductionism and dualism, and that generally eschew linear or homeostatic models. Not surprisingly, however, there are also wide divergences in subject matter, theoretical frameworks and methodological practices.

The institutional history of the organization that eventually became ISA RC51 began in 1980 with the founding of an Ad Hoc Group by Professor Francisco Parra-Luna and proceeded with the organization of sessions at succeeding quadrennial World Congresses of Sociology. In recognition of its extraordinary growth, the group was

el RC51 tiene su propia website, administrada por Chaime Marcuello, en la Universidad de Zaragoza. Ahí, se pueden encontrar una detallada descripción de las actividades pasadas, presentes y futuras del grupo. Les invito a cada uno de ustedes a que visiten el sitio, especialmente ya que hemos comenzado a anunciar la convocatoria de trabajos para la participación en el Congreso Mundial de Sociología de la ISA que se celebrará el próximo año en Brisbane, Australia. Somos afortunados por contar entre nosotros con el Coordinador de Sesiones, Bernard Scott. El RC51, también, publica una revista electrónica, el *Journal of Sociocybernetics*. Ahora es el órgano oficial del grupo. Las propuestas de artículos, notas, comentarios y crítica de libros para publicación son bien recibidas por parte tanto de miembros como de no miembros del RC51. La revista es gratuita y puede ser bajada del Internet dos veces al año, en primavera y en otoño. El volumen dos, número uno, está ahora disponible.

Éstas son realizaciones notables; sin embargo, las dos décadas pasadas de actividades organizacionales desmienten las raíces intelectuales más profundas de la sociocybernetica que remontan al ascenso de una larga serie de nuevos enfoques del preguntar científico comenzando en serio en los años 40. Aquí incluiría, la Teoría General de Sistemas, la Cybernetica y la Teoría de la Información, la Teoría de juegos y autómatas, entre otros. Cada una, de un modo u otro, fue una estrategia concebida para el estudio de algún aspecto de la "complejidad organizada" en la cual la solución de problemas tendría que depender del análisis de los sistemas como totalidades orgánicas. Ésta era la frontera del siguiente gran avance de la ciencia, que Warren Weaver observó en 1948 se encontraba entre los problemas simples de la física clásica con pocas variables, —el campo de la necesidad— y la complejidad desorganizada con muchas variables sensibles a la descripción por métodos estadísticos, —el dominio del azar—.

Aunque hoy el RC51 presenta una amplia red en términos de materias apropiadas, marcos teóricos pertinentes y metodologías aplicables, la serie de

promoted to the status of Research Committee at the 1998 World Congress of Sociology in Montreal, and for this we have to thank the indefatigable organizational efforts of then-Secretary Felix Geyer. Since June 1998 RC51 has had its own website, managed by our own Chaime Marcuello, at the University of Zaragoza. I would like to invite everyone to visit the website, especially as we have now begun to post details, including the Call for Papers, pertaining to the organization of RC51's participation in next year's World Congress of the International Sociological Association to be held in Brisbane, Australia. We are lucky to have Session Coordinator, Bernard Scott, with us here. RC51 also publishes an electronic journal, the *Journal of Sociocybernetics*. It has now become the official organ of the group. Submissions of full-length articles, notes, comments, and book reviews for publication are welcome from both members and non-members. The journal is free and may be downloaded from the website twice yearly in the spring and the fall. Volume two, number one is now available.

These are all notable accomplishments; however, the past two decades of organizational activities belie the deeper intellectual roots of sociocybernetics that reach back to the rise of a wide range of new approaches to scientific inquiry beginning in earnest in the 1940's. Here I would include, General System Theory, cybernetics and information theory, game theory and automata, among others. Each, in one way or another, was a strategy deemed appropriate to the study of some aspect of "organized complexity" in which problem solving would have to depend on analyzing systems as organic wholes. This was that frontier of the next great advance of science that Warren Weaver observed in 1948 lay between the simple problems of classical physics with few variables, the realm of necessity, and disorganized complexity with many variables amenable to description by statistical methods, the

enfoques desplegados por los académicos asociados al RC51 refleja la madurez de estos desarrollos. Aquí encontramos, de nuevo, Teoría General de Sistemas, y Primera y Segunda Cybernética; apoyándose sobre estas líneas, también encontramos una sensibilidad extendida a los asuntos englobados por los "estudios de la complejidad", especialmente en la conceptualización de los sistemas como auto-organizados, auto-catalíticos, auto-poiéticos. Además, la "teoría de sistemas" (al modo dado por Niklas Luhmann) ha llegado a ser uno de los enfoques más desarrollados en el trabajo de muchos de los integrantes del RC51, y aquí encontramos, también, un creciente interés en la perspectiva de sistema-mundo, la cual fue la base de mi propia formación.

Ahora, partiendo de la historia de la organización y de sus sólidos fundamentos intelectuales que he apuntado, me gustaría mirar al futuro. Aunque alguien pueda argumentar que los modelos utilizados para el estudio de la complejidad pueden ser útiles y directamente apropiados para el estudio de la realidad humana —el cuerpo del trabajo teórico y empírico en esta área está creciendo—, me parece que hay un importante objetivo en juego. Por un lado, el énfasis en los trabajos de la complejidad sobre la contingencia, la dependencia contextual, los múltiples solapamientos de encuadres temporales y espaciales, y los sistemas determinísticos pero impredecibles, implica una flecha del tiempo que sugiere que el mundo de la naturaleza sea tan "creativo" como el mundo del ser humano. La línea divisoria, entonces, entre ciencias y ciencias sociales es más confusa que lo que muchos querían pensar. Por consiguiente, muchos científicos están comenzando a decir que el mundo natural se ha de entender a través de las líneas del mundo social más que a la inversa —como pareció pronosticar von Bertalanffy—. Por otro lado, en las humanidades, los conceptos modernos de objeto original y creador humano autónomo han topado con un serio ataque en la forma de "anti-esencialismo" y "socio-constructivismo"; tales retos señalan la naturaleza dudosa de la línea divisoria entre humanidades y ciencias sociales. Estos dos fenómenos son evidencia de que los procesos a largo plazo que estructuran la formación del

dominion of chance.

Although today RC51 casts a wide net in terms of suitable subject matters, pertinent theoretical frameworks and applicable methodologies, the range of approaches deployed by scholars associated with RC51 reflects the maturation of these developments. Here we find, again, GST and first- and second-order cybernetics; building on these lines, we also find widespread sensitivity to the issues raised by "complexity studies", especially in work conceptualizing systems as self-organizing, autocatalytic or autopoietic. In addition, "system theory" (in the form given it by Niklas Luhmann) has become one of the most often deployed approaches in the work of many RC51 scholars and there is, too, a growing interest in the world-systems perspective, which was the basis of my own academic training.

Now, from the organizational history and solid intellectual foundation I have outlined, I would like to turn to the future. Although some would argue that models developed for the study of complexity can be usefully, and directly, appropriated for the study of human reality (and the body of theoretical and empirical work in this area is growing), it seems to me that there is a larger issue in play. On the one hand, the emphasis in complexity studies on contingency, context-dependency, multiple, overlapping temporal and spatial frameworks, and deterministic but unpredictable systems displaying an arrow-of-time suggests that the dividing line between the sciences and the social sciences is fuzzier than many might like to think; indeed, many scientists are beginning to say that the natural world is to be understood along the lines of the social world rather than vice versa. On the other hand, in the humanities, the uniquely modern concepts of original object and autonomous human creator have come under serious attack in the form of "anti-essentialism" and "social constructivism"; such challenges suggest the dubious nature of the dividing line between the humanities and the social sciences. These two

conocimiento como "Dos culturas" han alcanzado un *impasse*. A través de las disciplinas hay una nueva preocupación por las totalidades espacio-temporales constituidas de una vez de estructuras relacionales, representando las regularidades persistentes normalmente asociadas con el enfoque "científico" y el tiempo fenomenológico de su reproducción y cambio, representando las inconmensurables diferencias asociadas con el enfoque "humanístico".

Esto me remite al punto del comienzo. Azar y necesidad no pueden continuar siendo consideradas como opciones mutuamente excluyentes en la investigación social. Los métodos que especifican un ejemplo —a menudo sólo implícitamente— y luego un esfuerzo para predecir el impacto de intervenciones designadas para mover unidades supuestamente autónomas hacia algún estado ideal han mostrado ser altamente defectuosas y de una utilidad extremadamente limitada; en palabras llanas, no funcionan. Muchos, sin embargo, —incluyendo prominentes organizaciones—, todavía consideran éste como el paradigma de las ciencias sociales, con el énfasis en la legitimidad y autoridad de lo último. A pesar de todo, las regularidades de gran escala persisten sobre el tiempo y las "ricas descripciones" particularistas o las cuentas interpretativas basadas en un entendimiento, —*verstehen*—, de valores de contextos locales o recurriendo a la "creatividad humana" o a la "libre voluntad" como explicación fallan también para atrapar las interrelaciones de estructura y emergencia.

Pero, ¿qué significa todo esto para el RC51? Diría que, como institución, y el conjunto laxo de enfoques holísticos que abarca, el RC51 toma parte en un grande esfuerzo para resolver una crisis en el modo con el cual conocemos la realidad humana. Las consecuencias para este período de transición implican los futuros posibles que podemos imaginar y lo que nosotros podríamos considerar verosímil acelera la venida de un mundo sustantivamente más racional.

Todavía no sabemos la forma que el cambio tomará; un mundo sustantivamente más racional es sólo un resultado posible. Sin embargo, sabemos que la crisis

phenomena are evidence that the long-term processes structuring knowledge formation as "Two Cultures" have reached an *impasse*. Across the disciplines there is a new concern for spatial-temporal wholes constituted at once of relational structures, representing the persisting regularities normally associated with a "scientific" approach, and the phenomenological time of their reproduction and change, representing the incommensurable differences associated with a "humanistic" approach.

This brings me back to the point I made at the beginning. Necessity and chance can no longer be viewed as mutually exclusive options in social research. Methods that specify (often only implicitly) an exemplar and then endeavor to predict the impact of interventions designed to move supposedly autonomous units towards some ideal state have been shown to be highly flawed and of extremely limited utility; in simple language, they just don't work. Many, however, including prominent funding organizations, still consider this the paradigm of the social sciences, with the emphasis on the legitimacy and authority of the latter. All the same, large-scale regularities do persist over time and particularistic "rich description" or interpretive accounts based on an understanding, *verstehen*, of local value contexts or resorting to "human creativity" or "free will" explanations fail as well to capture the interrelatedness of structure and emergence.

But what does this all mean for RC51? I would argue that RC51, as an institution, and the loose collection of holistic approaches for the analysis of human reality it encompasses are part of an effort to resolve a crisis in the way we come to know human reality. The consequences for this present period of transition implicate the possible futures we can imagine and what we might consider feasible to hasten the coming of a more substantively rational world.

We do not yet know the form that

es estructural. Ciertamente, tengo que argüir además que la crisis en el campo del conocimiento, —esto es, en las estructuras de cognición e intencionalidad—, es parte del agotamiento total de los procesos reproduciendo las estructuras de producción y distribución en la esfera económica, y de aquellos coerción y toma de decisiones en la arena política. Puesto que esto es una crisis secular o estructural, el inicio del cambio no depende de nuestra acción normativamente motivada. Del mismo modo, la dirección del cambio será —como muestran los estudios de la complejidad— exquisitamente dependiente de las pequeñas fluctuaciones en la forma de nuestras decisiones y acciones individuales cargadas de valores.

Finalmente, permítanme terminar con una sugerencia tal vez provocando: los valores humanos ya no necesitan más el ser interpretados simplemente como un asunto de ética o moral individual en la creación del conocimiento autorizado de la realidad humana, sino que deben ahora en adelante, ser concebidos como una parte integral de una ciencia social histórica para nuestro tiempo con un amplio mandato para imaginar y evaluar futuros posibles y modos para su logro. Esta ciencia social histórica es, o por lo menos podemos esperar que será, *histórica* en el sentido de que toma en consideración la diferencia y la producción social de cambio, y *científica* en tanto que mantiene un compromiso para la producción de conocimiento fidedigno de las regularidades a largo plazo. La torre de marfil de "quién, qué, cuándo, por qué" y la "visión desde ninguna parte" está hundiéndose; nosotros, intelectuales orgánicos en su conjunto, podemos, más aún debemos, volver nuestra atención al "por quién, para qué, durante qué período, por dónde" y "desde qué punto de vista".

Es entonces, en este contexto de historia densa y posibilidades estimulantes donde el Comité de Investigación en Sociocybernetica abre y hace extensiva la invitación a la totalidad de esta dispar comunidad implicada en la interrogación común para comprender holísticamente y auto-reflexivamente la realidad social.

change may take; a substantively more rational world is only one possible outcome. We do know, however, that the crisis is structural. Indeed, I have argued elsewhere that the crisis in the field of knowledge, that is, in the structures of cognition and intentionality, is part of the overall exhaustion of the processes reproducing the structures of production and distribution in the economic sphere, and those of coercion and decision-making in the political arena. Since this is a secular, or structural crisis, change does not depend on our normatively motivated action for its initiation. By the same token, the direction of change will, as complexity studies show, be exquisitely dependent on small fluctuations in the form of our value-laden decisions and actions.

Finally, let me leave you with a perhaps somewhat provoking suggestion: human values no longer need be construed simply as a matter of individual ethics or morality in the creation of authoritative knowledge of human reality, but must hereafter be conceived as an integral part of a historical social science for our time with a broad mandate of imagining and evaluating possible futures and modes for their attainment. This historical social science is historical in the sense that it takes into consideration difference and the social production of change and scientific in that it maintains a commitment to the production of authoritative knowledge of long-term regularities. The ivory tower of "who, what, when, where, why" and the "view from nowhere" is giving way; organic intellectuals all, we may, nay must, turn our attention to "for whom, for what, for when, for where" and "from whose point-of-view".

It is, then, in this context of rich history and exciting possibilities that the Research Committee on Sociocybernetics of the International Sociological Association extends an open invitation to the totality of that diverse community engaged in the common quest to understand social reality holistically and self-reflexively.

### 3.4 Report of the President to the Board and Business Meetings

As the President of RC 51 I have reason to be very content with the development of this group, which, however, does not mean that everything is perfect.

Three **annual intermediate meetings** have been organized since the last World Congress of Sociology in Montreal under the title of “International Conferences on Sociocybernetics”.

The **Newsletter** of RC 51 has appeared regularly twice a year and has been incorporated now into our newly developed electronic *Journal of Sociocybernetics*.

**Publications** have resulted from the Montreal papers, a selection of which appeared as *Sociocybernetics, Complexity, Autopoiesis, and Observation of Social Systems*. Edited by Felix Geyer and Johannes Van Der Zouwen. Greenwood Press, Westport, CN, 2001. Work is also progressing on a selection of papers, edited by Richard E. Lee, from our other conferences for the International Review of Sociology.

Our **website** has been further developed, is fully operational, and is in a state now where only minor improvements and up dating are necessary.

Our member **Heinrich Ahlemeyer** donated \$1000US to RC 51, which was used to subsidize various expenses incurred especially as regards the Newsletter and Journal.

For the **Mattei Dogan Prize** for Comparative and Interdisciplinary Research in the Social Sciences RC 51 proposed Fred Riggs as a candidate. This newly established prize will be awarded by ISA at each World Congress, beginning with the congress in Brisbane.

Several **research topics** have been developed and have resulted in research proposals or are about to be formulated as such:

- Our Vice-President Vessela Misheva has organized a workshop on ICT users in Sweden in which our members Heinrich Ahlemeyer, Bernd Hornung, and Arne Kjellman participated.
- Our member Tessaleno Devezas has received a NATO Grant for an Advanced Workshop on long waves.
- Our member Fatima Adilova has received and carried out a NATO Advanced Workshop on Telemedicine in Central Asia as a follow-up to previous projects carried out with Bernd Hornung.
- Our members Fatima Adilova, Bernd Hornung, Günther Himmelmann and others have requested a research grant from INTAS on the study of health problems and the development of IT systems under the conditions of ecological disaster in the Aral Sea region.
- Our member Arne Kjellman is gathering a number of colleagues interested in working together with him on his subjectivist approach. Hopefully this will lead to more focused activities on this topic.

The **World Congress of Sociology in Brisbane** is under preparation and good progress has been made with regard to this. A series of **tutorials on sociocybernetics** is also being prepared as a collateral activity for the World Congress of Sociology in Brisbane.

**Membership** in RC 51 is increasing and we are the 4th largest ISA Research Committee. However, I am very sorry that I have to say that this is not the result of vigorous efforts of our Membership Drive Directors!

The last point is by no means a sign of crisis, yet it is a situation to be improved, in particular if we look at this issue in relation to the overall workload of the Board of RC 51, which also in some of the other functions is still very unevenly distributed. While a lot of work is being done by some of the Board Members, we hear very little from others.

### **3.5 Summary of the Conference and Closure, Bernd Hornung (Edited Version)**

I am supposed to give a summary of the conference and a farewell speech now, but farewell means that something has ended. Here, however, I feel not that something has ended and is finished, but that something has begun. I feel, that a new era has begun for RC 51 and Sociocybernetics. Indeed, I do not feel like saying “farewell” but rather like calling by telephone all of our members who could not be here telling them: “You poor guys and girls, you really missed something!”

As I mentioned in my opening address, Latin America and Mexico do have a tradition in systems science. The title of our conference, “The 21st Century and Possible Worlds” could also have been “20 Years of Sociocybernetics”. It has been twenty years since a group like this one met in Mexico City for a World Congress of Systems and Cybernetics. For me, that was my first international conference. When I was a doctoral student at Bielefeld and a research scientist at the Hannover “Institute of Applied Systems Research and Prognosis” of Eduard Pestel (who had been involved in World Modeling with Mike Mesarovic and Dennis and Donella Meadows), Luhmann told me, “Listen, there will be a congress in Mexico City and there is a crazy guy called Felix Geyer (in fact, he did not say “crazy”!) who is organizing a session. Why don't you go to that congress?”

That is where sociocybernetics comes from, and that is the spirit I find here in Leon now. That is when I met Felix's invisible college for the first time, 1981 in Mexico City. I am very happy that it is so well and alive in 2001 in Leon. It happened to materialize in the framework of ISA, but I dare say, this is not really important. Important is that the spirit is still the same; important are the people; important is what we are doing, whatever ISA records tell me about promotion and demotion.

New in this 3rd International Conference on Sociocybernetics is the unity of the conference, including the board and business meetings. New is that many papers cross-reference, implicitly or explicitly, without previous intervention of the organizers. All of you know, that Felix is

usually great in this. New is, that the Unity of Science, about which Systems Theory talks so much, is becoming evident in our work, which is gradually becoming more applied and empirical.

New is, that we are no longer, as previously, simply a collection of individuals, each one of us struggling separately with his own research topic and presenting his paper here, which does not have anything to do with the other papers except maybe the over-arching title. We have started to become what our name says, a research committee. We have started to practice what systems theory claims in theory, the Unity of Science. And we have started to acquire the instruments for this. In a way, we are reversing in this group what Felix has described as a trend in modern society: the emergence of more and more multiple personalities. RC 51 is on the way from a multiple personality, a heterogeneous group, to a healthy and well-functioning whole.

We have started to practice the Unity of Science as individuals in a team, as a research committee exploring in the joint efforts of its members a series of topics and developing the scientific tools for this in a way that they fit together.

In the presentations of this conference I find steps towards unity in bringing together:

- The natural sciences and the humanities (in German “Geisteswissenschaften”), traditional sociology being plagued with a split personality, as it is somewhere in between the two.
- The world of facts and the world of values.
- The worlds of matter, of cognition, and of feeling, whereby the latter is not just a pious wish or postulate. The world of feelings meanwhile belongs to the so-called hard facts of neurophysiology as investigated and presented to the public (e.g., by Antonio Damasio in his latest books\*).
- Quantitative and qualitative approaches, both of which are important to and compatible with a sociocybernetic approach, as the presentations of this conference have shown.

Integrating formerly disparate fields of science and research will provide us with a synergy, which is essential for a sociology of the 21st century. It will help us to improve the quality of what we are doing including the quality of our conferences. That we should make better quality our major concern for the future has not only come up in various discussions and communications before this congress, but also during our board and business meetings here in León. And yet, we should not look for more quality in the abstract but in the concrete research we are doing.

In this respect, several topics have appeared on which joint research seems to be both possible and desirable.

If we talk about Sociocybernetics, that is, Systems Science in Sociology, I insist on the concept of “Science” because it covers several large fields we want to deal with in our activities and

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\* Damasio, Antonio R. 1994. *Descartes' Error: Emotion, Reason and the Human Brain*. New York: Putnum.  
 Damasio, Antonio R. 1999. *The Feeling of What Happens: Body and Emotion in the Making of Consciousness*. New York: Harcourt Brace.

conferences, and that we in fact are dealing with. In all of these fields we have groups of colleagues now who are doing work and who are progressing. A “science” requires and includes an epistemology on which theory can be based, it has to take some position towards how to deal with values or an axiology, it requires of course a methodology, and encompasses empirical work and applications.

In all of these categories I can not only see individuals who work on them, but smaller or larger groups of members who share the same interests and who are about to start working on real research projects in their respective fields. This is a tremendous step ahead, which corresponds to our concern to spread what we know, to share it, and to apply it at a practical level. However, let me advance a very clear caution from my own experience in such an endeavor. Let me warn you against applying prematurely highly abstract theories and methods. Before any application we have to make sure that our theories are valid and our methods are sound. Only then can we hope to avoid doing more harm than good with our applications. We need patience to develop such a theoretical and methodological basis, but I am convinced, we are on our way now. We have in Sociocybernetic Epistemology Arne Kjellman's Subjectivist Approach and in Theory, 2nd Order Cybernetics in the tradition of Bertalanffy's General System Theory, Autopoietic Theory following Maturana and Varela, and Luhmann's Autopoietic Theory of social systems. These are three significant streams of systems theory on each of which members of RC 51 are working. However, it still requires a coordinated effort to specify the differences, compatibilities, and incompatibilities of these approaches in order to find a broad and valid basis for a sociology of the 21st century taking into account the merits of all of them.

In the field of axiology, value research, and ethics we also have two broad approaches so far. One is the indicator-oriented axiology of the founder of our group within ISA, our Past President Francisco Parra-Luna, who has established a tradition of research in this field over many years of investigating social systems. A second approach is the development of Orientation Theory by Hartmut Bossel on the basis of general systems theory. Orientation theory was originally applied to problems of ecology and sustainability, but is adaptable to virtually all kinds of social issues. For me, Hartmut Bossel, who recently received the book prize of the German Environmental Foundation for *Earth at a Crossroads*, has always been an invisible member of this group. He has been my teacher, not only on orientation theory but also on applied systems research and computer simulation in general.\*

In terms of methodology, several of us have long been involved in computer simulation, like Cor van Dijkum, Arne Kjellman, Karl-Heinz Simon and myself. But we have also heard here

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\* See Parra Luna, Francisco. 1974. *Comparing National Social Performances*. Thèse de doctorat présentée à l'Université de Lausanne. Genève: Imprimé S.A.; Parra Luna, Francisco. 1983. *Elementos para una teoría formal del sistema social, Una orientación crítica*, Madrid: Editorial de la Universidad Complutense Madrid; Parra Luna, Francisco, ed. 2000. *The Performance of Social Systems: Perspectives and Problems*. New York, Boston, Dordrecht, London, Moscow: Kluwer Academic Publishers/Plenum Publishers; Bossel, Hartmut. 1998. *Earth at a Crossroads: Paths to a Sustainable Future*, Cambridge: Cambridge University Press.

about such current activities on the part of Mike Byron, Alejandro Guzman, and Ricardo Mansilla Corona.

An excellent piece of carefully designed empirical research was presented this week by Jose Luis Piñuel. However, beyond such individual research, we now can identify several fields of application where teams of our members may cluster. Such fields are:

- *Information Technology* (IT or ICT), where we have quite a number of members involved and where Vessela Misheva is about to create a project.
- *Global systems*, development, and sustainability, topics of our International Conferences on Sociocybernetics, for which, however, a nucleus of persons is not yet visible. However, such a group could easily form around Richard E. Lee, our specialist in world-system studies.
- *Knowledge management* and business management, which has been present in all of our conferences.
- The *health care system*, in particular in connection with IT, a topic on which I am myself currently developing another project together with our member Fatima Adilova from Tashkent, Uzbekistan, and others.
- *Education*, which was presented here and at our last conferences by Bernard Scott as well as John Raven.
- *Family and community* studies, including the topic of feminism, which is a new focus appearing in this conference as far as the family is concerned.

Nonetheless, everything is not yet perfect in RC 51. We do have organizational deficits, which we have discussed here, and we do have to make some organizational optimizations. These, I hope, will be implemented by the next Board of RC 51. For this purpose we should not use the info-techno-fix, as our friend Czeslaw Mesjasz likes to express it, but rather Bernard Scott's learning organization approach.

Important, however, is that we concentrate on what we have to say to our fellow sociologists and maybe to the world at large. Our Past President Ken Bailey has made this very clear in his presentation. We really should use the Brisbane World Congress as a showcase and a step into the public and the practical world.

In my view this conference was really a good preparation for the World Congress in Brisbane. In Kolimbari and Panticosa we wanted to mind our own business. I think this conference has shown that we are a group doing group work and that we are now ready to open up to the outside.

Dear friends and colleagues,

I do not want to miss saying thank you to our hosts. I have to say, I am deeply impressed by the generosity and hospitality of our Mexican friends. We were received here as friends and members of a family. Hector Gomez, Mary Hernandez and their team have provided us with ideal conditions for work, excellent food, and, as far as time permitted, a look at life in Mexico. On behalf of RC 51 I want to thank Hector and his team, I want to thank the Iberoamerican University, which has so generously supported all of this, I want to thank its Dean and its

Academic Director, but also all of those behind the scenes who have contributed so much, often without our even knowing their names.

**Thank you very, very much! Muchas gracias!**

Of course, this conference would not have been possible without the innumerable e-mails and the work done by the International Organizing Committee and the reviewers of the papers. I want to thank all of you who have contributed your time and intellectual efforts to achieve this really high quality conference. In particular I want to thank our Honorary President Felix Geyer, who once more has been at the center of the storm and has very successfully shaped this conference.

**Thank you, and Thank you, Felix !**

I am sure now that we are well-prepared for Brisbane. Instead of saying farewell, I rather want to use one of Niklas Luhmann's favorite metaphors and say: Let Us Go Ahead To New Horizons Adelante Compañeros !Adelante A Brisbane !Adelante Al Siglo Veintiuno !

#### **4. 15<sup>TH</sup> WORLD CONGRESS OF SOCIOLOGY**

**Brisbane, Australia, 7-13 July, 2002**

##### **4.1 RC51 Tutorial Sessions, July 6-7**

Plans are in an advanced stage now to organize the following tutorial sessions for World Congress participants. They will be held the weekend before the World Congress, July 6 and 7. Exact time and place to be announced later:

1. Theory: Introduction to Systems Theory and Cybernetics (1 day)  
Bernard Scott
2. Theory: Niklas Luhmann's Theory of Social Systems (1 day)  
Bernd R. Hornung
3. Normativity: Systems Approach to Orientation, Values, and Indicators for Sustainable Development (1/2 day)  
Brigitte Ömer
4. Methodology: Simulating Social Systems (1 day)  
Cor van Dijkum
5. Philosophy of Science: Phenomenology and Constructivism - Foundations of the Subject-Oriented Approach (1 day)  
Arne Kjellman

Whether these tutorials will actually be held will of course depend on the number of registrants. The availability of these tutorials will soon be announced by the ISA.

## 4.2 Organization of Presentations

Nearly 100 persons submitted a 500-1000 word extended abstract by our November 30, 2001 deadline. In December, and over the Christmas holidays, these abstracts were reviewed by the members of our Review Committee. Each potential participant thus received four scores. These scores were averaged, and subsequently, proposals were rank ordered on descending average scores. We will be allowed 16 105-minute sessions, and have decided to present no more than four papers per session. We have also decided to have at least one roundtable discussion, plus one French and one Spanish session. This means the 60 authors with the highest average score have been invited to present their papers in Brisbane--assuming they are indeed able to come to Brisbane. This is presently being checked and obviously depends on a travel grant in most cases. If one of these 60 persons cannot come, the next person on the list will be asked to take his or her place, until no papers of sufficient quality are left. For this reason, the papers mentioned below are in some cases not yet quite certain to be presented.

Moreover, some of the abstracts were intended for specific sessions by their authors and approval of the session organizer concerned is still needed; some authors had no preference for a specific session; other authors again were invited by specific session organizers to prepare a paper for their session. Looking at all this from the viewpoint of our session organizers, the result is that some of our originally proposed sessions will be cancelled or combined with another partial session, most probably under a new name, while other sessions could use two time slots. The session proposed by our board member Tesseleno Devezas has been cancelled, as Devezas is spending a sabbatical at the Los Alamos National laboratory. It is worth mentioning here that his joint paper with James Corredine ("The Biological Determinants of Long Wave Behavior in Socioeconomic Growth and Development") published in *Technological Forecasting and Social Change*, volume 68, Number 1, pp. 1-58, September 2001, won the Elsevier 2001 Prize for the Outstanding Paper.

We had hoped to give you our complete Brisbane program in this issue but we did not want to postpone publication any longer, and now instead publish an alphabetical list of approved paper proposals (abstracts), which does not as yet indicate sessions. We hope that by early March it will be clear who is definitely able to come to Brisbane and in which session they will deliver their paper. Others, now in the reserve category, will possibly replace those unable to be present. Therefore, the program will be made available separately, as soon as it is finalized. The papers accepted for delivery are the following. As stated above, new papers may be added from our reserve category if the authors of some of these papers are unable to come to Brisbane.

### English sessions:

Adilova	The Analysis of New Independent States' Dynamic Sustainability Before and After Disintegration of Soviet Union
Aguado/Gutierrez	Value Oriented Technologies: Organizational Ecology in Social Systems Community
Albertsen/Diken	Art-Works' Networks

Anders	Autopoietic Systems in the Family
Anderson	Sociocybernetics and Changing Physician-Patient Relationships
Barbour	Information Technology Globalization: Impacts on Education, Business and Communities
Biggiero	Organizational Consequences of E-mail Introduction, Adoption and Diffusion
Brier	Luhmann Semiotized
Britain.	Modeling organizational factors affecting the development of E-learning in a University Using a Cybernetics Approach
Broom	Virtually Healthy: An Analysis of the Impact of the Internet on Patients' Experiences of Disease and Medical Treatment
Buchinger	Extending Luhmann's Theory of Social Systems to Real World Problems
Byron	Theory, Simulation, and Reality: Towards a Theory of Complementarity
Christis	Functional Analysis and Causal Explanation: Living Apart Together?
Collen	The Review of Research with Human Participants as a Sociocybernetic System
Connell	Community as "Place in this World": A Second-Order Observation
Dammann	Semantic Systems and The Functional Differentiation of Society: A Case Study on Terrorism as Warfare
Dijkum	The Validity of Simulation to Understand Complex Social Phenomena
Dimitrov-Dingsdag	Democracy in Redundance: Towards Understanding of Global Economic Empire
Drake	Understanding Chinese Art of Contract: Approach of Fuzziology
Flynn & Campbell	The Emergence of Social Groups as Complex Systems
Halbich	Trends in Sociocybernetics in Transitional Countries: Case Study Robotics
Holzer	Beyond the Nation-State: Positive, Negative and Reflexive Integration in World Society
Hornung	Emergence: A Key Concept for Sociocybernetic Theory of Information Society
Imada	Complex System and Postmodern: New Perspective for Society in the 21 <sup>st</sup> Century
Kaltenborn	The Child's Knowledge and Competence in Decision-Making in Family Transitions
Kampis	Knowledge Without Knowing
Kiessling	Global Ethics Programs and GGM: An Institutional Solution to the Existing Managerial Mindset
Kjellman	The Demise of Scientific Realism

Knez-Riedel	Strategic Choice and the Strength of Moral Argument in Enterprises in Transition Countries
Laermans	Bourdieu's Field Theory: A Systems Theoretical Re-Reading
Lee	The "War on Terror": Braudelian Speck or Secular Sandstorm
Main and Broadbent	Complex Industrial Relationships
Marcuello	The G.I.D.I.D. Project: An Experience of E-Learning, ICT, and Innovative Teaching at Zaragoza University
Misheva	Towards a Theory of the Systems Medium
Murray	A Learning Organization with 25,000 Members?
Muzzi-Dandi	Organizations' Genre Repertoire Structuration as a Self-Organizing Process: The Case of an International Virtual Research Team
Menanteau-Horta	Power Inequality, Globalization and "Compassionate Conservatism": Old and New Challenges for the 21 <sup>st</sup> Century
Mulej	Process of Creation of Economy and Society Supportive of Innovation in CEEC: A Comparative View of Slovenia
Nicolopoulos	The Ideology of Development and the Ecological Culture: Value Systems in Conflict in the Cases of Crete and Corfu and The Difficulties of the Decision-Making Process
Noe, Fjelsted, Alroe	Luhmann and Actor Network Theory as a New Basis for Studying Farm Enterprises
Ömer	Sustainable Development in Communities by Value-Based Change Management
Paetau	Social Order in Virtual Social Networks (tentative title)
Palavicini Corona	Two Methods of Applying Chaos Theory to Social Events
Parra-Luna	The Axiological Approach to the Measurement of the Quality of Universities
Raypaul	A Professional Conflict among Indian Lady Medical Practitioners: A Fuzzy Theoretical Approach
Reic	Social Responsibility of Firms and Strategic Managers: The Case of Croatia
Robbins	Ontology and Social Scientific Abstraction: Bourdieu and Luhmann
Scott	Reflexivity Revisited: the Sociocybernetics of Belief, Meaning, Truth and Power
Sevänen	Two Methods of Applying Chaos Theory to Social Events
Simon	Social Ecology as a New Systemic Inquiry into Society-Environment Interrelationships: Modeling Approaches as a Common Ground
Turnbull	Grounding the Theory of Social Organizations in Cybernetics Through Transaction Byte Analysis
Vanderstraeten	The Functional Differentiation of Modern Society
Verschraegen	The Importance of Medium Theory for Sociology: Niklas

## Luhmann on the Evolution of Communication

**French session:**

Andreewsky	Pour une sociocybernétique du texte
Guy	Système psychique et système social dans la théorie générale des systèmes de Niklas Luhmann
Kouby	Variabilité du sens des mots d'une culture à une autre
Laflamme	Retour à la phénoménologie pour aborder la production du sens et l'interpénétration entre systèmes psychiques et systèmes sociaux

**Spanish session:**

Aliende Urtasun	Procesos De Cambio Social En La República Dominicana
Amozurrutia	Cibernética en Hoja electrónica, para una Cibernética de Segundo Orden
Gómez Quintero	El conflicto colombiano, una mirada sociocibernética
De Landa	Un Modelo Familiar para el Siglo XXI
Nogales & Pintos	La Construcción Social De La Ciencia Desde Una Perspectiva Cibernética De La Mundialización: Una Reflexión Sobre Y Mas Alla De La Teoría De Sistemas Como Sociología, Según N. Luhmann

**Contributed Paper:**

Flynn	Historical Cycles: Parallelism in Art, Music, Architecture and Socio-Cultural Change Analysis
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**5. UPCOMING CONFERENCES**

This overview includes a few interesting conferences for which the abstract deadlines have already passed. They are mentioned nevertheless, as you may be interested in participating without delivering a paper or you may try to have your abstract accepted in spite of not keeping to the deadline.

**Operational Research Society**, Two Day Simulation Workshop, 20-21 March 2002, Hornton Grange, part of the University of Birmingham's conference park. For the full program, with papers on all aspects of simulation, see the society's website at <http://www.orsoc.org.uk>

**12th Mini EURO**, Brussels, April 2-5, 2002, with five themes: Decision Support Systems, Electronic and Mobile Commerce, Multicriteria Decision Aid, Human Centered Processes, and Ethical Dilemmas in Decision-Making, plus a special stream on Complex Societal Problems. See website <http://www.DSS.Brussels-2002.vub.ac.be>. Deadline for proposals was 15 November 2001, but you may try to contact Professor J.P. BRANS, University Brussels,

Center for Statistics and OR, Pleinlaan, 2, B-1050 Brussels, BELGIUM, Europe Tel.: +32-2-629.20.70 / +32-2-629.20.66

**16th European Meeting on Cybernetics and Systems Research (EMCSR 2002)**, April 2-5, 2002, Vienna, Austria, EU. See <http://www.ai.univie.ac.at/emcsr/>. Many separate symposia etc. are being held here, including:

- Third International Symposium "From Agent Theory to Agent Implementation". See <http://www.ai.univie.ac.at/~paolo/conf/at2ai3.html>. The paper submission deadline was November 16, 2001, symposium chairs are: Jörg P. Müller, and Paolo Petta ([joerg.mueller@mchp.siemens.de](mailto:joerg.mueller@mchp.siemens.de), [paolo@ai.univie.ac.at](mailto:paolo@ai.univie.ac.at)).
- Symposium on the Foundations of Information Science (FIS); please review abstracts of earlier FIS meetings since 1994 at <http://fis.iguw.tuwien.ac.at>. Paper submission by November 28, 2001 to: Béla Antal Bánathy at [BABanathy@worldnet.att.net](mailto:BABanathy@worldnet.att.net).

The **First Lake Arrowhead Conference On Computational Social Science and Social Complexity**: "Agent-Based Modeling In The Social Sciences", May 9-12, 2002, Lake Arrowhead, Southern California, USA. See <http://ccss.ucla.edu/lake-arrowhead-2002/>.

**IASTED International Conference Modeling and Simulation (MS 2002)**, May 13-15, 2002. Marina Del Rey, CA, USA, with two symposia: 1. Modeling and Simulation Methodologies; 2. Environmental Modeling and Simulation. This conference will be held in conjunction with the 6th IASTED International Conference on Power and Energy Systems (PES 2002) See <http://www.iasted.com/conferences/2002/marina/pes.htm>. Submissions due January 15, 2002. Notification of acceptance: February 15.

International Congress: **Causation And Explanation In The Natural And Social Sciences**, Ghent University - Belgium, 15-18 May 2002. See <http://logica.rug.ac.be/censs2002/>. Parallel sessions will be held on: causation and explanation in general, causation and explanation in the natural sciences and causation and explanation in the social sciences. Deadline for abstracts is 15 November 2001. Contact Address: CENSS2002, p/a Prof. Dr. Erik Weber, Centre for Logic and Philosophy of Science, Ghent University, Blandijnberg 2, B-9000 Ghent, Belgium. E-mail: [censs2002@logica.rug.ac.be](mailto:censs2002@logica.rug.ac.be).

**International Symposium 'Niklas Luhmann and Organization Theory'**; organized by EGOS, (with LMU Munich, Witten/Herdecke University, Hamburg University). Munich, 6-8 June 2002 (pre-conference workshop on 5 June 2002). Deadline for abstracts (500 words): 14 January 2002, for submission of complete papers: 6 May 2002. Papers will be circulated before the symposium. Please send submissions to: David Seidl, Ludwig-Maximilians-University, Institute of Organization, Ludwigstr. 28, Rgb. III, D-80539 Munich, email: [seidl@strategic-management.de](mailto:seidl@strategic-management.de), or to: Kai Helge Becker, Hamburg University, Faculty of Economics and Business Administration, Von-Melle-Park 5, D-20146 Hamburg, email: [becker@econ.uni-hamburg.de](mailto:becker@econ.uni-hamburg.de). The symposium, which will be held in English, will start with a pre-conference workshop on Wednesday afternoon, at which the key elements of Luhmann's theory will be

explored. This session will be of particular interest to delegates wishing to acquaint or perhaps reacquaint themselves with the key concepts. The main program will start on Thursday morning and will end on Saturday afternoon. For further information, see [www.strategic-management.de/luhmann-symposium](http://www.strategic-management.de/luhmann-symposium), or contact one of the organizers.

## **II Reunión Española de Ciencia de Sistemas (RECS-II) (in Spanish)**

June 7-9, 2002, University of Valencia (place to be determined)

Entidades Organizadoras: Departament de Matemàtica Aplicada de la Universitat de Valencia, Sociedad Española de Sistemas Generales (SESGE)

Simposiums: 1. La Ciudad Europea del Futuro y Sistemas Urbanos; 2. Sistemas Complejos: caos, autoorganización, autopoiesis; 3. Sociedad y Teoría de Sistemas (globalización, pobreza, medio ambiente, relaciones laborales); 4. Educación Teoría de Sistemas; 5. Salud Pública y Teoría de Sistemas; 6. Nuevas Tecnologías de la Comunicación y Teoría de Sistemas.

Fechas importantes: Recepción de las comunicaciones: 30 de Enero de 2002. Notificación de la aceptación: 30 de Marzo de 2002. Celebración del congreso y entrega Actas: 7,8,9 de Junio de 2002. See: <http://www.uv.es/~pla/SESGE/>.

**Complexity in Social Science (COSI) SUMMER SCHOOL**, 30th June to 6th July 2002, Chania, Crete.

Further details of the Summer School on the COSI summer school web pages:

<http://www.irit.fr/COSI/summerschool/index.html>.

Program Themes include:

- Notions about Complex Systems Theory (including Chaos, non-determinism etc.)
- Lessons from distributed system theory and Artificial Life (including Emergence, Self organization, Evolutionary computation, Agent based systems).
- Examples in the Social Sciences (including Ergonomics, Safety Critical Systems, Economics, Psychology, Cognition, Education).
- Tools for Social Scientists for Complexity Modeling (including Intelligent agents, Genetic algorithms, Neural networks, Cellular automata, etc.).

## **The Santa Fe Institute's 2002 Complex Systems Summer Schools:**

1. Santa Fe School: June 9 to July 6, 2002 in Santa Fe, New Mexico, USA

2. Budapest School: July 8 to August 2, 2002 in Budapest, Hungary

An intensive introduction to complex behavior in mathematical, physical, living, and social systems for graduate students and postdoctoral fellows in the sciences and social sciences.

Open to students from all countries. Students are expected to choose one school and attend the full four weeks. No tuition is charged. Some support for housing and travel expenses is also available. Women, minorities, and students from developing countries are especially encouraged to apply. For further information: <http://www.santafe.edu/csss02.html>, or e-mail [summerschool@santafe.edu](mailto:summerschool@santafe.edu).

**UK Systems Society 7th international conference, 'Systems Theory and Practice for the Knowledge Age'** York University, July 7- 10 2002. Information:

[ukssconference2002@hotmail.com](mailto:ukssconference2002@hotmail.com).

**The 6th World Multi Conference on Systemics, Cybernetics and Informatics Science**, 2002, July 14 - 18, 2002, Orlando, Florida, Usa, Sheraton World

Information: <http://www.iiis.org/sci2002/>.

General Chair: Professor Nagib Callaos, [ncallaos@callaos.com](mailto:ncallaos@callaos.com) or [ncallaos@aol.com](mailto:ncallaos@aol.com).

Abstract submission: deadline passed.

**On the Shoulders of Giants: Cybernetics - Interaction - Constructivism – Ethics**, July 25 - 28, 2002, San Francisco, CA, co-sponsored by the Mental Research Institute and Notre Dame de Namur University. Information: Wendel Ray, [waray@worldnet.att.net](mailto:waray@worldnet.att.net).

**2002 ISSS Annual Meeting and Conference, "Systems Thinking: Managing Complexity and Change"**, The Forty-Sixth Meeting of the International Society for the Systems Sciences (ISSS), 2nd – 6<sup>th</sup> August 2002, Shanghai Jiao Tong University, Shanghai, P.R. ISSS 2002. Conference website, with details of sessions, hotel accommodation, etc.: <http://www.iss.org>. Deadline for abstracts, February 15<sup>th</sup>, 2002.

**4th Triple Helix Conference, "Breaking boundaries -- building bridges"**, November 6th-9th 2002, Copenhagen, Denmark - Lund, Sweden

Open to anyone who is interested in the interactions of university-industry-society. The theme of this year's conference is breaking boundaries between university, industry and society and building bridges across the helices and across other geographical and national boundaries. The conference will be organized around 15 tracks with approx. 20 papers each. Papers are invited that deal with: science and technology policy issues, research and innovation management, university-industry links, knowledge network organization, organizational learning, commercialization of science, regional development and other topics related to the Triple Helix concept. Each track will be managed by a team of convenors. For participants who want to present a paper, an extended abstract should be submitted to the track convenors, by the 20th of April at latest. Track descriptions and contact details are available on the conference website. Extended abstracts should describe aim, methods, results and conclusions of the paper in a maximum of 1500 words. Papers are circulated via the net for track participants. For more information see: [www.triplehelix.dk](http://www.triplehelix.dk). If you are interested in further information from the local organizing committee, please send a mail with your postal address to: [secretariat@triplehelix.dk](mailto:secretariat@triplehelix.dk). You will then receive a brochure/poster in January 2002 as well as e-mails with news and information up till the event in November 20

**END OF NEWSLETTER 12**