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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: Karl-Heinz Simon (simon@usf.uni-kassel.de), Barry Gibson (B.J.Gibson@sheffield.ac.uk) and Juan Aguado (jmaguado@um.es). In general, please follow the Chicago Manuel 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.

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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NOTES FROM THE EDITORS

The current issue of JOS is centered on the tradition of Niklas Luhmann. This involves reprinting an early contribution by Luhmann titled “The Autopoiesis of Social Systems” in the “Classics”-section. That paper was published in the year 1986 as a follow-up of a conference on sociocybernetics that was organized by Felix Geyer and Hans van der Zouwen. As the proceedings of that conference are out of print and are therefore not so easy to obtain we have decided that it would be good to make a reprint of that text (in a slightly shortend version) available to people who were not associated with sociocybernetic activities at that time. Regardless of the 20 years that have passed since the first publication of the text it remains relevant. The idea of autopoiesis as the central theoretical concept to describe and explain social structure and dynamics is presented here in a clear and comprehensible form and allows a good understanding of the questions the concept was responding to and the solutions it implied.

In the two contributions to the “Articles”-section Nina Degele and Diane Laflamme build on Luhmann's ideas. Nina Degele discusses sociocybernetic concepts from different sources and reflects on the challenge of control and steering when thinking about social systems. The text is translated here for the first time from German although the references remain faithfully in German. Diane Laflamme also deals with fundamental concepts relevant in social systems theory: the concept of meaning as related to the problem of morality as a means of distinction, and what that means for a description of the evolution of social systems.

In the “Discussion”-section the answers of Francisco Parra-Luna to criticisms of his paper in JOS 1/2008 are published, these answers are supplemented by two replies to his comments. The controversy shows some element of personal differences, however, the basics that are under discussion are without doubt of crucial relevance for the fundamentals of sociocybernetics. Two science of science positions stand opposite: one position relying on classical cybernetics, and another taking serious challenges and achievements from newer offerings in cybernetics (and systems theoreties). Hopefully, the controversy might contribute to the productivity of each of the different concepts.

Next Issues of JOS

In the next issue of JOS educational approaches are the focal issue. In that context, a paper by Gordon Pask will be reprinted in the “Classics”-section. It is planned to have a special issue presenting selected papers form the Urbino-Conference on Sociocybernetics as JOS 2/2009.

The Editors

Papers

On Controlling Complex Systems - A Sociocybernetic Reflexion*)

Nina Degele

Introduction

Nearly half a century ago Norbert Wiener established cybernetics. Since then, two basic socio-cybernetic points of view have developed, which differ in the way they relate the science of monitoring and controlling technical and living systems to society. While constructivist sociocybernetics (or second-order cybernetics) focus on the highly individual operation mode of system-specific codes, Cybernetics IV concentrates on the identification of system dynamics and control corridors. As a consequence, the first mentioned discovers a certain scope for development and design, where the latter identifies limits of control capacities. These two strands at first sight appear incompatible, due to their differing sociological and system-theoretic foundation , but when applied show themselves to be complementary – such as when they are transferred onto the control of sociotechnical systems.[1] In order to approach this complementarity, it is however necessary to complete several analytic steps, which I intend to go into within this contribution. In a first step, I will discuss the dynamic and structural perspective on complexity. This will already unveil several theoretical pre-decisions, which are linked with the respective specific weighting of system logics and system dynamics (1). Due to these pre-decisions, the structural understanding of complexity corresponds with the concept of context control within the framework of theory of autopoietic systems (2), while the dynamic notion of complexity is rooted in the General System Theory, and works with the concepts of dual control (3). I would like to conclude by presenting just what an integration of both theoretic opponents could look like, by using an example taken from techno-sociology (4). However, I would like to begin by specifying the conceptual terminology: What renders systems complex, and what is control?

1 Complexity, Control and Sociocybernetics

Contrary to simple and complicated systems, complex systems may take on a variety of states within a short time. This renders them highly unpredictable, and even less computable (Ulrich/Probst 1990, 61; Flood 1987).

[1] We speak of socio-technological systems when technology is applied in a social context, „in which material and symbolic artefacts and social action functionally refer to each other and are organisationally linked“ (Rammert 1993, 32).

*) Translation from Soziale Systeme 3 (1997), pp 81-99 – translated by Steffani Ross, Kassel. The translation was supported by Institut für Integrierte Systemanalysen, Kassel.

The systems I will therefore term complex are those characterised by irreversibility, non-linearity, emergence, and interconnectedness under dynamic conditions: systems are emergent if after a critical mass has been exceeded, the behaviour of said system can no longer adequately be conceived as an aggregation of (its) parts (cf. Stöckler 1990; Hejl 1992; Heidelberger 1994; Garciá-Olivarez 1993, 14); they are non-linear if the system output is disproportional to the stimulus (DeGreen 1990, 160); irreversible if original states can not be repeated , or are not even achievable again (Taschdjian 1978, 178; 1982, 12), and interconnected if due to immanent limitations on the interconnective capacity of the elements the individual link can no longer be linked to all other links, at all times" (Luhmann 1984, 46).

By contrast, classical system-theoretic concepts of complexity consider only the characteristics of interdependence and emergence. They then structurally determine complexity, namely by investigating the possible and realised relationships of the elements. What is described by theoreticians such as Herbert Simon, Warren Weaver and Niklas Luhmann, is actually static complexity, or complicatedness – complexity forces selection (not all possible relations are realised) and contingency (other relationships are possible) (Luhmann 1984, 46). In addition, complexity is based on hierarchy as one of the „central structural patterns" – on a „ large number of parts that have many interactions" (Simon 1978a, 95f). These „many interactions" are based on the existence of interrelated subsystems. According to Simon, hierarchic (and therefore complex systems) are nearly, but not completely, decomposable, as „intra-component linkages are generally stronger than inter-component linkages" (Simon 1978a, 111). According to Simon, their stability is mainly due to their multiply redundant architecture, and we can use this redundancy to simplify their description, however not on a level of basal components, but on an aggregated, higher hierarchical level. Simon wants to use these circumstances for simulations – as a foundation for „aggregative, but perhaps robust, policy manipulations" (Simon 1978b, 121), actually interventions. With similarly pragmatic interest, Warren Weaver terms the relationships of elements (instead of their properties) as constitutive for processing organised complexity (Weaver 1978, 44). Weaver distinguishes the latter from simple complexity problems (i.e. linear contexts), as well as from disorganised complexity, which may be grasped statistically. Summarising, a „system, problem or decision field is the more complex, the more levels it has, the higher its connectivity is, the more important its consequences are (Willke 1993, 24)[2] Why does this not suffice for determining complexity?

The fact that the outlined concept is actually a description of complicatedness, is due to the insufficient consideration of the temporal dimension. A multitude of elements, hierarchies and interdependencies do not yet turn a system complex, but merely complicated. In order for it to be complex, it takes system state modifications, at high speed. For this, the system does not necessarily need to include a large number of elements. (Ulrich/Probst 1990, 61; Forrester 1971, 82). Actually, irreversibility and non-linearity are the dynamic components responsible

[2] „Complexity is here defined as the degree of functional differentiation of a social system and the number of relevant reference levels (these are levels, which need to be differentiated analytically and empirically – e.g. individual, group, organization, as statements within the context of one level are not necessarily valid within the context of another level); connectivity describes the type and degree of mutual dependency betweeen parts as well as between parts and the whole; and the importance of consequences is determined by the number and severity of the causal chains and subsequent processes set in motion within the resepective social system by a certain decision; the term decision field refers to the fact that there is no complexity in itself, but only in view of a certain problem, which for a given system and in a given situation necessitates selection ." (Willke 1993, 24 – translation: S.Ross) In order to formally describe static complexity, Todd LaPorte – using the term of structural complexity – determines the level of complexity as a function created by three factors: a number of systemcomponents, relative differentiation among these components, and interdependencies between these components. (LaPorte 1975, 6f)

for rendering systems difficult to decompose and to describe. In this sense, time is a complexity-generating factor, able to transform a complicated system into a complex one[3].

What does this mean for controllability? Let me first include a few remarks on the notion of control. The term control has been used since the 1970s (…). Amitai Etzioni writes about „control as the process of specifying preferred states of affairs and revising ongoing processes so as to move in the direction of these preferred states" (Etzioni 1968, 45). He thereby emphasises the intentional aspect of control – steering aims at the achievement of preferred states. On the other hand, within the scope of his structure-functional theory on social systems, Talcott Parsons developed a cybernetic hierarchy of control, differentiating between conditional-energetic and informational-cybernetic hierarchies, and connected energy flows with control mechanisms (Ackerman/Parsons 1966; Parsons 1968). With respect to control, energy and information flows move in opposite directions: (Ackerman/Parsons 1976, 79) „ The aspects of a system with a high degree of information (and sense structuring) control those aspects, which exhibit a lower level of information, but a considerable level of energy; vice-versa, systems with high energy-levels, but lower levels of information create the conditions for activating and realising informational purpose and maintenance functions." One example for this is Freud's analogy of the horse and the rider. On an energetic level, the horse dominates, whereas from an informational point of view the rider is dominant. In order for a social exchange process to happen in a controlled way, generalised and symbolic control media are necessary (Parsons 1968, 302-305). As is well known, Parsons differentiates between the economy (money), politics/goal-attainment (power), culture (commitment) and social /communal system (influence). They aim at safeguarding the notion of coordination, or integration methodically, and to keep the system in balance – that is, to control it. Parsons is actually not concerned with intentional goal-attainment, but in the coordinative function. (…). Within a wider understanding of the notion, "control" describes an integrative mechanism and serves to coordinate functionally differentiated social systems (Willke 1993, 214f; 1994, 85-91; Mayntz 1987, 92f). The narrow interpretation of „control", on the other hand, presumes an intentionally acting subject with an identifiable steering objective, which takes measures for safeguarding goal-achievement (Mayntz 1987, 94; Bühl 1990, 180; Busch/Busch 1981).

If these steering intentions are identifiable, it is possible to separate between control activity and control effect. As this last step allows a differentiated analysis of empirical processes when dealing with complexity, I have decided to use the term control in this sense – as an attempt for dealing with complexity.[4]

After having discussed the central system-theoretic terms of complexity and of control, I will now focus on the question as to how they are used in socio-cybernetic theories. In socio-cybernetics, system analysis, modelling and the rationale for claiming for control or omitting of control. (Aulin 1986; Bühl 1990, 135-144; Dyke 1990, 119)

During the late 1970s, sociocybernetics adopted the notion or programme to consider and to explain complex systems as wilful, that is, not externally controlled systems, thereby abandoning the idea of a social technology as an applied social science (Geyer/van der Zouwen 1978, 1f). Still, its image within sociology is not a good one: sociocybernetic contributions

[3] By contrast, Luhmann focusses on the system-immanent method of coping with complexity: in his opinion, time facilitates a reduction of complexity („time is extension of choice" Luhmann 1978, 97) as it allows a system to realise possible relationships one after another, instead of simultaneously). Luhmann calls this the „temporalisation of complexity" (Luhmann 1984, 77)

[4] It seems evident to speak of control in case of steering effects, or actually handled or unhandled complexity. However, this is not the topic of this contribution. I have therefore decided to dispense with this terminological differentiation.

are rarely published in socio-scientific publications, but may mainly be found in system-theoretic publications.

And even worse: as „Thermostat-Theory“ (Friedrich/Sens1976), it is equated with Norbert Wieners technical control circuit cybernetic model (1948), as cybernetics describes steering and control processes in „machines as well as in life-forms“ (Wiener 1948, 32; also Friedrich/Sens 1976, 39; Geyer 1995, 7-12; Robb 1984, 21). And as a matter of fact, the 1940s' and 50s' paradigm was the thermostat, as a model of controllable feedback. Balance and system maintenance were seen as the research-guiding backdrop for the correction of external disruptions, the development of control systems and the construction of intelligent machines. These efforts, all of them predominating the 1950s, were committed to the paradigm of balance, and are therefore neither suited for the analysis of non-linear processes, nor for coping with social complexity.

The benefits of these early considerations to sociology may therefore not be found in a crude transferral of „steady state“ or feedback onto social contexts. The focus is rather on the possibilities and limitations of rational control – social systems are not machines, and are therefore not controllable. Constructivist sociocybernetics and Cybernetics IV, which will both be discussed below, are both based on this state of knowledge – on the need to extend cybernetics. Instead of postulating cybernetic control circuits independent of observer, point in time of observation and the problem in question, these socio-cybernetic system theories move from a machine- to a circuit-oriented image, and focus on change processes instead of stability. They emphasise the subjective, time and observation-dependent character of knowledge, dismiss the option of external controllability of social systems, and take interest in the consequences of self-referentiality and –steering (Geyer/van der Zouwen 1978, 1f; Geyer/van der Zouwen 1991, 83; Geyer 1995; Bailey 1994, 127-135).

While constructivist sociocybernetics stress the control limits of social systems, which are due to these systems' operational closedness, cybernetics IV focuses on the identification of system dynamics and steering options/possibilities (or control corridors). In sociocybernetics, handling of social complexity is mainly achieved by the concept of context steering (Willke 1989), while cybernetics IV system-theoreticians prefer control concept, such as dual control (Bühl 1989). I would like to begin by discussing constructivist sociocybernetics.

2 Context Steering in Constructivist Sociocybernetics

When constructivist sociocybernetic theoreticians talk about dealing with, or handling complexity, the term they use is „intervention“ instead of „steering“. In their concept, steering is the „effect of wilful logic (order or regularity) of an operatively closed context of communication, which as a self-referential control system affects itself (internal control) or external events (= external control) (Willke 1993, 282). Interventions, on the other hand, aim at „initiating changes within a system and to facilitate them“(Willke 1994, 41).

One means for handling complexity is context steering, „the reflexive, decentralised steering of the context conditions of all subsystems and self-referential internal control of each individual subsystem“ (Willke 1989, 58). What does that mean? The socio-cybernetic concept of context steering rests on two pillars: second-order cybernetics and the diagnosis of a functionally differentiated society. Second-order cybernetics is based on the work done by Heinz von Foerster (1981). By placing the relationship between the observer and the observed system at the centre of his considerations, he heralded a paradigm change in cybernetic thinking, by introducing „cybernetics of cybernetics“ in the 1970s. He paved the way for a communication-theoretically based, constructivist epistemology. Since then, socio-cybernetic theoreticians have been more interested in the perspectivity of controlling than in the controlled system. Because: „that which is (given the role of being) >controlled< also controls that which is (gi-

ven the role of being) the >controller<“ (Glanville 1987, 104). The introduction of such a meta-level of observation is expressive of a shift of control functions from the environment to the system. Niklas Luhmann (1984) provides an in-depth contribution by shifting the Autopoeisis –concept from biological to social systems: autopoeitic systems operate operationally closed, and the „primary objective of aotopoietic systems is always the continuation of the autopoiesis, with no consideration for the environment“ (Luhmann 1986, 38). If each external intervention is processed by the respective system only in view of its operational closedness, this will bounce off all measures that are committed/related to different system logic. This is why self-referential system composition results in an „abandonment of the idea of unilateral control“ (Luhmann 1984, 63).

These theoretic considerations are included in the diagnosis of operational closedness of highly differentiated societal //social systems of function, which is why //wherefore local interventions may lead to over-steering there. The modus of operation of the system-specific code is oriented towards improving performance, and due to its operational closedness may only be suppressed, but not influenced. The result may be a retraction of functional differentiation (as was the case in socialist states). In case of understeering, however, society fails to achieve a consensus, it „drifts“ (Willke 1993, 217, Etzioni 1968, 119, 466f). In order to avoid both under- and over-steering, a balanced ratio of control and consensus is required. In this case, Amitai Etzioni speaks of an active society; Willke calls it a context-controlled society. In other words, controlling functionally differentiated societies is therefore all about identifying the gap between under- and oversteering. (On the theoretic formulation of such a control corridor, Aulin 1986, 115). Decentralised context control and self-control of the subsystems are then not simply the steering poles. Context control and self-control are rather two sides of the same coin, as context control aims at mobilising a system’s powers of self-control//steering. This can succeed if the specific code of the subsystems is addressed. However, this does not yet provide any information on the control effects; these may at best be computable. The intervening agent may actually initiate processes; the effects are not within his control (Willke 1994, 52; 88-90). What is missing in this concept? The sketched concept of control is peculiarly non-temporal in its way of thinking. As constructivist socio cybernetics are mainly interested in the native, inherent logic of the respective system, social change processes do not receive a lot of attention: control problems arise from the cumulation of the subsystems’ inherent complexity, the emergence of lateral world-systems and the shifting of the time horizons into the future (Willke 1993, 265-268).

A principally open and viable future, time is viewed as an abstract background dimension, instead of finding consideration as a complexity-generating core of social systems. Still, it is worthwhile to consider constructivist sociocybernetics from a control-theoretical point of view. First of all, it does acknowledge that within the act of observation, the observer decisively influences the system, as the perception of social complexity is impinged by recursive, self-affecting processes. To a certain degree, complexity is therefore always a socially constructed reality[5].

And secondly, the emphasis of the inherent logic does suggest inclusion of a temporal perspective: social processes are subject to their own, inherent dynamics if they „move from within and without any external impact, thereby creating a characteristic pattern“ i.e. „if during the process the actors themselves create and amplify the motivations driving them“ (Mayntz/Nedelmann 1987, 648f). If the system states operate with themselves and develop eigenbehaviour (von Foerster 1988), complex systems therefore ?? their own reality with own

[5] Examples of this are provided by the practice of Systemic Therapy (Wiesner/Willutzki 1992). It views diagnostics not as an external access to the patient, but as part of the therapy (which the therapist as a part of the system merely kicks off). If this is so, the problem’s definition already contains options for its solution.

rules; actually, for coping with complexity, it is precisely these rules, which require identification in order to proceed.

3 Dual Control in Cybernetics IV

Until now, I have discussed the eigenlogic of systems from a structural point of view. The question was, how do boundaried systems function in relation to the environment, and what this entails for control. Now I would like to suggest a path, which is complementary to constructivist sociocybernetics, a path followed by sociocybernetics in the tradition of the General System Theory. Their cybernetic grounding is expressed by their choice of terminology as well as by their empirical-pragmatic approach. When Cybernetics IV addresses the topic of coping with complexity, they do not speak of steering, but of control. The objective is the congruence of explanation, prognosis and control model with the primacy of the control theory (Bühl 1990, 135-144).

For this, it does not focus on addressing a dominant code of the system to be controlled, but rather on the interaction between dynamics (Bühl 1990) and control processes (Busch/Busch 1981; 1984), which concurrently are at play within a given system. The assumption behind this approach is that through destabilisation processes complex systems keep moving back to so-called bifurcation points. At these points, or better, in these states the system is forced to choose between two branches to continue along (Taylor 1987; Bühl 1990, 126f). Controlling actors need to primarily observe the correct moment for interventions – as the most promising moments for interventions seem to be the bifurcation points (However, within Cybernetics IV, this theory has not yet been systematically elaborated, but has only been metaphorically made plausible). In order to clarify the relation between balance and imbalance processes, and of change-sensitive and change-resistant parameters, sociocybernetics are step by step including characteristics of societal complexity into Norbert Wiener's technical cybernetics (Maruyama 1963; Taschdjian 1976; 1978; 1982; Busch 1979; Busch/Busch 1981; 1984; Bühl 1990). How does this happen?

Using the control cycle as the cybernetic model of a self-controlling system, cybernetics was sufficient to explain technical control cycles as special purpose-programmed systems: using a set-actual comparison, back-coupling is used to adapt the system to previously defined target functions, and in an identified mechanism of negative back-coupling periodic fluctuations around a defined target state and adjustments of deviations always lead back to a state of balance.

The system elements may be multiply (hierarchically) interconnected, but do not behave predictably and time-dependant. The paradigm of negative feedback is therefore based on "punishment" , the conservation of the previous state. By contrast, in social situations, rewards ("positive reinforcements") play a much more important role: deviations lead to new system states, which is why Magoroh Maruyama (1963) introduced the mechanism of positive back-coupling (morphogenesis) into "Cybernetics II): „In t he light of the deviation-amplifying mutual causal process, the law of causality is now revised to state that similar conditions may result in dissimilar products."

On this level, systems have already ceased to behave in a linear and reversible way, but still move within a limited repertoire of behaviour. Only if negative and positive back coupling also happen concurrently, do system theoreticians speak of Cybernetics III. Systems are then equipped with a control system capable of processing symbols, not only signals, on the basis of which they are able to formulate their own goals (Busch 1979; Busch/Busch 1981) and to behave time-dependently: each decision made is an act of discontinuity, which first of all does away with other options and secondly is executed within a specific time horizon (Taschdjian 1978, 178; 1982, 12). The analysis of time-dependent systems is therefore no

longer concerned with the system state to be examined, but with a series of different states at various points in time.

On the third level of cybernetics, it is still possible to assign the status of a goal-formulating control centre to the brain. However, if individual target objectives are in conflict with, complement or cancel out each other, the necessity for a super-individual, societal coordination in shape of conventions, norms, laws etc –of control arises. Cybernetics IV therefore expands the three cybernetics by society as an additional dimension (Busch 1979; Busch/Busch 1981; 1984; Bühl 1990, 12-14). If such a steering process is coupled with a consensus, the aspects of motivation, voluntariness and of self-steering move to the foreground: "If control is increased without increasing consensus-building, we expect a greater reliance on force." (Etzioni 1968, 482; also compare Beniger 1978, 24-26).

In the heterarchically connected, emergent, non-linear and irreversible and therefore highly complex Cybernetics IV-systems, steering processes are negotiated in shape of consensus and conflicts, which replace restrictive control. Precondition is the identification of the control vector, which converts from one system state to another, or is at least able to approximate it[6]..

The identified system states may be based on dynamics as diverse as cycles, catastrophes, fluctuations, but also balancing processes. If within context steering the wilfulness of the systems to be steered is in the foreground, Cybernetics IV emphasizes the time dependence of interventions. This circumstance is to be accommodated by the concept of dual control (Bühl 1989, 29): Target states are not predetermined from the very beginning on, but only arise by and by while the system acts and reacts. They are relative to the starting point and are changeable (Bühl 1990, 47). Practitioners gain their information on the system's behaviour only by conducting control tests. They therefore need to be more patient in planning, and need to leave ample time to their interventions for them to unfold their full effects. They are also required to again and again reconsider their original steering target. So instead of attempting to implement pre-defined plans and programmes true to the original, it is much more appropriate to maintain the system's capacity for interaction between over- and understeering.

In this sense, steering is something that "goes along with" the system: a good steerswoman or steersman determines the steering target, structurally, functionally and dynamically describes the system to be steered, reassess the steering target, differentiates between steerable and non-steerable areas, reconnects these results with the steering target, adapts the steering measures to the complexity characteristics of the system to be steered (a decision to be made problem-specifically) and controls this process. Such a cybernetic model of self-regulation for handling complexity operates recursively, as ongoing action and evaluation (monitoring) (Sirgy 1990; Flood/Carson 1993, 97-131; Ulricht/Probst 1990, 114-220).

So what does sociocybernetics actually gain from the confrontation between the two antagonists? First of all, it defines handling of complexity as an infinite, and predominantly incremental process. As there is no optimal solution, the existing options are maximized and / or costs incurred by mistakes are minimised. This pragmatically motivated approach is commensurate with "as best is possible", and is also called "satisficing"(Perlstadt 1981).

The term allows for the idea, that mistakes are unavoidable, but may at least be reduced and their effects may be controlled. This cautious approach to steering is compatible with the concept of context steering, which rejects punctiform and direct interventions. The latter goes

[6] The connection between control object and subject is created by indirectly functioning, generalized control media, such as money, market, information, public opinion, etc. Examples for direct contol and steering instruments are ordinances, police interventions, taxes, etc (Bühl 1990, 180). The steering concept involved is an acteur-based one.

one step further, by refusing to provide any positively formulated development directions[7]. Here too, the intention is to avoid undesirable developments, in as far as this is possible. Still, both schools of thought have deficits. Constructivist context steering kicks off eigen-logics and facilitates them; however, it lacks the temporal positioning of system behaviour. This gap is filled by "dually controlling" Cybernetics IV". It focuses its attention on breaks and transitions in the dynamic, initiates them and/or accompanies them, but does not provide any theoretically-justified criteria for its diagnosis. Beyond, its consideration of the closedness of eigenlogics in its steering concept of dual control is insufficient. But still: context steering and dual control are mainly derived from the insight that in handling complexity complete and total knowledge is impossible, and that there needs to be constant feedback between reality and its modelling[8]. In spite of its macro-sociological origin socio-cybernetic models are also suitable for handling complexity on a meso-level. Even more: this is what renders complementarity even more visible. As a conclusion, I would like to exemplify this by an example, for which I have chosen the development and the application of software in organisations.

4 On the Integration of Perspectives

System logics and system dynamics – these are the respective pivotal points of the two socio-cybernetic perspectives. But only in an integrated perspective do they prevent misconceptions concerning the steerability of socio-technical systems. To illustrate this point: the development and the application of software are mostly planned as a sequential, directly steerable succession of phases – a complete misapprehension. A famous and well-documented example of such a misunderstanding is the configuration programme XCON by the computer manufacturer DEC. In spite of its "successful" technical realisation it generated massive consequential organisational problems[9].

From a system-theoretic point of view, this career is extremely instructive. To begin with, in development and application there are several overlapping phases, which are not coupled sequentially, but recursively. The theoretic framework for this is provided by Cybernetics IV. Secondly, software projects often suffer from collisions of the logics from differently institutionalised reputation systems (scientific research laboratory, industrial R+D departments, operation application departments) with a variety of actors (computer scientists, engineers, users) (Degele 1996). From the point of view of constructivist sociocybernetics, all of these systems operate based on their own, system-specific code, which are not able to irritate the other subsystems. I would like to include a short presentation of these arguments:

Let me begin with a few remarks on the operational closedness of the subsystems. To software-engineers, functional efficiency is predominant – a programme needs to work. System-theoretically, the code governing R+D-processes is innovation: "The symbiotic mechanism eventually shows in the functional artefacts." (translated by S.R.)

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[7] This is the credo of systemic consulatation of organisations. here, an intervention is already expressive of a different perspective (König/Volmer 1994, 39-43; Willke 1994, 205; Wimmer 1992, 67-70).

[8] In such an incremental procedure//approach the process of modeling can become more important than the model itself – this is something even „hard"//"hard-core" (in the sense of formalising) system theoretics of „System Dynamics" (Dash 1994) have documented as the result of 30 years of experience with simulation.

[9] After programming was finalised, it took three years until XCON showed the precentage of correct results required for commercial application, which is 90-95%. After this had been achieved, the system was entirely intransparent. The company was forced to contract John McDermott, its developper from the Carnegie-Mellon-University, in order to conduct a complete re-implementation and maintenance measures. User-compatibility and fault tolerance replaced technical elegance and formal correctness as the decisive factors for success. This was something nobody had been able to foresee. The possible conclusion is: development and implementation of a programme such as XCON need to be handled as a complex problem, as in addition to technical factors, a host of economic, organisational and other factors enter mutual dependencies – and may quickly become incontrollable (Degele 1994, 15-23).

(Mambrey/Paetau/Tepper 1995, 153) The cognitive structure of engineering sciences is therefore dominated by efficiency. They have generated a language code, which is largely self-referenced, thereby contributing to maintaining their professional powers of definition and of design. "Technological terminologies are characterised by exactness, brevity and non-evaluativeness." (translated by S.R.) (Mai 1994, 451; cf. Degele/Holzer 1996).

On the contrary, software users are interested in simple and robust problem solutions. Brevity and elegance of mathematical assertions of correctness or the originality of the programme's design are of no consequence to them. However, users cannot simple use a programme. Unlike a toaster or an electric iron, software does not come with clearly defined user instructions or rules; these may not even exist. In order to sensibly use the programme, users need to actively appropriate it. In order to do so, they revert to their own store of experience, using this to derive more or less systematic routines and rules. As the modular, i.e. multifunctional configuration of information-technological artefacts offers users the opportunity to use the system in a totally different way than was originally intended by the contractor and the developer (and the way it is usually done), management's and development's control options are limited.

What about the second argument, the phase-specific localisation of the different logics? If the development and implementation of technology is not viewed as the product of a targeted, and thereby controlled process, but as the result of an antagonism of various mechanisation processes, then actors with specific visions of mechanisation assert themselves either in cooperation or in competition with the other actors, in various phases of the technological development.

This is what technology genesis research focuses on[10]. System-theoretically reformulated, it traces the development and the application of technology as a multi-tiered selection process, which is characterised by intersections between scientific, engineering and user logics (Rammert 1992, 18). For an analysis of the development and application processes, such an amendment of system-specific codes by the dimension of time is definitely useful: the pressure exerted on the user, to appropriate software, generates new knowledge, new practice and regulations, and a new (operational) reality. Management, which normally kicked off these processes –usually without intending to do so-, may use this to develop new systems or to enhance existing programmes.

In this case, the creative appropriation of technology by the user flows back into the development of new systems or the improvement of old one, thereby becoming recursive (Degele 1997). Whether this actually happens, is not predictable; success is not guaranteed. This is why managers and software developers often view software-use deviating from the "prescribed" application as failed projects. However, if one views software development as a recursive, and not as a sequential process, the socio-cybernetic punch-line is the fact that such a process cannot be controlled directly, but can only be initiated and facilitated (Willke 1994, 41), and that at different points in time such facilitation needs to take into consideration the various, variously effective system logics. For example, the question as to the scope of user-participation in software development is much less relevant that the question as when user-participation takes place. If, for example, user participation sets in with the formulation of the catalogue of requirements, the wrong course has already been set (Weltz/Ortmann 1992, 76).

[10] At the Wissenschaftszentrum Berlin several case studies were conducted on the generating and the introduction of the mechanic typewriter (Knie/Buhr/Hass 1992), the combustion engine (Knie 1991) and the Internet as cultural realm//sphere (Helmers 1994).

Conclusion

In a dynamic control perspective, software development and application appears to be a process within which the different systemlogics do not only collide, but also link up. If steering interventions fail, then the systemic dynamics of software projects are not the only factor to blame. An aspect dual control theorists tend to neglect (because they reject its assumption of operational closedness) is the importance of the momentum of (socio-technical) subsystems (Bühl 1987, 245). The conclusion to be drawn is: one strand of cybernetics needs to learn from the others, as steering of complex systems (indirectly) starts with the context, instead of directly in the system.

The awareness for this is improved by constructivist sociocybernetics. And Cybernetics IV emphasises the fact that this process is iterative (repetitive) instead of sequential (successive efforts), and that it operates on a long- rather than a short term basis. It further underlines the necessity of a long-term perspective, as interventions on a context-level only rarely show immediate and visible effects. It is the system itself, which decides whether and in which way to react on interventions, to translate them into its own logic or to ignore them (which is the focus of constructivist cybernetics). All of this takes time. This is why the "realistic control theory" of Cybernetics IV is concerned with describing the time-dependency of systemic behaviour, or more precisely "recording end explaining the phase transitions between balancing processes and imbalance processes, and to record their respective basic conditions and progressions, as well as the subsequent dynamics." (Bühl 1990, 144). (translated by S.R.) .

A constructivist control theory sets its hopes in "grabbing" the system at its own logic heel. However, an integration of system logics, action orientations and system dynamics seems advisable, also from the perspective of the disciplines. More recent techno-sociological papers bemoan the circumstance that the practice of delineation of product development phases, which has so far been in use in social sciences, has failed when it comes to examining software projects: a process of de-differentiation takes place not only between development and application, but also between technology and organisation. Product and process innovation may no longer be differentiated, micro and macro level dissolve into inner- and inter-operational networks (Verbund sozialwissenschaftlicher Forschung 1995; Kubicek/Seeger 1994).

All of this clearly advocates a level-, phase- and sub-system-comprehensive perspective and integration. The current state of socio-cybernetic theory-formation offers good conditions for this. Within both cybernetics, there is agreement that steering already represents the design of institutional basic framework conditions. While practicioners consider the major problem to be that within complex systems they can no longer identify a control centre on which to focus, constructivist sociocybernetics view this as an excellent opportunity: the autonomy of the interconnected parts renders central steering superfluous; system elements become stronger and the entire system more adaptable. Instead of improving steering capacities from top-down, they promote bottom-up steering ability. The necessity for external intervention decreases as the system's self-regulatory capacity increases (Aulin 1986). Viewed in this context, if steering of socio-technological systems relies on the evolvement of recursive and eigen-dynamic processes, instead of sequential processes, and if steering is merely able to positively or negatively influence institutional framework-conditions (Rammert 1995, 103), then context steering and dual control on an institutional level promote the creation of a deviation-tolerant environment. This may entail the inclusion of redefinitions in software solutions, by users, into the development (Schlese 1995, 361f); it may entail built-in functional redundancies in technical systems, so that occurring faults may be handled (Perrow 1989, 392-400), or that system components spread on various levels are loosely interconnected and appropriate communication relationships are installed (Bühl 1990, 16, 38).

On a techno-political level, this would support the abolishment of technical monocultures (Rammert 1993, 61f). And there is one final conclusion to be drawn: for cases such as those outlined here, sociocybernetics offer the suitable tools for the formulation of the problem. The problem's solution needs to come from the system itself.

Literature

Ackerman, Charles/Talcott Parsons (1966): Der Begriff „Sozialsystem" als theoretisches Instrument. S.69-84 in: Jensen, Stefan (Ed.), Talcott Parsons: Zur Theorie sozialer Systeme. Opladen: WDV 1976.

Aulin, Arvid (1986): Notes on the concept of self-steering, pp100-118 in: Geyer, Felix /van der Zouwen, Johannes (Ed.), Sociocybernetic paradoxes. London: Sage.

Bailey, Kenneth D. (1994): Sociology and new systems theory. Toward a theoretical synthesis. New York: Albany.

Beniger, James R. (1978): Control theory and social change: toward a synthesis of the system and action approaches, pp15-27 in: Geyer, Felix /van der Zouwen, Johannes (Ed.), Sociocybernetics. Leiden/Boston/London: Martinus Nijhoff. Vol. 2.

Bühl, Walter L. (1987): Grenzen der Autopoiesis. KZfSS 39, pp 225-254.

Bühl, Walter L. (1989): Entwicklungslinien einer soziologischen Systemtheorie. Annali di Sociologia 5/II, pp 13-46.

Bühl, Walter L. (1990): Sozialer Wandel im Ungleichgewicht. Stuttgart: Enke.

Busch, John A. (1979): Cybernetics III. Cybernetica 22, pp 89-103.

Busch, John A./Busch, Gladys M. (1981): Cybernetics IV, pp1238-1243 in: Lasker, G.E. (Ed.), Applied systems and cybernetics, vol. III. New York.

Busch, John A./Busch, Gladys M. (1984): The elaboration of cybernetics for the study of social systems, pp 3-8 in: dies. (Ed.), Issues in sociocybernetics. Seaside/CA: Intersystems Press.

Dash, D.P. (1994): System Dynamics: Changing Perspectives. Systems Practice 7, pp 87-97.

Degele, Nina (1994): Der überforderte Computer. Ffm: Campus.

Degele, Nina (1996): Die Entwicklung und Nutzung von Software. Zur Genese informationstechnischen Handelns. Zeitschrift für Soziologie 25, pp 58-70.

Degele, Nina (1997): Kreativität rekursiv. Von der technischen Kreativität zur kreativen Aneignung von Technik, pp 5-13 in: Bechmann, Gotthard /Rammert, Werner (Ed.),Jahrbuch 9 - Technik und Gesellschaft. Ffm: Campus.

Degele, Nina/Holzer, Boris (1996): Software-Engineering zwischen wissenschaftlicher Methode und systematisiertem Handwerk. Ms. (unpublished)

DeGreen, Kenyon B. (1990): Nonlinear management in technological-induced fields. Systems Research 7, pp 159-168.

Dyke, C. (1990): Expectation and strategy in a nonlinear world. Systems Research 7, pp 117-125.

Etzioni, Amitai (1968): The active society. New York: Free Press.

Flood, R. L. (1987): Complexity: a definition by construction of a conceptual framework. Systems research 4, pp 177-185.

Flood, Robert L./Carson, Ewart E. (1993): Dealing with complexity. New York/London: Plenum Press. 2nd ed.

Foerster, Heinz von (1981): On cybernetics of cybernetics and social theory, pp 102-105 in: Roth, Gerhard /Schwegler, Helmut (Ed.) Self-organizing systems. Ffm: Campus.

Foerster, Heinz von (1988): Abbau und Aufbau, pp19-33 in: Simon, Fritz B.(Ed.), Lebende Systeme. Wirklichkeitskonstruktion in der systemischen Therapie. Berlin: Springer.

Forrester, Jay (1971): Planung unter dem dynamischen Einfluß komplexer sozialer Systeme, pp 81-90 in: Ronge, Volker /Schmieg, Günter (Ed.), Politische Planung in Theorie und Praxis. Munich: Piper.

Friedrich, Jürgen/Sens, Eberhard (1976): Systemtheorie und Theorie der Gesellschaft. Zur gegenwärtigen Kybernetik-Rezeption in den Sozialwissenschaften. KZfSS 28, pp 27-47.
Garciá-Olivares, Antonio (1993): Self-organization and intermittency in social systems: towards a science of complexity. Kybernetes 22, pp 9-19.
Geyer, Felix (1995): The challenge of sociocybernetics. Kybernetes 24, pp 6-32.
Geyer, Felix/Zouwen, Johannes van der (1978) (Ed.): Sociocybernetics: An actororiented social systems approach, vol. 2. Leiden/Boston/London: Martinus Nijhoff.
Geyer, Felix/Zouwen, Johannes van der (1986) (Ed.): Sociocybernetic paradoxes. London: Sage.
Geyer, Felix/Zouwen, Johannes van der (1991): Cybernetics and social science: theories and research in sociocybernetics. Kybernetes 20, pp 81-92.
Glanville, Ranulph (1987): The question of cybernetics. Cybernetics and systems 18, pp 99-112.
Heidelberger, Michael (1994): Die Wirklichkeit emergenter Eigenschaften, pp 340-358 in: Pape, Helmut (Ed.), Kreativität und Logik. Charles S. Peirce und das philosophische Problem des Neuen. Ffm: Suhrkamp.
Hejl, Peter M. (1992): Selbstorganisation und Emergenz in sozialen Systemen, pp 269-292 in: Krohn, Wolfgang /Küppers, Günter (Ed.), Emergenz: die Entstehung von Ordnung, Organisation und Bedeutung. Ffm: Suhrkamp.
Helmers, Sabine (1994): Internet im Auge der Ethnographin. WZB FS II 94-102. Berlin.
Knie, Andreas (1991): Diesel - Karriere einer Technik. Zur Grundlegung der allgemeinen Technologie. Berlin: Edition sigma.
Knie, Andreas/Buhr, R./Hass, M. (1992): Auf der Suche nach den strategischen Orten der Technikgestaltung: Die Schreibmaschinen-Entwicklung der Mercedes-Büromaschinen-Werke AG zwischen den Jahren 1907 und 1940. WZB FS II pp 92-101. Berlin.
König, Eckard/Volmer, Gerda (1994): Systemische Organisationsberatung. Weinheim: Deutscher Studien Verlag. 3. edition
Kubicek, Herbert/Seeger, Peter (1994): Technikgenese: Entwicklungspfade und Koordinationsprobleme. Mitteilungen des Verbundes sozialwissenschaftlicher Technikforschung. Volume 12: pp 12-41.
LaPorte, Todd R. (1975): Organized social complexity: Explication of a concept, pp 3-39 in: ders. (Ed.), Organized social complexity. Princeton: University Press.
Luhmann, Niklas (1978): Temporalization of complexity, pp 95-111 in: Geyer, Felix /van der Zouwen, Johannes (Ed.), Sociocybernetics. Leiden/Boston/London: Martinus Nijhoff. Vol. 2.
Luhmann, Niklas (1984): Soziale Systeme. Ffm: Suhrkamp.
Luhmann, Niklas (1986): Ökologische Kommunikation. Opladen: WDV.
Mai, Manfred (1994): Die Steuerbarkeit technischer Systeme und zur Steuerungsfähigkeit des Staates. Zeitschrift für Soziologie 23, pp 447-459.
Mambrey, Peter/Paetau, Michael/Tepper, August (1995): Technikentwicklung durch Leitbilder. Neue Steuerungs- und Bewertungsinstrumente. Ffm: Campus.
Maruyama, Magoroh (1963): The second cybernetics. American Scientist 51, pp 164-179.
Mayntz, Renate (1987): Politische Steuerung und gesellschaftliche Steuerungsprobleme - Anmerkungen zu einem theoretischen Paradigma, pp 89-109 in: Thomas Ellwein et al. (Ed.), Jahrbuch zur Staats- und Verwaltungswissenschaft. Band 1. Baden-Baden: Nomos.
Mayntz, Renate/Nedelmann, Birgitta (1987): Eigendynamik sozialer Prozesse. Anmerkungen zu einem analytischen Paradigma. KZfSS 39, pp 648-668.
Parsons, Talcott (1968): Sozialsysteme, pp275-318 in: Jensen, Stefan (Ed.), Talcott Parsons: Zur Theorie sozialer Systeme. Opladen: WDV 1976.

Perlstadt, Harry (1981): On the incorporation of the non-rational into sociocybernetics and complex systems, pp 1256-1262 in: Lasker, G.E. (Ed.), Applied systems and cybernetics. Vol. III. New York.
Perrow, Charles (1989): Lernen wir etwas aus den jüngsten Katastrophen? Soziale Welt, Issue 37, pp 390-401
Rammert, Werner (1992): Entstehung und Entwicklung der Technik: Der Stand der Forschung zur Technikgenese in Deutschland. Journal für Sozialforschung 32, pp 177-208.
Rammert, Werner (1993): Technik aus soziologischer Perspektive. Opladen: WDV.
Rammert, Werner (1995): Von der Kinematik zur Informatik. Konzeptuelle Wurzeln der Hochtechnologien im sozialen Kontext, pp 65-109 in: ders. (Ed.), Soziologie und künstliche Intelligenz. Produkte und Probleme einer Hochtechnologie. Ffm: Campus.
Robb, Fenton F. (1984): Cybernetics in management thinking. Systems Research 1, pp 5-23.
Schlese, Michael (1995): Software als "Medium der Kommunikation". Zur Rolle von Leitvorstellungen bei der Konstruktion eines wissensbasierten Systems, pp 359-391 in: Rammert, Werner (Ed.), Soziologie und künstliche Intelligenz. Produkte und Probleme einer Hochtechnologie. Ffm: Campus.
Simon, Herbert A. (1978a): Die Architektur der Komplexität, pp 94-120 in: Türk, Klaus (Ed.), Handlungssysteme. Opladen: WDV.
Simon, Herbert A. (1978b): Simulation of large-scale systems by aggregation, pp 113-122 in: Geyer, Felix /van der Zouwen, Johannes (Ed.), Sociocybernetics. Leiden/Boston/London: Martinus Nijhoff. Vol. 2.
Sirgy, M. Joseph (1990): Self-cybernetics toward an integrated model of self-concept processes. Systems Research 7, pp 19-32.
Stöckler, Manfred (1990): Emergenz. Bausteine für eine Begriffsexplanation. Conceptus 24, pp 7-24.
Taschdjian, Edgar (1976): The third cybernetics. Cybernetica 19, pp 91-104.
Taschdjian, Edgar (1978): The third cybernetics and temporal logic. Kybernetes 7, pp 177-183.
Taschdjian, Edgar (1982): Nonlinear cybernetics. Cybernetica 26, pp5-15.
Taylor, Lauren P. (1987): Management: Agent of human cultural evolution. Futures 19, pp 513-527.
Ulrich, Hans/Probst, Gilbert J. (1990): Anleitung zum ganzheitlichen Denken und Handeln. Bern/Stuttgart: Haupt.
Verbund sozialwissenschaftlicher Technikforschung (1995): Die Organisation technischer Innovationen. Mitteilungen des Verbundes sozialwissenschaftlicher Technikforschung. Issue 14. pp 50-58.
Weaver, Warren (1978): Wissenschaft und Komplexität, pp 38-46 in: Türk, Klaus (Ed.), Handlungssysteme. Opladen: WDV.
Weltz, Friedrich/ Ortmann, Rolf (1992): Das Software-Projekt. Projektmanagement in der Praxis. Ffm: Campus.
Wiener, Norbert (1948): Cybernetics. New York: Wiley.
Wiesner, Manfred/ Willutzki, Ulrike(1992): Sozial-konstruktivistische Wege in der Psychotherapie, pp337-379 in: Schmidt, Siegfried J. (Ed.) Kognition und Gesellschaft. Der Diskurs des radikalen Konstruktivismus 2. Ffm: Suhrkamp.
Willke, Helmut (1989): Systemtheorie entwickelter Gesellschaften. Dynamik und Riskanz moderner gesellschaftlicher Selbstorganisation. Weinheim/Munich: Juventa.
Willke, Helmut (1993): Systemtheorie: eine Einführung in die Grundprobleme der Theorie sozialer Systeme. Stuttgart/Jena: UTB. 4. Aufl.
Willke, Helmut (1994): Systemtheorie II: Interventionstheorie. Stuttgart/Jena: UTB.

Wimmer, Rudolf (1992): Was kann Beratung leisten? Zum Interventionsrepertoire und Interventionsverständnis der systemischen Organisationsberatung, pp 59-111 in: ders. (Ed.), Organisationsberatung. Neue Wege und Konzepte. Wiesbaden: Gabler.

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Moral coding and programming as evolutionary achievements

Diane Laflamme

Abstract

In Luhmann's own words, forms are generated in a medium and the most general medium, the one that is essential to the functioning of both psychic and social systems, is meaning.

Psychic systems and social systems are "meaning-constituting systems": in psychic systems, meaning is actualized as consciousness, in social systems, as communication. The operations of meaning-constituting systems are contingent selections constantly in search of connectivity: the system selects this conscious thought, this communication – and not the other possibilities. Through such selections, meaning is "constituted" within the horizon comprising the totality of the references presented by a meaningfully intended object.

Meaning can be considered, according to Luhmann, as an "evolutionary universal", more precisely an "evolutionary achievement" made possible by the "co-evolution" of psychic and social systems. Meaning-constituting selections can be conditioned: the system establishes under which conditions a connection will or will not happen. Morality is such a conditioning. Meaning-constituting systems use morality as a form in order to condition their selections and to insure a better connectivity between their operations. When making a connection, the system applies the binary code good or bad as a condition of its choice between this selection and all the other possibilities. For Luhmann, morality designates the conditions under which one can praise or blame oneself and another, and under which esteem or disesteem can be communicated.

Conditioning communication through a binary coding is an operation that can itself be conditioned; this gives rise to a program.

In this paper, we present how meaning-constituting systems operate in a horizon of possibilities, how the binary schematism of morality works for these systems as a reciprocal enabling device and how moral conditioning and programming thus contribute to an evolutionary process.

Life, consciousness and communication are a self-generated state of affairs: they are "emergent" realities (Luhmann, 2002: 157). Life can be observed in biological systems, consciousness in psychic systems and communication in social systems. These three levels of system formations are operationally closed to each other: one system can steer only its own operations, not the operations of the others.

As long as he or she is alive, a human being can both perceive and think, thus operating as a system of consciousness, and he or she can communicate about his or her perceptions and

thoughts.[11] Countless systems are at work within humans – even though a human being is not "a system". These systems are operationally independent, but they can also be observed as interdependent (Luhmann, 2002: 170). They interpenetrate: one system is an environment for the other system. Meaning is the common evolutionary achievement shared by both psychic systems and social systems.

Luhmann claims that meaning is sociology's basic concept (1990: Chap.2; 1995: Chap.2). But he is reluctant to formulate a definition of meaning, barely mentioning that meaning can be best presented in the form of a "phenomenological description" (1995: 60). For the purpose of the analysis presented here, we will select two of Luhmann's numerous descriptions of meaning: "Meaning is the continual actualization of potentialities. […] Meaning is the unity of actualization and virtualization, of re-actualization and re-virtualization, as a self-propelling process (which can be conditioned by systems)." (1995: 65)[12]

To refer to the relationship between meaning and system, Luhmann uses the word "constitution";[13] psychic systems and social systems are both "meaning-constituting systems" that respectively produce: meaningful thoughts by connecting one thought to another and meaningful communication by connecting one communication to another. In both cases meaning is constituted within a recursive process that needs time; each thought, each communication, refers to another thought or another communication and uses this reference process to move on from one present moment to the next one. If this process stops, consciousness stops, or communication comes to an end.

Meaning-constituting systems are both "constituted" and "constituting": they are continuously "constituted" by their own search for more connectivity and they also keep constituting themselves, reproducing who or what they are, as systems different from their environment, inasmuch as their own operations keep allowing for more connectivity in the next operations. The connectivity of their operations gives them a lifeworld, and we could add that it also "gives them to themselves", in their always changing but also always recognizable identity. They keep changing as systems, they are moving on (as human beings or as organizations for example), but they nevertheless keep recognizing themselves and their identity is still recognizable for their observers.

Meaning-constituting systems make their selections in a horizon of possibilities. They can select their meaning-references in a double horizon for each one of the three dimensions of meaning. We will briefly present how it works, before we look at the specific role of moral coding and programming as a device allowing for the conditioning of meaning through the binary schematism good/bad. Meaning-constituting systems condition their operations in order to improve connectivity. In doing so, they move towards more internal complexity, thus

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[11] See Chapter 8: "How can the Mind participate in Communication?" in Luhmann, 2002, p. 169-184.

[12] Luhmann (1995: 513) quotes in a note to his chapter on Meaning, the following definition of the meaning of an act proposed by J. Frese (1966: 45-55): "The meaning of an act is the ensemble of possibilities of connecting further acts onto this one that is given as a specific situation; that is, the meaning of an act is the multiplicity of connective possibilities that the act opens up. This is synonymous with saying that the meaning of an act is its reference to one or more places in the system where it performs its function".

[13] Luhmann criticizes Husserl's use of the term constitution as "ambivalent in at least two regards" because it "fluctuates in its meaning, namely between the having of immediate evidence and performance on one hand and between receptive clarification and creative production on the other." (1990a: 69) In order to explain his own use of the term constitution, Luhmann writes: "meaning always appears within some delimitable context and yet at the same time always points beyond this context and lets us see other possibilities. What I want to understand and to describe with the term constitution is this relationship between a selectively restricted order and the openness of other possibilities, a relationship of mutual interdependence, of being-possible-only-together." (1990a: 25)

reducing the difference of complexity between them and their environment. Moral conditioning has an impact on this evolution of meaning-constituting systems towards more complexity. We will consider this impact as a reciprocal enabling – for good or for bad! Finally, looking more closely into Luhmann's theory of system evolution, we will consider how moral coding and programming could work as evolutionary mechanisms.

1. Meaning references are bound to a horizon of possibilities

In meaning-constituting systems, the conscious thought or the communication that is distinguished as meaningful by a specific operation of selection is inseparable from the horizon against which it is distinguished: "a reactualizable core of meaning arises and, inextricably bound up with it, a horizon of reference to other possibilities" (Luhmann, 2002: 120).

For systems that constitute and use meaning, actual experience and actions are always given within a horizon of further possibilities. "They experience themselves, their environment, and everything that functions in it as an element, as a selection within a horizon that includes all possibilities and indicates further ones", says Luhmann (1995: 207). The system cannot command its environment as it pleases but whenever necessary, any operation of the system can push back its horizon still further, under the constraints imposed by the system's own capacity for connectivity. The system's horizon "always recedes when it is approached, but only in accordance with the system's own operations. It can never be pushed through or transcended because it is not a boundary. It accompanies every system operation when this refers to something outside the system" (1995: 17; see also 1989: 22).

When a selection is actualized, it also has the effect to virtualize all the potentialities that were not distinguished. But what is not actualized during the process of distinguishing a distinction is not eliminated; it is merely displaced "into a state of momentary inactuality, says Luhmann. It can be preserved as a potentiality in the process of re-virtualization and carried over into new horizons". Meaning processing requires a "continual actualization of potentialities" (1995: 65-66). Every selection made by the system is simultaneously an actualization and a potentialisation (or virtualization): the system selects "this and not something else". Here, "something else" designates what is potentialised (or virtualized). When a distinction distinguished "this", the other side of the distinction ("…the rest") is not erased, it is also "co-presented along with the distinction" (2000: 59). The other possibilities do not disappear, they are preserved and they could reappear in a subsequent actualization of meaning, as the system will keep searching for more connectivity.

Meaning-constituting systems can only operate sequentially and selectively. At any time, only one of the possibilities can be pursued or actualized, but the system exposes itself to new possibilities, opens itself to new horizons, a process that Luhmann describes in direct reference to Husserlian phenomenology (Laflamme, 2006).

As meaning, the world is accessible everywhere: "in every situation, in any detail, at each point on the scale from concrete to abstract", but at a given time only very little can form the actual focus of the conscious attention of a psychic system or be treated as an actual theme of communication by a social system. (1989: 17; 1995: 70) Nonetheless, the possibilities of further meaningful experiencing and acting are indicated in the horizon of actual experience and action, even if they cannot yet become available at the level of operations because the meaning-constituting system is still not complex enough to show the required connectivity that would allow more complex conscious thoughts or more complex communications.

2. Meaning references can be selected in a double horizon for each one of the three dimensions of meaning.

Luhmann describes how every operation of a meaning-constituting system has to locate its intended meaning within the structure of the three mutually independent dimensions of meaning and experience: the Fact dimension, the Time (or temporal) dimension and the Social dimension. In every meaning these three dimensions appear together (1995: 83-106; 1990: 34-43).

In each dimension the two constitutive horizons function together, and the system can redirect its operations from one horizon to the other within each one of the dimensions and between them. "A horizon is not a boundary; one cannot step across it", indicates Luhmann, but at any time, one can turn back to the opposite horizon (1995: 77). The term horizon is a useful metaphor here since it refers to an experience that we are familiar with: we know that changing direction, turning back to orient ourselves to the horizon opposite to the one chosen previously does not imply that we lose our lifeworld and its familiar references. We experience a direct access to meaning, in its actualized form (A) and in the non-actualized form (non-A) in very much the same way that we experience a direct access to our lifeworld, when we move in space from one horizon to another one (Laflamme, 2008). Luhmann describes it as follow:

> 'turning back' means that any pursuit of intentions (by a psychic system) or themes (by a communication system) is always experienced as approaching, never as receding from, a horizon. When one is absorbed in a single object, its external world does not recede into an ever-greater distance, and one does not need to unwind all the sequences of experience and action that have occurred for the opposite horizon to come into view. It is always represented with the object and it is always directly available as an immediacy of turning back. (1995: 77)

The meaningful references can pertain, for example, to an object perceived or consciously intended by a psychic system or to a theme or a contribution to a theme in a communication system. To select its next operation among all the possible references, the system aggregates some of the possibilities, makes a bundle out of meaning references and attributes them to one or the other of the double horizon available in each dimension of experience and meaning. The system can oscillate between the two horizons (1998: 10). In each one of the three dimensions, meaningful references can be bundled together according to a specific perspective (Laflamme, 2003).

The Fact dimension is constituted "in that meaning divides the reference structure of what is meant into "this" and "something else" (1995: 76). Thus, "two horizons cooperate in the factual constitution of meaning" and "twofold descriptions giving internal and outer profile are necessary to fix the meaning of an object" (1995: 77). The double horizon is: internal horizon (self; consciousness) or external horizon (other-than-self; phenomena). Meaning-constituting systems can thus distinguish between self-reference and external reference, although this distinction remains a system-internal distinction, since the system cannot carry its operations into the environment (operative closure; see 2000: 9). Conscious operations can only happen within consciousness; communication operations can only happen within communications.

In their experiencing and acting, meaning-constituting systems distinguish between two Temporal horizons which meet and are linked together in the present: that of the past and that of the future. The system can operate only in the present, of course, but it can also recursively refer backward or forward to previous perceptions or thoughts (psychic systems) or to other communications (social systems). The actualization of meaning is time-related: it happens in

an instant of experience or of communication. Meaning-constituting systems use the actuality of their operations as starting point and connecting point to further meaning references that extend in the past and in the future (2000: 139).

The Social dimension "concerns what one at any time accepts as like oneself, as an "alter ego". (1995: 80). Its double constitutive horizon is: ego and alter ego. One can ask of every meaning whether somebody else experiences it in exactly the same way he or she does. The Social dimension of experience and meaning is constituted "by a non-ego being recognized as another ego, being experienced as the bearer of its own albeit different experience and perspective of the world." (1990: 37)

	3 dimensions of meaning and experience		
	Fact dimension	**Time dimension**	**Social dimension**
Double constitutive horizon:	Horizon of self-reference Horizon of external reference	Horizon of the past Horizon of the future	Horizon of Ego Horizon of Alter Ego
How meaning is constituted: (1990: 36-39)	With meaning appearing materially or objectively in "Otherness", in being-one-thing-and not-another. The identity of an object intended by a psychic system Or of a theme used by a communication system stands as well specified against a background of other possibilities.	With factual identities fixed in their own temporal reference schemes, for example dated or assigned to the past or to the future. In the present, meaning extending into the past or the future can be presented to the system (for ex.: the steps necessary to realize a future goal can be chosen in the present)	Mutual recognition: Non-ego is recognized as another ego and is experienced as the bearer of it own albeit different experience and perspectives of the world
Meaning references can be thematized in communication: (1995: 157)	Meaning references are condensed into themes. The system's connectivity is improved: contributions to themes can be more easily distinguished and selected.	Themes and contributions to a theme can be recursively recalled and anticipated. Themes are old or new; they can become obsolete.	*When the theme is moralized in communication: the contribution refers to the conditions according to which one approves or disapproves of other and the self.* (1991:84) *Mutual blame: "morality indicates the conditions under which persons can praise or blame one another and themselves" (*1995:82)

Table 1. Horizon, meaning-constitution and communication in the three dimensions of meaning and experience

The following table shows, in a brief summary and for each one of the three dimensions of experience and meaning, how the double horizon is indicated, how meaning is constituted in

each dimension, how the thematization of meaning references is observed in each dimension and, more importantly for the present investigation, how moralized themes can be used in the Social dimension (last line, last column).

3. Expectations simplify the search for connectivity

As described by Luhmann, the phenomenon of meaning "appears as a surplus of references to other possibilities of experience and action. Something stands in the focal point, at the center of intention, and all else is indicated marginally as the horizon of an 'and so forth' of experience and action" (1995: 60). We have described the self-propelling process of actualization, virtualization, reactualization, revirtualization that allows a meaning-constituting systems to move from one selection to the other, without losing access to the surplus of references that characterizes meaning. The notion of a horizon, where this surplus of references is preserved, was expanded when we introduced the presentation of the three dimensions of experience and meaning, since each dimension has a double constitutive horizon.

Meaning constituting systems can also generalize meaning. They bundle together many meaning references, excluding what does not fit, in order to get to a generalization that allows more connectivity between its operations. The repertoire of possibilities becomes narrower but the system can orient itself more quickly: it knows what to expect.

Luhmann describes a feed-back loop between generalizations and expectations: on one hand, generalizations "condense the referential structure of every meaning into expectations, which indicate what a given meaning situation foresees"; on the other hand, "the requisite expectations and proofs of worth in concrete situations guide and correct generalizations. By means of expectations that one directly tests or that one cannot give up without considerable disorientation, one decides how far to push generalization" (1995: 96).

The generalization of meaning is sometimes done with the use of "symbolic abbreviations" and Luhmann refers to this as the "symbolic generalization of meaning". He gives examples of such abstractions or schematisms used by the system to make sure that once a generalization of meaning has proven to be useful, it can be made available again and again:

> symbolic abbreviations representing highly complex expectational situations are necessary for ongoing orientation. Stipulations of what should be done, values, concepts of obligation, and references to custom, normality, or what is usual are, for example, abstractions with this function. They have settled on the meta-level of expectations that are expected and serve there as a surrogate for a tedious investigation, enumeration, and publication of the actual expectations implied in any given situation. (1995: 306)

Morality is such a symbolic generalization. It appears in communication since moral regulation and thematization require communication. In moralized communications the binary schematism (or binary code) "good or bad" is used to generalize meaning references: the complexity of alter/ego relations is thus reduced to expressions of esteem for what is generalized as "good", or disdain for what is generalized as "not-good" (1995: 236). By esteem, Luhmann means a "generalized" recognition and evaluation which honor the fact that others accord with the "expectations" one believes must be assumed for social relations to continue (1995: 235).

Symbolic generalizations of meaning "stamp identities onto the flux of experience" (1995: 94). These identities are reductive references, but they make it easier for the meaning-constituting system to join its operations onto one another. In so doing, these generalizations prove their worth. For example, what has been generalized in a moralized communication

under the symbol "good" is a reductive reference to "the good", but with this reduction the meaning reference acquires re-availability: it can be made available in different kinds of situations (Fact dimension), at other points in time (Time dimension), and with other possible partners of communication (Social dimension).

This link between the capacity to select and the capacity to bridge discontinuities between the three dimensions of meaning contributes to evolutionary structural processes in meaning-constituting systems: "The hypothesis of a correlation between selection, on the one hand, and the bridging of fact / temporal / social discontinuities, on the other, explains how redundant complexity is used in evolutionary structural processes", says Luhmann, "the interesting fact is that surpluses of meaning must be used selectively, and that this must is a can in the sense of selecting expectations that extend across discontinuities and can thereby prove themselves as generalizations." (1995: 97)

In a binary schematism, the positive value of the code can be transformed in the negative value and vice versa; if we take the moral schematism, for example, what is good can be bad and what is bad can be good. "Good" is a symbolic abbreviation, the designated value of a code, whose negative value is "not-good". Binary coding, like the one used by the moral, is a way to impose conditions on the operations of selection. It is about the criteria guiding the application of the code that opinions might differ.

What the system indicates as "good" or excludes as "not-good" (or bad) is decided on the basis of a program (2000: 204). "A program is a complex of conditions for the correctness (and thus the social acceptability) of behavior" (1995: 317). Moral programming will organize the assignment of the value "good" and the value "bad" according to criteria that will be subject to consensus or dissent (1989: 127). The code is stable, but we can observe how moral programs have varied over the history of human societies. Meaning is constituted through a recursive linking of operations: whatever can become morally relevant results from a connection with whatever already possesses moral relevance. Whatever counts morally reproduces itself.

Morality is a symbolic generalization and, as such, it works through a reductive simplification of meaning references bundled together. Symbolic generalizations are "contained and refabricated within a network of expectations. They organize – or better, continually reorganize – expectations, and depending on the course of experience and action, they take up material from the underlying referential strata of meaning complexes or allow what is too seldom used to sink back down." (1995: 96-97) Fortunately, the simplification of meaning references does not make the world shrink; the full complexity of the world remains accessible to meaning-constituting systems, even though they sometimes let some unwelcome meaning references "sink back down" quite deeply! Complexity cannot be erased:

> It is a mark of conscious experience, as opposed to purely organic selection, that it regulates itself through this self-overburdening, with complexity and contingency regulating the selective processing of experience in a very specific way, viz. in the form of meaning. This requires that the complexity of other possibilities be constituted within experience itself and remain preserved there. Experience and action are unceasing selections but cannot simply eliminate those alternatives not chosen […] they can only neutralize them. Complexity cannot simply be "erased," […] but is, so to speak, only placed in brackets, reduced from moment to moment in continually different ways, and always remains preserved as the most generally constituted selection domain, as the "source" of constantly new and constantly different additional choices – as the world. (1990a: 27)

Meaning-constituting systems are systems that "condition their conditionings" in a world that is a horizon of possibilities. Through their experience and action,[14] they paradoxically use complexity reduction mechanisms in order to move towards more complexity. The binary schematism of morality is a far-reaching mechanism since it reduces the complexity of ego and alter relationships to expressions of esteem or disdain towards an individual as a participant in communication. It is also far-reaching when it functions as an enabling device for interpenetration between meaning-constituting systems.

4. Reciprocal enabling through the binary schematism of morality

Psychic systems and social systems have evolved together[15] and this co-evolution[16] has led to a common achievement called meaning. Meaning enables the systems that produce it: «meaning simultaneously enables consciousness to understand itself and continue to affect itself in communication, and enables communication to be referred back to the consciousness of the participants» (Luhmann, 1995: 219). Meaning is credited with a tremendous impact: « the referential wealth of meaning enables the formation of societal systems through which human beings can have consciousness and life » (Luhmann, 1995, 219).

Meaning makes possible an interpenetration[17] between human beings (interhuman interpenetration) and between human beings and social systems (social interpenetration). Interhuman interpenetration exists because «the complexity of a human being has significance for another human being and vice versa» (Luhmann, 1995: 223) Luhmann indicates that interhuman interpenetration is possible only by communication, that is, only by forming social systems. He also observes that interhuman interpenetration exceeds the possibilities of communication (1995: 223, 228).

In the word "interpenetration", the prefix, "inter", points to a reciprocal process: meaning-constituting systems enable each other when interpenetration happens.[18] Meaning-constituting systems operate within complexity and reciprocity becomes the key word for dealing with

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[14] « There are two modes of meaningful selection, action and experience. We conceive a process as *action* if its selectivity is attributed to a system and as *experience* if its selectivity is attributed to the situation or the environment of the system." (Luhmann, 1977: 510; see also 515, 518)

[15] « Persons cannot emerge and continue to exist without social systems, nor can social systems without persons » (Luhmann, 1995: 59). But the relationship between systems of consciousness and systems of communication is asymmetrical: « Once it has come into existence, a system of consciousness can be active even without communication. It experiences this and that within itself, observes something, feels itself thinking, and even talks to itself. Communication, on the other hand, can hardly come into being without the participation of the mind. » (Luhmann, 2002: 171) Luhmann also notes that communication can be stimulated only by the mind and not by a state of fact brought about by any physical, chemical, biochemical or neurophysiological operations as such. These « can have no effect on communication if it is not perceived, measured, and made conscious; only then can the fact stimulate the attempt to communicate about it » (2002: 177).

[16] [16] For a description of this co-evolution, see: Luhmann, 2002, p. 167. Also to be noted: « The evolution of social communication is possible only in a constantly operative link with states of consciousness. This link was first achieved through language, then more effectively through writing, and finally through printing. » (2002: 173)

[17] Luhmann uses the concept of interpenetration to designate an "operative and structural link" (2002: 182) between two systems that are environment for each other. On the concept of interpenetration, see also 1990b, Chapitre XVI. For a short explanation of the distinction Luhmann establishes between his concept of interpenetration and the same concept in Parsons, see note 5, in 1995, p. 546-547.

[18] « Systems of the mind are socialized by interpenetration with social systems" (…) Communication systems experience interpenetration by considering the personal dynamics of humans in their physical and mental (including the mind) dimensions. » (Luhmann, 2002: 183)

complexity. A meaning-constituting system can make its own complexity[19] available for constructing another system ("penetration"). There is "interpenetration" when this occurs reciprocally, that is, when both systems "enable" each other by introducing their already-constituted complexity into each other. Then, « the behavior of the penetrating system is co-determined by the receiving system ». Because of this co-determination, interpenetration has an impact on freedom (an enlarged horizon of possibilities) and dependency (co-determination as how meaning references will be generalized and conditioned in order to insure connectivity): « greater degree of freedom are possible in spite (better: because) of increased dependencies » (Luhmann, 1995: 213).

Moreover, « evolution is possible, says Luhmann, only by interpenetration, that is, only by reciprocity » (1995: 216). This is where morality comes into play, enabling both interpenetration and evolution towards more complexity. Morality has the function « to reduce the complexity of both interhuman interpenetration and social interpenetration" (Luhmann, 1995: 234) Morality is given the function to coordinate interpenetration, to enable the ongoing articulation of the two levels of interpenetration: the interpenetration between psychic systems (interhuman interpenetration) and the interpenetration between psychic systems and social systems (social interpenetration) (Luhmann, 1995: 235). It will do so by conditioning the generalization of meaning references with the binary schematism good/bad. Luhmann calls this schematism an evolutionary universal void of content: « It is specific and universal at the same time because, once invented, there cannot be an uncoded moral communication (…) But this evolutionary universal is void of content. It does not give any information about what is good and what is bad.» (1996: 30)

The binary conditioning called morality can facilitate understanding and conjoining behavior, but it can also bring conflicts into focus (Luhmann, 1995: 235). Criteria or programs of the moral will be needed to allow the system to distinguish between good and bad, and to allocate accordingly "esteem" to the whole participant in communication when meaning references are indicated as "good", and "non-esteem" (or disdain) when meaning references are coded as "not-good" (or bad). « Nobody can avoid the moral implications of his or her own statements but everybody can choose the programmes that favour their own interests and opinions, says Luhmann (1996: 31). We can observe how moral programs change historically, and how morality is "pluralized" in the social dimension of meaning: « For societies that are becoming more complex, a global programming of the social dimension in the form of morality becomes increasingly inadequate: in part because morality's zone of tolerance must be overextended, in part because everything excluded must be morally discredited – and practically because both occur together and morality is thereby pluralized. » (Luhmann, 1995: 82) Moral programs will bring more stability among meaningful selections, but they can generate dissent as well as consensus; moral programs are stable because they are ambivalent, says Luhmann: « they produce a semantic cover for unresolved conflicts. » (1996: 31-32)

Evolution does not necessarily imply progress; it operates without foresight (Luhmann, 1982: 300). How do we recognize the success of morality as an enabling device for meaning-constituting system? Morality succeeds, says Luhmann, « if it succeeds in binding the conditions under which one can relate to one another as a person and as a human being back to the construction of a common social system (or to having already lived in such a social system), and if, conversely, the continuation of such a system's operations is inconceivable without considering what human beings personally think of each other and how they include each other's complexity and freedom of decision into their own self interpretation." (1995: 238; we

[19] It is the "unity and complexity of one system" that is given a function within another system, and not the specific conditions and operations of this system (Luhmann, 1995:)

underline). To show esteem or disdain for a fellow human being is a far-reaching mechanism: interhuman interpenetration and social interpenetration become coordinated through the binary conditioning of morality and "connections are constituted" (1995: 218) in the same way meaning is "constituted". The horizon of possibilities for the meaning-constituting systems involved in the process is enlarged, as described here in section 1, and those possibilities that cannot become available to a system at the level of its operations because this system is not complex enough yet to show the required connectivity, do not disappear: they remain preserved as a selection domain, as the world.

5. Moral coding and programming as evolutionary mechanisms

For system theory, evolution[20] means dealing with complexity (Luhmann 1982). In Luhmann's own words, a "general theory of system evolution" comprehends evolution as « structural change that proceeds in the direction of more complexity, both on the level of the world as a whole and in some (not all!) systems » (1990a: 66). This evolution operates without a goal and is unpredictable (Luhmann, 1982).

There is a "complexity gradient" between system and environment: the environment is always more complex than the system itself. For a given system, gains in complexity are made when the system increases the number and the variability of its elements (2002: 157). The elements of a meaning-constituting system are its operations. Through their meaning-constituting operations, meaning-constituting systems both reduce and preserve complexity: « what is special about the meaningful or meaning-based processing of experience is that it makes possible both the reduction and the preservation of complexity; i.e., it provides a form of selection that prevents the world from shrinking down to just one particular content of consciousness with each act of determining experience. » (1990a: 27)

As complexity increases in the course of evolution, everything determinate becomes a choice from out of an increased number of alternate possibilities (1990a: 67). When a system makes an operation of selection, « every yes implies more nos », says Luhmann (1990a: 67). Evolution, apart from increasing complexity as well as the systems capacity for reducing complexity also increases the probability of highly improbable selections/ structures).

Complexity requires selection; to insure connectivity between their selections, meaning-constituting systems use generalizations, among others the generalizations made through morality. The generalization of meaning through symbolic[21] schematisms such as the one used by morality are reductive, the code good or bad is applied according to programs that can provoke dissent and conflict but, let us repeat it again: the world will not shrink and complexity will not be erased. It looks as if evolution at the level of meaning-constituting systems could be « an evolution of the technique of generalizing » (1990: 69) in the world conceived as an infinity of other possibilities of human experience and action (an enlarged horizon of possibilities) and dependency (co-determination as how meaning references will be generalized and conditioned in order to insure connectivity).

We have described here, in section 3, how generalizations are linked to expectations and how meaning-constituting systems rely on expectations to simplify their search for connecti-

[20] When he refers to system evolution, Luhmann indicates that three types of system-specific mechanisms are required: « mechanisms for the projection of possibilities, mechanisms for the selection of suitable possibilities, and mechanisms for stabilizing what has been chosen by the system » (1990a: 66-67; 2000: 214). These three mechanisms work as follows: « In the context of a theory of evolution, one can show that changes within socially presupposed stability conditions yield possibilities of variation and selection that are left to their own internal dynamic and lead to a rapidly accelerating, self-generated structural change. » (2000: 237-238)

[21] On generalized symbolic patterns, see Luhmann, 1977, pp. 511-512 and 520.

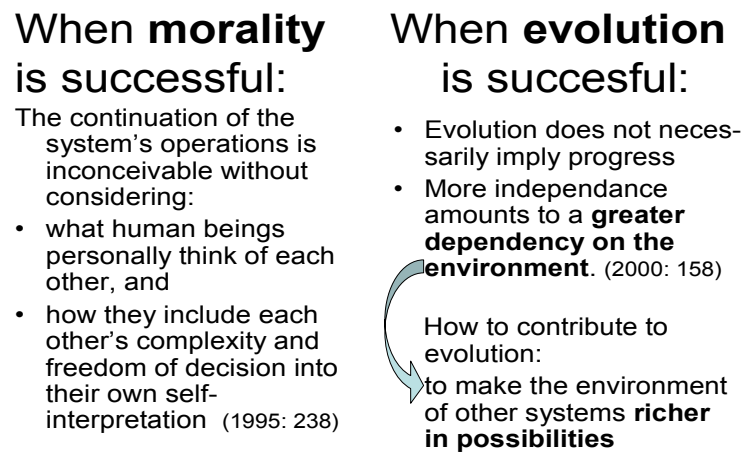
vity. Meaning is constituted through structures of expectations: expectations that are fulfilled acquire a structural value. They have proven their worth by allowing for more connectivity so the system orients itself to these expectations in order to choose more rapidly and with less risk its next operation. Expectations also allow the system to bridge discontinuities between the three dimensions of meaning.

Evolution also relies on structures of expectations: « Every situation allows possibilities for connection more or less room to play. (…) The ability to connect on is secured by the self-reference of the elements and by structures of expectations. Within this superfluity of possibilities exist distinct probabilities that are fixed within the meaning horizon of the moment and can be observed as probabilities. This room for play can, if it is structured by distinct probabilities, be understood as a potential for evolution at the same time. » (1995: 434; we underline). This potential will not necessarily be actualized; failures and stagnation can also occur.

Success implies, for evolution, more dependency on the environment: « In systems that are successful in evolutionary terms, more independence typically amounts to a greater dependency on the environment. A complex system can have a more complex environment and is capable of processing a greater amount of irritation internally, that is, it can increase its own complexity more rapidly. » (2000:158) But the success of evolutionary achievements does not seem to require that all meaning-constituting systems be necessarily enlisted into a sweeping movement towards complexity; Luhmann indicates that the movement in the direction of increased complexity appears "both on the level of the world as a whole and in some (not all!) systems" (1990: 66).

This implies that even at a small scale, meaning-constituting selections in general, and those conditioned with the binary coding of morality in particular, are differences that can make a quite a difference! They contribute to the meaningful experience of other meaning-constituting systems. They also leave the environment of other systems richer in possibilities even though the evolutionary leap might look quite insignificant at the level of the system itself: "structural changes in individual systems make the environment of other systems more complex, and these react by exhausting new possibilities, or by adaptation or indifference – in any case, by increasing the selectivity of their state. Structural changes beneficial to the adapting system can, in turn, leave the environment of other systems richer in possibilities so that, although complexity does not necessarily increase for all systems or types of systems, it does for their relationship, which is then available to meaningful experience as the world." (1990a: 66; we underline)

Success for morality, and success for evolution could be presented as follows:



Meaning-constituting systems are interpenetrating systems. One system can make its own complexity available for constructing the other one, and this is a reciprocal mechanism. Relationships of interpenetration enable the system for freedom, in an enlarged horizon of possibilities, but also bring with them more dependency since there is co-determination as how meaning references will, from now on, be generalized and conditioned in view to insure the needed connectivity between the operations of interpenetrating systems. What should be remembered though, is that morality functions as a form (1993: 996), when it coordinates relationships of interpenetration. Meaning, for its part, is a medium, a universal one and the most general one. To distinguish forms into a medium does not exhaust it, it rather regenerates its possibilities.[22]

Meaning is an "evolutionary achievement", says Luhmann (1995: 59). Moreover, meaning accelerates evolution because the whole set of possibilities meaning-constituting systems are choosing from are preserved within meaning: "Since possibilities can be thematized and negated within meaning itself, meaning (…) makes possible a substantial acceleration of the evolution process. In the meaningfully identified premises of experience processing, it is not only what, in any instance, is actually chosen that is firmly stabilized – i.e., made continually available – but also the whole set of possibilities chosen from." (we underline; 1990a: 67) Meaning contributes to the stabilization of what meaning-constituting systems reciprocally make available to one another through interpenetration, but what is stabilized is not limited to what has been selected through a reductive – and hopelessly blind, because it works according to the law of the excluded third[23] – generalizing process. The whole set of possibilities chosen from is preserved as a "lifeworld", and is still accessible to the systems' operations.

Luhmann proposes a short description of how evolutionary achievements in meaning-constituting systems could be observed in the three dimensions of experience and meaning (1990: 68).

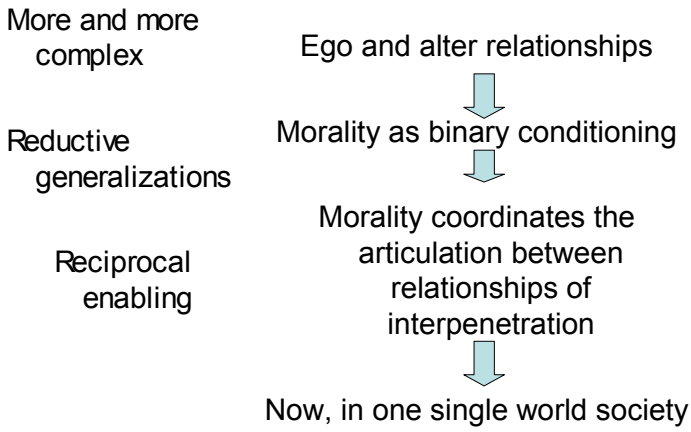
	The 3 dimensions of experience and meaning		
	Fact dimension:	**Time dimension:**	**Social dimension:**
In meaning systems enabled by evolutionary achievements we can observe:	- « More varied forms of human behavior into the society » - Acceptance of « more individually formed psychic systems »	Expanding the horizon of possibilities involves: - « a mobilization of what can be seen as present; - a more complex thematizing and planning of the future, and - a 'capitalizing' of the past »	« Meaning-constituting social relationship are (…) abstracted (…) and replaced by the formula of the free and equal subject, the constituting consciousness, whose function no longer depends on particular attributes or membership, and whose role may be assumed by anyone. »

Table 2. Indicators of evolutionary achievements in the three dimensions of experience and meaning

[22] Forms are generated in a medium via a tight coupling of the elements loosely coupled in the medium. The medium is constant; it imposes limits to the forms that can be generated in it. The forms alternate; they are subject to variations and they can be generated, forgotten and remembered. Luhmann uses the example of words as forms in the medium of sound. A meaningful "form" does not exhaust the possibilities contained in the medium "meaning", it rather selects and condenses inside the form some of the meaning references and, in so doing, it distinguishes itself from the remaining possibilities contained in the medium. See Luhmann, 2000, Chapter 3.

[23] On moral invention as a process requiring the re-inclusion of the previously excluded third, see Laflamme, 2006.

As evolutionary achievements, do moral coding and programming contribute to the acceptation into society of more varied forms of human behavior, of more individually formed psychic systems? Do they contribute to a more complex thematizing of the future? Those are examples of some of the questions involved with "regenerating the possibilities" of the medium in which morality is "a form" among others. For meaning-constituting systems, morality is there to stay: "Naturally, no society renounces morality, if for no other reason than that the problem of reciprocal esteem is continually reproduced in interaction between human beings." Luhmann judges severely the contribution of morality in "the modern era", where morality has become, as he observes it quite rightly, "a disturbing factor or, in any event, an attitude that cannot be observed without distrust and must be kept in check" (1995: 240). What we could add is this: what is to be "kept in check" is the reciprocal enabling that happens when meaning-constituting systems are involved in relationships of interpenetration.



Conclusion

Looking at moral coding and programming as evolutionary achievements, we observed how morality coordinates a reciprocal enabling between meaning-constituting systems and how the reductive generalizations made with the binary schematism of morality also have the effect to provide an environment richer in possibilities for meaning-constituting systems. To further the considerations developed here, what would be needed is to investigate how meaning-constituting systems steer and control their operations[24] when multiple conditionings come together, using for that their capacity for oscillation and memory.

The "motor" for evolution is the world/system difference, says Luhmann (1990a: 66). He also observes that evolution has brought us into "one single world society". In an article published in English in 1977, Luhmann boldly declared: "In fact, there exists today only one society on earth: the world society". With a remarkable insight, he goes on, describing the

[24] See Luhmann, 1997, p. 367: « One may define the concept of steering as *intention for change of specific differences*. " Control "is the retrospective self-observation of a system which follows upon steering attempts. Control is not merely success control either. It may exist too when the system tries to divert or to eliminate external steering attempts or steering attempts from above. (…) Control may mean too, however, that the narrowing of the field of vision to specific differences is resolved or at least loosened and one starts to describe the steering impulse in a more complex way. Thus control is almost always connected with a redescription of the steering, which exposes the system to a constant self-correction."

very situation that we can observe more clearly thirty years later: "The environment of this one global society cannot consist of other human societies, and it can no longer be marked by territorial frontiers. It consists of other possibilities of experience and action which are not selected by social systems but are contingently available to human beings." (1977: 526)

Nowadays, contingent selections continue to be made by human beings in this "one single world society" and meaning references continue to be morally conditioned with the schematism esteem/disdain. Using again and again the mechanism of moral coding and programming, we continue to reduce the full complexity of our ego/alter relationships, relying, in order to do so, on generalizations that make us blind to the full complexity of what is at stakes in our experiencing and acting. We are blindly using a device that reciprocally enables us, namely morality. What is stabilized as something that morally counts keeps going on, reproducing itself. Relationships of interpenetration can challenge these stabilizations inasmuch as some (not necessarily many) meaning-constituting systems make the environment of other systems richer in possibilities. The impact of reciprocal enabling could even be stronger now since, as Luhmann notices, in "one single world society" evolution cannot select any more the successful ones among many societies: "If all social systems today belong to one single world society, the theory of evolution faces a new kind of problem: the level of sociocultural evolution is represented by one system only. There are no longer many societies from which evolution can select successful ones." (1982: 302)

We keep going, using a blind binary schematism to make distinctions, but this "one single world society" we are part of will not shrink because of the blindness of our search for connectivity. Since the problem of reciprocal esteem is continually reproduced in interaction between human beings, and since interhuman interpenetration continues to fascinate us, what could be decisive in terms of an evolution allowing for the continuation of life, consciousness and communication in this one single world society that is now ours, could be our capacity to recognize that the complexity of one human being has the highest significance for its fellow human beings.

Bibliography

Laflamme, D. (2008). "Ethics and the Interplay between the Logic of the Excluded Middle and the Logic of the Included Middle", in Nicolescu B. (ed.), Transdisciplinarity: Theory and Practice, Hampton Press, NJ.

Laflamme, D. (2006). "Moral Invention in Meaning-constituting Systems", Kybernetes, Vol. 35, Issue 7/8, p. 1210-1222.

Laflamme, D (2003). "Faire sens grâce à nos opérations conscientes et à nos communications. La notion de sens chez Niklas Luhmann, Frontières, vol. 15, no 2, p. 78-84.

Luhmann, N. (2002). Theories of Distinction, Stanford University Press, Standford.

Luhmann, N. (2000). Art as a Social System. Stanford University Press, Stanford.

Luhmann, N. (1998), Observations on Modernity. Stanford University Press, Standford.

Luhmann, N. (1997). "The Control of Intransparency", System Research Behavioral Science, John Wiley & Sons, Ltd., Vol. 14, p. 359-371.

Luhmann, N. (1996). "The Sociology of the Moral and Ethics", International Sociology, Vol. 11, no 1, March, p, 27-36.

Luhmann, N. (1995). Social Systems, Stanford University Press, Standford.

Luhmann, N. (1994). "Politicians, Honesty and the Higher Amorality of Politics", in Theory, Culture & Society, Sage, London, vol. 11, p. 25-36.

Luhmann, N. (1993). "The Code of the Moral", Cardozo Law Review, vol. 14, pp. 995-1009.

Luhmann, N. (1991). "Paradigm Lost: on the Ethical Reflection of Morality", Thesis Eleven, 29.

Luhmann, N. (1990a). Essays on Self-Reference, Columbia University Press, New York.
Lumann, N. (1990b). Amour comme passion. De la codification de l'intimité, Paris, Aubier.
Luhmann, N. (1989). Ecological Communication, University of Chicago Press, Chicago.
Luhmann, N. (1982). "The World Society as a Social System", International Journal of General Systems, April.
Luhmann, N. (1977). "Generalized Media and the Problem of Contingency", in Loubser, Baum, Effrat & Lidz, Explorations in The General Theory In Social Science. Essays in Honor Of Talcott Parsons, The Free Press, New York.

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Classics

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The autopoiesis of social systems

Niklas Luhmann

Meaning and life as different modes of autopoietic organization

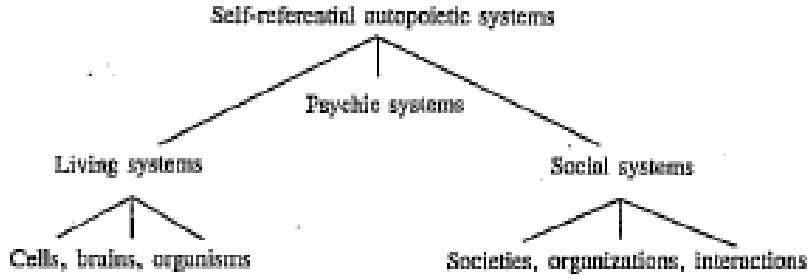
The term ‚autopoiesis' has been invented to define life. Its origin is clearly biological. Its extension to other fields has been discussed, but rather unsuccessfully and on the wrong premises. The problem may well be that we use a questionable approach to the issue, ‚tangling' our ‚hierarchies' of investigation.

At first sight it seems safe to say that psychic systems, and even social systems, are also living systems. Would there be consciousness or social life without (biological) life? And then, if life is defined as autopoiesis, how could one refuse to describe psychic systems and social systems as autopoietic systems? In this way we can retain the close relation between autopoiesis and life and apply this concept to psychic systems and to social systems as well. We are almost forced to do it by our conceptual approach (Maturana, 1980; Hejl, 1982; Bunge, 1979). However, we immediately get into trouble in defining precisely what the ‚components' of psychic and social systems are whose reproduction by the same components of the same systems recursively defines the autopoietic unity of the system. And what does ‚closure' mean in the case of psychic and social systems if our theoretical approach requires the inclusion of cells, neurophysiological systems, immune systems, etc. of living bodies into the encompassing (?) psychological or sociological realities?

Moreover, because it is tied to life as a mode of self-reproduction of autopoietic systems, the theory of autopoiesis does not really attain the level of general systems theory which includes brains and machines, psychic systems and social systems, societies and short-term interactions. From this point of view, living systems are a special type of systems. However, if we abstract from life and define autopoiesis as a general form of system-building using self-referential closure, we would have to admit that there are non-living autopoietic systems, different modes of autopoietic reproduction, and general principles of autopoietic organization which materialize as life, but also in other modes of circularity and selfreproduction. In other words, if we find non-living autopoietic systems in our world, then and only then will we need a truly general theory of autopoiesis which carefully avoids references which hold true only for living systems. But which attributes of autopoiesis will remain valid on this highest level, and which will have to be dropped on behalf of their connection with life?

The text that follows uses this kind of multi-level approach. It distinguishes a general theory of self-referential autopoietic systems and a more concrete level at which we may distinguish living systems (cells, brains, organisms, etc.), psychic systems and social systems (societies, organzations, interactions) as different kinds of autopoietic systems (see Figure 1).

FIGURE 1
Types of self-referential autopoietic systems



Types of self-referential autopoietie systems

This scheme does not describe an internal systems differentiation. It is a scheme not for the operations of systems, but for their observation. It differentiates different types of systems or different modes of realization of autopoiesis.

This approach is usable only if we are prepared to accept its anti-Aristotelian premise that social systems, and even psychic systems are not living systems. The concept of autopoietic closure itself requires this theoretical decision, and leads to a sharp distinction between meaning and life as different kinds of autopoietic organization; and meaning-using systems again have to be distinguished according to whether they use consciousness or communication as modes of meaning-based reproduction. On the one hand, then, a psychological and a sociological theory have to be developed which meet these requirements; on the other hand, the concept of autopoiesis has to be abstracted from biological connotations. Both tasks are clearly interdependent. The general theory of autopoietic systems forms the foundation of the theories of psychic and social systems; the general theory itself, however, is meaningful only if this implementation succeeds, because otherwise we would be unable to determine which kind of attributes are truly general.

Communications as the basic elements of social systems

To use ipsissima verba ‘autopoietic systems’ are systems that are defined as unities, as networks of productions of components, that recursively, through their interactions, generate and realize the network that produecs them and constitute, in the space in which they exist, the boundaries of the 'network as components that participate in the realization of the network' (Maturana, 1981: 21). Autopoietic systems, then, are not only self-organizing systems. Not only do they produce and eventually change their own structures but their self-reference applies to the production of other components as well. This is the decisive conceptual innovation. It adds a turbocharger to the already powerful engine of self-referential machines. Even elements, that is last components (in-dividuals), which are, at least for the system itself, undecomposable, are produced by the system itself. Thus, everything which is used as a unit by the system is produced as a unit by the system itself. This applies to elements, processes, boundaries and other structures, and last but not least to the unity of the system itself. Autopoietic systems, of course, exist within an environment. They cannot exist on their own. But there is no input and no output of unity.

Autopoietic systems, then, are sovereign with respect to the constitution of identities and differences. They do not create a material world of their own. They presuppose other levels of reality. Human life, for example, presupposes the small scope of temperature in which water exists as a liquid. But whatever they use as identities and as differences is of their own ma-

king. In other words, they cannot import identities and differences from the outer world; these are forms about which they have to decide themselves.

Social systems use communication as their particular mode of autopoietic reproduction. Their elements are communications which are recursively produced and reproduced by a network of communications and which cannot exist outside of such a network. Communications are not ‚living' units, they are not ‚conscious' units, they are not ‚actions'. Their unity requires a synthesis of three selections: namely, information, utterance1) and understanding (including misunderstanding).2) This synthesis is produced by the network of communication, not by some kind of inherent power of consciousness, or by the inherent quality of the information. Also - and this goes against all kinds of ‚structuralism' - communication is not produced by language. Structuralists have never been able to show how a structure can produce an event. At this point, the theory of autopoiesis offers a decisive advance. It is the network of events which reproduces itself and structures are required for the reproduction of events by events.

The synthesis of information, utterance and understanding cannot be preprogrammed by language. It has to be recreated from situation to situation by referring to previous communications and to possibilities of further communications which are to be restricted by the actual event. This operation requires self-reference. It can in no way use the environment. Information, utterances and understandings are aspects which for the system cannot exist independently of the system; they are co-created within the process of communication. Even ‚information' is not something which the system takes in from the environment. Pieces of information don't exist ‘out there', waiting to be picked up by the system. As selections they are produced by the system itself in comparison with someting else (e.g., in comparison with something which could have happened).

The communicative synthesis of information, utterance and understanding is possible only as an elementary unit of an ongoing social system. As the operating unit it is undecomposable, doing its autopoietic work only as an element of the system. However, further units of the same system can distinguish between information and utterance and can use this distinction to separate hetero-referentiality and self-referentiality. They can, being themselves undecomposable for the moment, refer primarily to the content of previous communications, asking for further information about the information; or they can question the ‚how' and the ‚why' of the communication, focusing on its utterance. In the first case, they will pursue hetero-referentiality, in the second case self-referentiality. Using a terminology proposed by Gotthard Günther (1979), we can say that the process of communication is not simply auto-referential in the sense that it is what it is. It is forced by its own structure to separate and to recombine hetero-referentiality and self-referentiality. Referring to itself, the process has to distinguish information and utterance and to indicate which side of the distinction is supposed to serve as the base for further communication. Therefore, self-reference is nothing but reference to this distinction between hetero-reference and self-reference. And, whereas auto-referentiality could be seen as a one-value thing (it is what it is), and could be described by a logic with two values only, namely, true and false, the base of social systems is one of much greater complexity because its self-reference (1) is based on an ongoing auto-referential (autopoietic) process, which refers to itself (2) as processing the distinction between itself and (3) its topics. If such a system did not have an environment, it would have to invent it as the horizon of its hetero-referentiality.

The elementary, undecomposable units of the system are communications of minimal size. This minimal size, again, cannot be determined independent of the system.3) It is constituted by further communication or by the prospect of further communication. An elementary unit has the minimal meaning which is necessary for reference by further communication - for instance, the minimal meaning which still can be negated. Further communication can very well separate pieces of information, utterances and understandings and discuss them separate-

ly, but this still would presuppose their synthesis in previous communication. The system does not limit itself by using constraints for the constitution of its elementary units. If need be, it can communicate about everything and can decompose aspects of previous communication to satisfy actual desires. As an operating system, however, it will not always do this to the extreme. Communication includes understanding as a necessary part of the unity of its operation. It does not include the acceptance of its content. It is not the function of communication to produce a consensus as the favoured state of mind. Communication always results in an open situation of either acceptance or rejection. It reproduces situations with a specified and enforced choice. Such situations are not possible without communication; they do not occur as natural happenings. Only communication itself is able to reach a point which bifurcates further possibilities. The bifurcation itself is a reduction of complexity and, by this very fact, an enforcement of selection. Automatically, the selection of further communication is either an acceptance or rejection of previous communication or a visible avoidance or adjournment of the issue. Whatever its content and whatever its intention, communication reacts within the framework of enforced choice. To take one course is not to take the other. This highly artificial condition structures the self-reference of the system; it makes it unavoidable to take other communications of the same system into account, and every communication renews the same condition within a varied context. If the system were set up to produce consensus it soon would come to an end. It would never produce and reproduce a society. In fact, however, it is designed to reproduce itself by submitting itself to self-reproduced selectivity. Only this arrangement makes social evolution possible, if evolution is seen as a kind of structural selection superinduced on selectivity.

Societies and interactions as different types of social systems

Social systems, then, are recursively closed systems with respect to communication. However, there are two different meanings of ‚closure' which make it possible to distinguish between societies and interactions as different types of social systems. Societies are encompassing systems in the sense that they indude all events which, for them, have the quality of communication. They cannot communicate with their environment because this would mean including their understanding partner in the system, understanding being an essential aspect of the communication itself.4) By communication they extend and limit the societal system, deciding about whether and what to communicate, and what to avoid.

Interactions, on the other hand, form their boundaries by the presence of people who are well aware that communication goes on around them without having contact with their own actual interaction. Interactions must take into account environmental communication, and have to acknowledge the fact that persons who are present and participate in the interaction have other roles and other obligations within systems which cannot be controlled here and now.

But interactions also are closed systems, in the sense that their own communication can be motivated and understood only in the context of the system. For example, if somebody approaches the interactional space and begins to participate, he has to be introduced and the topics of conversation eventually have to be adapted to the new situation. Interactions, moreover, cannot import communication ready-made from their environment. They communicate or they do not communicate, according to whether they decide to reproduce or not to reproduce their own elements. They continue or discontinue their autopoiesis like living systems which continue as living systems or die. There are no third possibilities, neither for life nor for communication. All selections have to be adapted to the maintenance of autopoietic reproduction. Something has to be said, or, at least, good and peaceful (or bad and aggressive) intentions have to be shown if others are present.5) Everything else remains a matter of structured choice within the system. Some of its structures, then, become specialized in assuring that

communication goes on even if nothing of informative quality remains and even if the communication becomes controversial and unpleasant (Malinowski, 1960).

The relation between action and communication

Confronted with the question of elementary units, most sociologists would come up with the answer: action. Sometimes ‚roles' or even human individuals are preferred, but since the time of Max Weber and Talcott Parsons, action theory seems to offer the most advanced conceptualization.6) Communication is introduced as a kind of action - for example, as ‚kommunikatives Handeln' in the sense of Jürgen Habermas (1981). Usually this conceptualization is taken for granted, and classical sociological theory finds itself resumed under the title of ‚Theory of Action' (Münch, 1982). Controversies are fought over headings such as action versus system, or individualistic versus holistic approaches to social reality. There is no serious conceptual discussion which treats the relation of actions and communications, and the important question of whether action or communication should be considered as the basic and undecomposable unit of social systems has not been taken up. For a theory of autopoietic systems, only communication is a serious candidate for the position of the elementary unit of the basic self-referential process of social systems. Only communication is necessarily and inherently social. Action is not. Moreover, social action already implies communication; it implies at least the communication of the meaning of the action or the intent of the actor, and it also implies the communication of the definition of the situation, of the expectation of being understood and accepted, and so on. Above all, communication is not a kind of action because it always contains a far richer meaning than the utterance or transmittance of messages alone. As we have seen, the perfection of communication implies understanding, and understanding is not part of the activity of the communicator and cannot be attributed to him. Therefore, the theory of autopoietic social systems requires a conceptual revolution within sociology: the replacement of action theory by communication theory as the characterization of the elementary operative level of the system.

The relation of action and communication has to be reversed. Social systems are not composed of actions of a special kind; they are not communicative actions, but require the attribution of actions to effectuate their own autopoiesis. Neither psychological motivation, nor reasoning or capacity of argumentation, constitutes action, but simply the attribution as such, that is, the linking of selection and responsibility for the narrowing of choice.7) Only by attributing the responsibility for selecting the communication can the process of further communication be directed. One has to know who said what to be able to decide about further contributions to the process. Only by using this kind of simplifying localization of decision points can the process return to itself and communicate about communication.

Reflexive communication is not only an occasional event, but also a continuing possibility being co-reproduced by the autopoiesis itself. Every communication has to anticipate this kind of recursive elaboration, questioning, denial or correction, and has to preadapt to these future possibilities. Only in working out this kind of presumptive fitness can it become part of the autopoietic process. This, however, requires the allocation and distribution of responsibilities. And this function is fulfilled by accounting for action. The process therefore produces a second version of itself as a chain of actions. Contrary to the nature of communication itself, which inducles the selectivity of information and the selectivity of understanding, and thereby constitutes its elements by overlapping and partial interpenetration, this action chain consists of clear-cut elements which exclude each other. Contrary to the underlying reality of communication, the chain of communicative actions can be seen and treated as asymmetric.

In this sense the constitution and attribution of actions serve as a simplifying self-observation of the communicative system. The system processes information but it takes responsibility only for the action part of this process, not for the information. It is congruent

with the world, universally competent, including all exclusions, and at the same time it is a system within the world, able to distinguish and observe and control itself. It is a self-referential system and, thereby, a totalizing system. It cannot avoid operating within a ‚world' of its own. Societies constitute worlds. Observing themselves, that is, communicating about themselves, societies cannot avoid using distinctions which differentiate the observing system from something else. Their communication observes itself within its world and describes the limitation of its own competence. Communication never becomes self-transcending.8) It never can use operations outside its own boundaries. The boundaries themselves, however, are components of the system and cannot be taken as given by a pre-constituted world.

All this sounds paradoxical, and rightly so. Social systems as seen by an observer are paradoxical systems.9) They include self-referential operations, not only as a condition of the possibility of their autopoiesis but also because of their self-observation. The distinction of communication and action and, as a result, the distinction of world and system are operative requirements. The general theory of autopoietic systems postulates a clear distinction between autopoiesis and observation. This condition is fulfilled in the case of social systems as well. Without using this distinction, the system could not accomplish the self-simplification necessary for self-observation. Autopoiesis and observation, communication and attribution of action are not the same and can never fuse. Nevertheless, self-observation in this specific sense of describing itself as a chain of clear-cut and responsible actions is a prerequisite of autopoiesis as such. Without this technique of using a simplified model of itself, the system could not communicate about communication and could not select its basic elements in view of their capacity to adapt themselves to the requirements of autopoiesis. This particular constellation may not be universally valid for all autopoietic systems. In view of the special case of social systems, however, the general theory has to formulate the distinction of autopoiesis and observation in a way which does not exclude cases in which self-observation is a necessary requirement of autopoiesis as such.

Observing such systems under the special constraints of logical analysis, we have to describe them as paradoxical systems or as ‚tangled hierarchies'. It is not the task of an external observation to de-paradoxize the system and describe it in a way which is suitable for multi-level logical analysis. 10) The system de-paradoxizes itself. This requires ‚undecidable' decisions. In the case of social systems these are decisions about the attribution of action. If desired, these decisions themselves can be attributed as actions, which again could be attributed as action, and so on in infinite regress. Logically, actions are always unfounded and decisions are decisions precisely because they contain an unavoidable moment of arbitrariness and unpredictablity. But this does not lead into lethal consequences. The system learns its own habits of acting and deciding,11) accumulating experiences with itself and consolidating, on the basis of previous actions, expectations concerning future actions (structures). The autopoiesis does not stop in face of logical contradictions: it jumps, provided that possibilities of further communication are close enough at hand.

Maintenance of social systems by self-referential production of elements

The formal definition of autopoiesis gives no indication of the span of time during which components exist. Autopoiesis presupposes a recurring need for renewal. On the biological level, however, we tend to think about the process of replacement of molecules within cells or the replacement of cells within organisms, postponing for some time the final, inevitable decay. The limited duration of life seems to be a way of paying the cost of evolutionary improbability. All complex order seems to be wrested from decay.

This holds true for social systems as well, but with a characteristic difference. Conscious systems and social systems have to produce their own decay. They produce their basic elements, that is, thoughts and communications, not as short-term states but as events which va-

nish as soon as they appear. Events, too, occupy a minimal span of time, a specious present, but their duration is a matter of definition and has to be regulated by the autopoietic system itself: events cannot be accumulated. A conscious system does not consist of a collection of all its past and present thoughts, nor does a social system stockpile all its communications. After a very short time the mass of elements would be intolerably large and its complexity would be so great that the system would be unable to select a pattern of coordination and would produce chaos. The solution is to renounce all stability at the operative level of elements and to use events only. Thereby, the continuing dissolution of the system becomes a necessary cause of its autopoietic reproduction. The system becomes dynamic in a very basic sense. It becomes inherently restless. The instability of its elements is a condition of its duration.

All structures of social systems have to be based on this fundamental fact of vanishing events, disappearing gestures or words that are dying away. Memory, and then writing, have their function in preserving not the events, but their structure-generating power.13) The events themselves cannot be saved, but their loss is the condition of their regeneration. Thus, time and irreversibility are built into the system not ony at the structural level, but also at the level of its elements. Its elements are operations, and there is no reasonable way to distinguish between ‚points' and ‚operations'. Disintegration and reintegration, disordering and ordering require each other, and reproduction comes about only by a recurring integration of disintegration and reintegration.

The theoretical shift from self-referential structural integration to self-referential constitution of elements has important consequences for systems maintenance. Maintenance is not simply a question of replication, of cultural transmission, of reproducing the same patterns under similar circumstances, such as using forks and knives while eating and only while eating;14) its primary process is the production of next elements in the actual situation, all these have to be different from the previous ones to be recognizable as events. This does not exclude the relevance of preservable patterns; indeed, it even requires them for a sufficiently quick recognition of next possibillties. However, the system maintains itself not by storing patterns but by producing elements; not by transmitting ‚memes' (units of cultural transmission analogous to ‚genes')15), but by recursively using events for producing events. Its stability is based on instabillty. This built-in requirement of discontinuity and newness amounts to a necessity to handle and process information, whatever the environment or the state of the system offers as occasions. Information is an internal change of state, a self-produced aspect of communicative events and not something which exists in the environment of the system and has to be exploited for adaptive or similar purposes.16)

(…)

The contribution of the general theory of autopoietic systems

These short remarks by no means exhaust the range of suggestions that the theory of social systems can contribute to the abstraction and refinement of the general theory of autopoietic systems (for a more extensive treatment, see Luhmann, 1984). We can now return to the question, what is new about it, given a long tradition of thinking about creatio continua, continuance, duration, maintenance and so forth 21) (Ebeling, 1976)? Since the end of the sixteenth century, the idea of self-maintenance has been used to displace teleological reasoning, and to reintroduce teleology with the argument that the maintenance of the system is the goal of the system or the function of its structures and operations. It is no surprise, therefore, that the question of what is added by the theory of autopoiesis to this well-known and rather futile traditional conceptualization has been appended to this discussion.22) An easy answer would be to mention the sharp distinction between self-reference on the level of structures (self-organization) and self-reference on the level of basic operations, or elements. Moreover, we

could point to the epistemological consequences of distinguishing autopoiesis and observation, observing systems being themselves autopoietic systems. We have only to look at the consequences of an ‚event-structure' approach for sociological theory to be aware of new problems and new attempts at solution, compared with the Malinowski/Radcliffe Brown/Parsons level of previous controversies. There is, however, a further aspect which should be made explicit.

The theory of autopoietic systems formulates a situation of binary choice. A System either continues its autopoiesis or it does not. There are no in-between states, no third states. A woman may be pregnant or not: she cannot be a little pregnant. This is true, of course, for ‚systems maintenance' as well. Superficial observers will find the same tautology. The theory of autopoietic systems, however, has been invented for a situation in which the theory of open systems has become generally accepted. Given this historical context, the concept of autopoietic closure has to be understood as the recursively closed organization of an open system. It does not return to the old notion of ‚closed [versus open] systems' (Varela, 1979). The problem, then, is to see how autopoietic closure is possible in open systems. The new insight postulates closure as a condition of openness, and in this sense the theory formulates limiting conditions for the possibility of components of the system. Components in general and basic elements in particular can be reproduced only if they have the capacity to link closure and openness. For biological systems this does not require an ‚awareness' of, or knowledge about, the environment. For meaning-based conscious or social systems the autopoietic mode of meaning gives the possibility of ‚re-entry' ‚23) that is, of presenting the difference between system and environment within the system. This re-entered distinction structures the elementary operations of these systems. In social, that is, communicative, systems, the elementary operation of communication comes about by an ‚understanding' distinction between ‚information' and ‚utterance'. Information can refer to the environment of the system. Utterance, which is attributed to an agent as action, is responsible for the autopoietic regeneration of the system itself. In this way information and utterance are forced to cooperate, forced into unity. The emergent level of communication presupposes this synthesis. Without the basic distinction between information and utterance as different kinds of selection, the understanding would be not an aspect of communication, but a simple perception.

Thus, a sufficiently differentiated analysis of communication can show how the recurrent articulation of closure and openness comes about. It is a constitutive necessity of an emergent level of communication. Without a synthesis of three selections - information, utterance and understanding - there would be no communication but simply perception. By this synthesis, the system is forced into looking for possibilities of mediating closure and openness. In other words, communication is an evolutionary potential for building up systems which are able to maintain closure under the condition of openness and openness under the condition of closure. These systems face the continuing necessity to select meanings which satisfy these constraints. The result is our society.

(…)

This may become more clear if we consider the case of social systems. Autopoiesis in this case means ‚to continue to communicate'. This becomes problematic in face of two different thresholds of discouragement. The first tends to stop the process because the communication has not been understood. The second tends to stop the process because the communication has been rejected. These thresholds are related to each other because understanding increases the chances of rejection.25) It is possible to refrain from communication in face of these difficulties, and this is a rather common solution for interaction systems, particularly under modern conditions of highly arbitrary interactions. Society however, the system of all communications, cannot simply capitulate in the face of these problems; it cannot stop all communications at once and decide to avoid any renewal.26) The autopoiesis of society has invented powerful

mechanisms to guarantee its continuity in the face of a lack of understanding or even open rejection. It continues by changing the interactional context or by reflexive communication. The process of communication returns to itself and communicates its own difficulties. It uses a kind of (rather superficial) self-control to become aware of serious misunderstandings, and it has the ability to communicate the rejection and restructure itself around this 'no'. In other words, the process is not obliged to follow the rules of logic. It can contradict itself. The system which uses this technique does not finish its autopoiesis and does not come to an end; it reorganizes itself as conflict to save its autopoiesis. When faced with serious problems of understanding and apparent misunderstandings, social systems very often tend to avoid the burden of argumentation and reasoned discourse to reach consensus - very much to the dismay of Habermas. Rather, they tend to favour the rejection of proposals and to embark on a course of conflict.

However this may be, the communication of contradiction, controversy and conflict seems to function as a kind of immune system of the social system (Luhmann, 1984). It saves autopoiesis by opening new modes of communication outside normal constraints. The law records experiences and rules for behaving under these abnormal conditions and, by some kind of epigenesis, develops norms for everyday behaviour which help to anticipate the conflict and to preadapt to its probable outcome (Luhmann, 1983a). In highly developed society we even find a functionally differentiated legal system which reproduces its own autopoietic unity. It controls the immune system of the larger societal system by a highly specialized synthesis of normative (not-learning) closure and cognitive (learning) openness (Luhmann, 1983b). At the same time, it increases the possibilities of conflict, makes more complex the immune system and limits its consequences. It cannot, of course, exclude conflicts outside the law, which may save the autopoieses of communication at even higher costs.27)

(…)

Notes

1. In German I could use the untranslatable term 'Mitteilung'.
2. The source of this threefold distinction (which also has been usal by Austin and Searle) is Karl Bühler (1934). However, we modiy the reference of this distinction. It refers not to 'functions', and not to types of 'acts', but to selections.
3. This argument, of course, does not limit the analytical powers of an observer, who, however, has to take into account the limitations of the system.
4. For problems of religion, and particularly for problems of 'communication with God' (revelation, prayer, etc.), see Niklas Luhmann (1985).
5. This again is not a motive for action but a self-produced fact of the social system. If nobody is motivated to say anything or to show his intentions, everybody would assume such communications and they would be produced without regard to such a highly improbable psychological environment.
6. See the discussion of 'The Unit of Action Systems' in Parsons (1937: 43 ff), which had a lasting impact on the whole theoretical framework of the later Parsons.
7. To elaborate on this point, of course, we would have to distinguish between 'behaviour' and 'action'. A corresponding concept of 'motive' as a symbolic device facilitating the attribution of action has been used by Max Weber. See also Mills (1940), Burke (1945/1950) and Blum and McHugh (1971).
8. See the distinction between perceiving oneself and transcending oneself made by Hofstadter (1979).
9. The term 'paradox' refers to a logical collapse of a multi-Ievel hierarchy, not to a simple contradiction. See Wilden (1972: 390 ff), Hofstadter (1979), Barel (1979).

10. I do not comment on the possibility of a logical analysis of self-referential systems which bypasses the Gödel limitations and avoids hierarchization.
11. ‘Learning' understood as aspect of autopoiesis, that is, as a change of structure within a closed system (and not as adaptation to a changing environment): see Maturana (1983: 60-71).
12. It is rare that social scientists have a sense for the radicality and the importance of this insight; but see Allport (1940, 1954).
13. This explains that the invention of writing speeds up the evolution of complex societal systems, making it possible to preserve highly diversified structural information. This is, by now, a well explored phenomenon which still lacks a sufficient foundation in theory. See Yates (1966), Ong (1967), Havelock (1982).
14. This is the famous ‘latent pattern maintenance' of Parsons – ‘latent' because the system cannot actualize all its patterns all the time but has to maintain them as largely unused possibilities.
15. Dawkins's term; see Dawkins (1976).
16. See also (for systems) von Foerster (1981) especially p. 263: “The environment contains no information: the environment is as it is.”

(…)

21 See Ebeling (1976), and of course the extensive ‘functionalist' discussion about ‘systems maintenance'.
22. See Jantsch (1981), who prefers the theory of thermodynamic disequilibrium and dissipative structures.
23. In the sense of Spencer Brown (1971). Gotthard Günther makes the same point in stating ‘that these systems of self-reflection with centers of their own could not behave as they do unless they are capable of “drawing a line" between themselves and their environment'. And this leads Günther ‘to the surprising conclusion that parts of the universe have a higher reflective power than the whole of it' (Günther, 1976: 319).

(…)

25. From an evolutionary point of view - see Luhmann (1981).
26. That the physical destruction of the possibility of communication has become possible, and that this destruction can be intended and produced by communication, is another question. In the same sense, life cannot choose to put an end to itself, but conscious systems can decide to kill their own bodies.
27. Recent tendencies to recommend and to domesticate symbolic illegalities as a kind of communication adapted to too high an integration of society and positive law seems to postulate a second kind of immune system on the basis of a revived natural law, of careful choice of topics and highly conscientious practice; see Guggenberger (1983).

(…)

References

Allort, Floyd H. (1940) ‚An Event-System Theory of Collective Action: With Illustrations from Economic and Political Phenomena and the Production of War', Journal of Social Psychology, 11: 417-45.

Allport, Floyd H. (1954) ‚The Structuring of Events: Outline of a General Theory with Applications to Psychology', Psychological Review, 61: 281-303.

Barel, Yves (1979) Le Paradoxe et le Systeme: Essai sur le Fantastique Social. Grenoble: Presses Universitaires.

Blum, Alan F., and Peter McHugh (1971) ‚The Social Ascription of Motives', American Sociological Review, 36: 98-109.

Bühler, Karl (1934) Sprachtheorie: Die Darstellungsfunktion der Sprache. Jena: Fischer.

Bunge, Mario (1979) ‚A Systems Concept of Society: Beyond lndividualism and Holism', Theory and Decision, 10:13-30.
Burke, Kenneth (1945) A Grammar of Motives. Reprinted together with A Rhetoric of Motives (1950). Cleveland, Ohio: World Publishing Company.
Dawkins, R. (1976) The Selfish Gene. New York: Oxford University Press.
Ebeling, Hans (ed.) (1976) Subjektivität und Selbsterhaltung: Beiträge zur Diagnose der Moderne. Frankfurt: Suhrkamp.
Guggenberger, Bernd (1983) ‚An den Grenzen der Verfassung', Frankfurter Allgemeine Zeitung, no. 281, 3 December.
Günther, Gotthard (1976) ‚Cybernetic Ontology and Transjunctional Operations pp. 249-328 (esp. 319) in Gotthard Günther (ed.), Beiträge zur Grundlegung einer operationsfähigen Dialektik, Vol. 1. Hamburg: Meiner.
Günther, Gotthard (1979) ‚Natural Numbers in Trans-classic Systems', pp. 241-64 in Günther, Gotthard (ed.), Beiträge zur Grundlegung einer operationsfähigen Dialektik, Vol. 2. Hamburg: Meiner.
Habermas, Jürgen (1981) Theorie des kommunikativen Handelns. Frankfurt: Suhrkamp.
Havelock, Eric A. (1982) The Literate Revolution in Greece and its Cultural Consequences. Princeton: Princeton University Press.
Hejl, Peter M. (1982) Sozialwissenschaft als Theorie selbstreferentieller Systeme. Frankfurt: Campus.
Hofstadter, Douglas R. (1979) Gödel, Escher, Bach: An Eternal Golden Braid. Hassocks, Sussex: Harvester Press.
Jantsch, Erich (1981) ‚Autopoiesis: A Central Aspect of Dissipative Self-organization', pp. 65-88 in Milan Zeleny (ed.), Autopoiesis: A Theory ofLiving Organization. New York: North Holland.
Luhmann, Niklas (1980) ‚Temporalisierung von Komplexität: Zur Semantik neuzeitlicher Zeitbegriffe', pp. 235-300 in Niklas Luhmann, Gesellschaftsstruktur und Semantik, Vol. 1. Frankfurt: Suhrkamp.
Luhmann, Niklas (1981) ‚The Improbability of Communication', International Social Science Journal, 23(1) 122-32.
Luhmann, Niklas (1982a) ‚The Future Cannot Begin: Temporal Structures in Modern Society', pp. 271-88 in Niklas Luhmann, The Differentiation of Society. New York: Columbia University Press.
Luhmann, NikIas (1982bb) ‚World-time and System History: Interrelations between Temporal Horizons and Social Sructures', pp. 289-323 in The Differentiation of Society. New York: Columbia University Press.
Luhmann, Niklas (1983a) Rechtssoziologie (2nd ed.). Opladen: Westdeutscher Verlag.
Luhmann, Niklas (1983b) ‚Die Einheit des Rechtssystems', Rechtstheorie, 14:129-54.
Luhmann, Niklas (1984) Soziale Systeme: Grundriss einer allgemeinen Theorie. Frankfurt: Suhrkamp.
Luhmann, Niklas (1985) ‚Society, Meaning, Religion - Based on Self-Reference', Sociological Analysis, 46: 5-20.
Malinowski, Bronislaw (1960) ‚The Problem of Meaning in Primitive Language', pp. 296-336 in C. K. Ogden and J. A. Richards (eds), The Meaning of Meaning: A Study of the Influence of Language upon Thought and the Science of Symbolism (10th ed.). London: Roudedge & Kegan Paul.
Markowitz, Jürgen (1979) Die Soziale Situation. Frankfurt: Suhrkamp.
Maturana, Humberto R. (1978) ‚Cognition', pp. 29-49 in Peter M. Hejl et al. (eds), Wahrnehmung und Kommunikation. Frankfurt: Lang.

Maturana, Humberto R. (1980) ‚Man and Society', pp. 11-31 in Frank Benseler, Peter M. Hejl and Wolfram Köck (eds), Autopoiesis, Communication and Society: The Theory of Autopoietic System in the Social Sciences. Frankfurt: Campus.
Maturana, Humberto R. (1981) ‚Autopoiesis', pp. 21-30 in Milan Zeleny (ed.), Autopoiesis: A Theory ofLiving Organization. New York: North Holland.
Maturana, Humberto R. (1983) Reflexionen: Lernen oder ontogenetischer Drift. Delfin II: 60-72.
Mills, C. Wright (1940) ‚Situated Actions and Vocabularies of Motive', American Sociological Review, 5: 904-13.
Münch, Richard (1982) Theorie des Handelns: Zur Rekonstruktion der Beiträge von Talcott Parsons, Emile Durkheim und Max Weber. Frankfurt: Suhrkamp.
Ong, Walter J. (1967) The Presence of the Word: Some Prolegomena for Cultural and Religious History. New Haven, Conn.: Yale University Press.
Parsons, Talcott (1937) The Structure of Social Action. New York: McGraw-Hill.
Spencer Brown, George (1971) Laws of Form (2nd ed.). London: AlIen & Unwin.
Varela, Francisco J. (1979) Principles of Biological Autonomy. New York: North Holland.
von Foerster, Heinz (1981) Observing Systems. Seaside, Cal.: lntersystems Publications.
Wilden, Anthony (1972) System and Structure: Essays in Communication and Exchange. London: Tavistock Press.
Yates, Frances A. (1966) The Art of Memory. London: Routledge & Kegan Paul.

Discussion

A REPLY TO BERNARD SCOTT

Francisco Parra-Luna

It is enough to read the very first sentence of Scott's criticism to realize what is going to follow. Anyone who reads my paper (an honest, even if it is wrong, criticism to SOC), and after reads the following sentence of Bernard Scott, "It is rare to come across an academic paper that seems to be so clearly based on prejudice and singularly lacking in scholarly merit", would realize that there must be some hidden motivation to response in such a tone.

(…).

But it is always interesting to comment on any kind of criticism for several reasons: First, because in this case I want to admit that the explanation I have about the Scott's reaction, implies precisely one application of SOC, since what I did just now is to observe the "observing subject" instead of the "observed object". Therefore, I acknowledge with pleasure (I like to learn) that SOC can play a certain role on the understanding of social phenomena.

The second reason is that this recognition changes very little of my initial criticism to SOC, since what is relevant for me is the "observed system" (in this case my initial paper) and what is important, scientifically speaking, is the validity or non-validity of my paper. On the contrary, it would not be so relevant my personal motivation and circumstances underlying my decision to write the paper in 2007, nor the motivation and circumstances of those who criticized it. Again, what should be relevant is the "observed object", and not so much the "observing subject". In this line, it is also easy to understand that what it is important and decisive, socially speaking, are, f.i., those scientific discoveries such as the gravity law, electricity, penicillin, relativity theory and so on… as "observed systems", but in no way are so important the motivations and personal circumstances of Newton, Faraday, Fleming or Einstein, when as "observing systems" discovered their theories. I consider, therefore, that the latter are secondary aspects in relation with the former, and this is my initial criticism towards SOC. In most researches both FOC and SOC may be complementary, but let me say that I consider much more important FOC (centred on the "observed system") than SOC (centred on the "observing system"). If I say that "A implies B", the important issue is not me as the observer, nor my motivation and circumstances, but the inter-subjective opinion of other observers about this implication and its verification. Science, thus, tends to eliminate the particularities, motivations, and circumstances of the "observing subjects" who could remain only as historical curiosities. This has always been the normal functioning of science, with, or without SOC.

But my main criticism is another one. I am afraid that by centering exclusively on the application of SOC we may complicate unnecessarily the knowledge we are looking for. I have even been surprised to know the solution of SOC when f.i., I asked simply: "if it is true that there are 24 people in the class-room?", because Scott's answer to this simple question seems so inadequate and unnecessarily complicated that it could be a good example of what should never be done, risking also the hypothetical usefulness of SOC in social research. Here is Scott's answer:

."...The participants' in extenso models of the relation 'students in a classroom' must correspond. It must also be the case that the participants' ways of defining concepts in intenso in

terms of other concepts must also correspond in some way. For example, one participant's concept of a 'person in a classroom' may include the criterion that he/she is a full time member of an educational institution. Another participant's concept may be broader, encompassing part-timers or any learner engaged in study activities. The concept of what is a 'classroom' may also differ significantly. One participant may have in mind a particular physical location and temporal interval. Another might have in mind a virtual classroom that exists in 'cyberspace' and might also have in mind a different temporal interval. It is only through conversation and negotiation that the participants may indeed conclude that they are in agreement about a simple 'real fact'.

Imagine, what is necessary to analyze only to answer if it is true that there are 24 people in the room. Scott proceeds like that on the assumption that "statements of facts can always be put into question" and I completely agree. But there are statements and statements, and I do not want to think what would be necessary to make in order to answer a more complicated question, like f.i. the political ideology of these 24 individuals. That is why I am afraid that when we try to apply SOC to other simple but more important fact (let us think, f.i. in the tragedy of 92 young Africans who died in a boat with 102 people when trying to arrive to Europe from Africa), the answer could be equally unnecessarily complicated and maybe endless. Because, applying the Scott's answer to this tragedy the result would go in the double following direction:

First, taking and translating the words of Scott about the 24 people, the answer would be (remember that we only want to know if 92 people died, not other things):

"The participants' in extenso models of the relation 'youngs in a boat' must correspond. It must also be the case that the participants' ways of defining concepts in intenso in terms of other concepts must also correspond in some way. For example, one participant's concept of a 'person in a boat' may include the criterion that he/she is a full time member of people without a job in Africa. Another participant's concept may be broader, encompassing part-timers or any job engaged in doing some activities. The concept of what is a 'boat' may also differ significantly. One participant may have in mind a particular physical location and temporal interval. Another might have in mind a virtual boat that exists in 'cyberspace' and might also have in mind a different temporal interval. It is only through conversation and negotiation that the participants may indeed conclude that they are in agreement about a simple 'real fact'.

It is indeed a strange answer to the simple question of how many people died in the boat.

And second, as SOC is mainly interested in the "observing subject" we should ask as observers what are our personal motivations to know the number of died people, who are we, which are our circumstances, our memory, our knowledge of African history, who is our own family and what are the rest of personal situations, etc., etc. That is to say, we could study in depth and analyze ourselves as "the observing subject" for years and maybe we would suggest to our students to write a PhD before being able to say scientifically that 92 people died. Unfortunately, in the meantime, hundreds of other young African people could continue dying while waiting for a SOC solution to avoid a new tragedy. This is my main problem with SOC since, for me, it's postulates seems to imply some visible ethical contradictions. If I am wrong I certainly will rectify, and even I must say that I indeed would like to rectify as soon as possible, at least in order not to be a "rara avis" in the community of sociocyberneticians. But I need convincing arguments and not precisely those given in this case by B. Scott.

In relation to the ethical contradictions, Scott still writes:

"As von Foerster points out (von Foerster,1992), it is our freedom to choose with respect to undecideables that makes clear the extent to which we are responsible for the realities we construct. Second order cybernetics educates us (L. educare, to lead out) about what it is to be

human. It leads us out of the darkness of ignorance and prejudice into the light of freedom and responsibility"

Therefore, if the realities we construct are those derived from the description of Scott about the 24 people in the class-room, and for logical extension to the 92 dead people on the boat, and after such a complicated analysis, it may happen that we do not know even the exact number of people dead, the question is: What reality have we constructed?.. Which amount of responsibility should we assume if we do not know even the number of people dead?. And Scott still adds unnecessary complications to the subject:

"The goal of SOC is to explain the observer to him/herself and that (paraphrase), "It behoves the observer to enter the domain of his/her own descriptions." In other words, we, as observing systems should acknowledge that we are the kind of systems we are trying to understand."

And still more clear:

"In sociology and anthropology, there is a distinction between first order data collection and systems modelling and second order research where there is a concern with the communication of meaning and where the "verstehen" of Weber plays a central role in informing an observer's hypotheses about the observing systems that are under observation".

That is to say, not a single word about the main fact (the dead persons) as the observed system, not a word about the concrete number of 92 people, not a word about the "real inter-subjective fact" of the tragedy since most of the attention of the research is for the "observing system", for the researcher him/herself, for his/her motivation, predisposition, observing conditions, particular problems, and so on . It would be really difficult to find a higher degree of professional narcissism.

Another interesting misperception of Scott is to assure that I am an "avowed realist". But I must say that not at all. What I consider myself is an "inter-subjective constructor of realities", since it is clear, as I said several times in my paper, that everything we perceive goes first through our individual mind or senses, and that every perception is always unavoidably subjective. But having said that (a truism), I accept the "reality" of things when: a) there is an inter-subjective agreement about the "reality" of any concept; and b) I experiment personally this reality. For instance, when people says that an airplane is, first, a real thing and I agree with it; and second, when I check that I can fly on it, then, and only then, the airplane is a "real thing for me". Only under these two conditions I consider that the airplane is an "objective reality". And in fact, I am so little realist that it may even happen that the airplane does not really exist, but as the propositions about its reality fulfil these two conditions, I conclude, even if provisionally, that the airplane is an objective reality. This is my kind of realism.

Still another misperception of Scott is to criticize me because I differentiate between "Systems" and "Cybernetics" arguing that for the broader cybernetics community are essentially synonymous". I do not think this is true (in any case ¡What a lack of sophistication!), since even Ashby (1956), quoted by Scott, starts his book quoting the father of Cybernetics (Wiener) who defines it as "the science of control and communication in animals and human beings". In any case we all know that science progress, among other things, by the analytical differentiation and subdivision of concepts, and in this sense I repeat what I said in my paper: "Cybernetics, according to its founding fathers, is the part of the system which deals with the control of its efficiency". It is therefore a part of the system, but not the system.

Another weak statement of Scott is to say that I fail to give a clear definition of FOC and SOC. In my view, the difference is quite clear in my paper even if it is not explicit. But in short here it is: FOC focuses on the "observed object" and sees it as an "intersubjective (ob-

jective) reality", while SOC focuses excessively on the "observing subject", and does it at the ethical and epistemological risk of excluding the "intersubjective (objective) reality".

What is a real pity, is that Scott seems not to have arguments against my position, and that is why he hides behind numerous social scientists that support (that is true) some of the postulates of SOC. But following this way of accepting blindly what the others say, and putting aside my humble intellectual capacity, it can be said f.i., that the geocentric theory, supported by most scientists until the XVI century, could still be valid in spite of Copernicus and Galileo. It is correct and logic to ask for the support of prestigious scientists, but the first condition is that one has to show his/her own arguments, and after to quote the support of others. Unfortunately, Scott does only the easy thing: to quote the others, but not the difficult thing: to argue convincingly. I respect very much the authors cited by Scott and even some of the them (Glanville, Glassersfeld ..and others who firmly sustain SOC) collaborate with me in the Encyclopedia of Life Support System of UNESCO, and my best memories are of my relationship with them. I did not agree with their postulates but I was very open to them. When in the 70s I had the opportunity of meeting von Foerster and eating with him in Madrid, I must say that I never met a person so alive, joyful, intelligent, and kind as Heinz von Foerster. In that occasion we were with the late R. Rodriguez Delgado and we kept in our memory the wonderful conversation we had with von Foerster. I do not know how much I would pay today to live again that situation and to be able to ask some questions of Heinz.

What I mean by remembering those joyful moments is that one thing is our personal relations and another thing our theoretical differences, and that we should discuss about the latter as deeply as we can, but never to disqualify the opponent for extra-academic personal motives.

Summarizing, what I sustained in my previous paper and I continue to do, are the following critical propositions:

1. The observer never changes the observed object, since only communication or action could do it; and when the observer is inside the social system, the change would affect only to the observer himself. (therefore, it is already time to stop repeating continually that "the observer changes through his/her observation the observed object".

2. When the observer communicates his/her observation, then the changes in the observed object is either nil or a function of several factors, among them the complexity of the object. (F.i., in the case of the 92 people who died, neither observation, nor communication, nor anything else, could change this number).

3. To say that everything we see is a subjective perception of the real world is a "déjà vu" historical truism, and would be of little use for the scientific improvement of social systems. (it is fully useless to say, and repeat again and again, that the 92 people who died is a "subjective perception" (a "déjà vu"), since the inevitable "inter-subjective perception" of the fact equals the "objective reality", even if provisionally).

4. To refuse the objective perception of reality leads to a refusal of objective perception of a pragmatic operational world, and that may have negative consequences for society.(F.i., as we would be unable to count in the moment the boat arrives –"Scott dixit"- the 92 people who died in it, there would not be such an specific problem about 92 dead people, and consequently we could not even prepare de 92 corresponding coffins; since before, SOC postulates should be applied perhaps by an interdisciplinary team of researchers during a certain time - maybe months or years- in order to fulfil Scott's SOC protocol. Therefore, is this the social use of SOC?)

5. As this kind of rejection implies the impossibility of defining acute social problems, SOC leads to ethic for the rich; that is to say, ethics where unjust situations cannot be tackled since they would not be real objective situations.

(F.i., merchants of poor people between Africa and Europe could apply SOC and argue to the police that before talking of the 92 dead people it is necessary to read and apply the seminal Scott's proposal for counting the number of individuals as in the class-room case. Then, one could ask again: is this the ethic which promotes SOC?)

Or in a more concentrated way:

1. Observation does not change usually the observed system.

2. The excessive emphasize that SOC puts in the "observing system" may avoid to perceive reality as a valid, even if provisionally, "inter-subjective definition of objective reality".

3. This exclusion may lead to practice an ethic which could be negative for society.

And let me add a new "risked" hypothesis:

Since what science has been done during its history, is to eliminate any particular or personal influence of the "observing systems" (the scientists) on the "observed systems" (the discoveries), through the "inter- subjective agreement of scientists",

THERE ARE WOULD BE WELL-FOUNDED GROUNDS TO CONSIDER SECOND ORDER CYBERNETICS BOTH AS AN ANTI-SCIENTIFIC AND AN ANTI PROGRESS INTELLECTUAL MOVEMENT

It would be desirable that Bernard Scott refute these hypotheses under two requirements: first, using only strict scientific or academic arguments; and second, I would prefer that this refutation were mainly done by himself, and not only taking refuge behind what other colleagues have said to written.

A REPLY TO EVA BUCHINGER

By Francisco Parra-Luna

Let me first emphasize the decisive importance of a good communication mainly when there are some disagreements between the transmitter of the message and the receiver of it. It is well known that the first requirement for an useful communication resides in the code that both transmitter and receiver share and use. If the code is not appropriate for whatever cause may be (idiomatic, cultural background, etc.) the messages will not be correctly understood, they may be useless, or even could generate conflict.

Moreover, when we deal with a science like Sociology, which language has not still reached a minimum level of scientific precision, the process of communication among us and with other scientists becomes sometimes difficult. We sociologists are still accustomed to use the literary, common, non- formalized and non-quantified language which many sciences have already overcome. It is not our personal fault, it is rather our traditional philosophical culture and our way of doing Sociology. If, besides, we use a certain "jargon" that too many times obscures the meaning of the message, we really find additional difficulties to progress as a science.

Let us take for example the following quotation presented by Eva Buchinger in her criticism to my paper:

"N. Luhmann ([1986] 1989:24f) introduces the concept resonance to explain observation basically: "An observer who recognizes that an object is a self-referential system notices at the same time that it is constituted tautologously and paradoxically, i.e., is arbitrary and inoperable, unobservable. (…) With the assumption of let us say, a supermodal, observationally dictated distinction of necessary and contingent the observer can eliminate the paradox while providing the observation with an operational object. (…) Our concept of resonance assumes this second-order cybernetics."

I am sure that many of us are asking: what does really this paragraph mean? Of course, there are and can be a lot of interpretations and clarifications about its meaning , but the problem is that we have no a direct access to it and we have to re-interpret what the authors (Luhmann and Buchinger) wanted really to transmit. I respect Luhmann in many aspects of his work and I enjoyed some of the papers presented by Eva in our meetings, but in my opinion the unavoidable "hot air" of the paragraph is not the best way to build a science.

On the other hand, it is first confirmed, that those sciences that progress tend to use a formalized and quantified language full of numerical data for which verification or falsification is possible; and second, it is also confirmed that Sociology is losing influence in some important academic sites like the Faculties or Schools of Economics and Business Administration (at least in Spain) mainly because its language is not appreciated. Let me quote in this moment to Lachenmeyer ("The Language of Sociology"), where in his criticisms to our discipline he maintains that Sociology is not a science because the language it uses is "obscure, imprecise, vague and contradictory"…,

We could say, then, in order to have a fruitful discussion about SOC, that we should try first, to put in a very clear and honest way what we want to say, and second, to replay with the same type of language or code in order to better understand each other.

In relation to this specific criticism, I must recognize that I have some difficulties to understand most of the objections of Eva Buchinger to my paper, maybe because I was not enough clear, and that is why I suggest to fulfill the following principles for a possible continuation of the debate:

1. As my answers to B. Scott could perhaps be valid to answer also some criticisms of Eva Buchinger, I would ask Eva to have a look at these responses to see if some of them clarify, or even dissolve, our initial disagreements.

2. In any case, we should try to use from now on, both of us, very clear statements specially devoted to convince the opponent. Let us, then, revise, our language.

3. To adopt the moral and intellectual commitment that we scientists are always looking for the truth, and therefore it would be a very good exercise to recognize our mistakes, lack of knowledge or weak arguments. It would be in any case the best way to learn and progress.

4. Finally, it would be good to forget any personal previous conflict or disagreement not related with the debate and which should not play any role in it.

I therefore would suggest to my good friend Eva to follow these four points in order not only to have a fruitful debate between us, but also to enjoy it.

Reply to P-L's Reply to My Responses to His Paper

Bernard Scott

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Perhaps the opening sentence of my original response was rather strongly worded and I apologise for that if it is seen as a lack of courtesy on my part. I was reacting to having read a paper where there was criticism of a topic (Second Order Cybernetics - SOC) about which, in my view, the author showed little understanding. Indeed, rather contrarily, the author professes to lack understanding of SOC. This latter has not prevented him arguing against SOC on rnany occasions nor has it dissuaded him from putting his views in writing.

As I read it, P-L's now expanded description of his constructivist approach to ‚what is real' is fully compatible with what second order cybemetics has to say about the making of first order observations. Thus far I see no quarrel between us. P-L's use of the ‚boat' example is thus rather muddled and contradictory. Who decides that facts are so simple that they can be taken as read for all observers? That itseif is a second order question. (I could also point out that P-L's mantra that, „The observer never changes the observed object", does not apply at the quantum level but that, I assume, is taken as understood.)

I can see nothing in what I have said to merit P-L's assertion that, „The excessive emphasize that SOC puts in the „observing system" may avoid to perceive reality as a valid, even if provisionally, „inter-subjective definition of objective reality"."Once there is agreement about that which is pragmatically relevant and ‚real', one may proceed to act. As in the boat example, often this agreement about ‚facts' is made quickly and tacitly but this does not contradict the underlying principle that the ‚real' is a subjective construction. Thus P-L's critique about SOC being an ethic for the rich is a travesty without foundation.

What remains unaddressed by P-L is the explicit making of second order observations, as carried out by a participant observer. As phrased by Gregory Bateson, „One cannot not communicate." One cannot observe by participation without affecting the system observed. My own statements about this process and its complexity can be found in Scott (2008). My view has always been that First Order Cybernetics and SOC are complementary. One cannot do one without doing the other, if only tacitly. It is our research questions that determine what kind of data we collect.

Re the relation between cybemetics and systems theory. lt is not unsophisticated of me to point out that there are different views about the relation between the two disciplines. That these different views exist is common knowledge. As it happens my reading of Ashby is different from that of P-L. Ashby also states that, „Cybemetics is the study of all possible machines." In the same text, his *Introduction to Cybernetics*, he states that, „A machine is a system" and „A system is that which persists." This could then be paraphrased as, „Cybemetics is the study of all possible systems." To be fair to P-L, Ashby does have a qualification to this, namely that, „Cybemetics is primarily interested in systems that are energetically open but closed to information and control, that are ‚information tight"' in other words, there is a great interest in systems that are complex enough to be distinguished as having internal organisations of control and communication and that act to mainatain that organisation (i.e., in more recent terminology, are autopoietic or ‚organisationally closed'). Thus a living system might be considered to be a more interesting machine than a weather system or a system that is energetically closed and open to information control, such as a digital computer and associated networks - but those are moot points.

P-L accuses me of ,,accepting blindly what the others say". This is not the kind of remark one might expect from one scientist to another. Yes, I quote authority figures -I see that as a legitimate part of scientific discourse - but I hope I do not do so blindly. Nor do I accept the charge that I have failed to present cogent arguments. I have repeated here much that I said in my original response to P-L's paper. As far as speaking in my own voice is concerned, I have indude references to several of my scholarly articles both here and in my original reply.

P-L ends by saying:

,,Since what science has been done during its history, is to eliminate any particular or personal influence of the ,,observing systems" (the scientists) on the ,,observed systems" (the discoveries), through the ,,inter- subjective agreement of scientists",

TRERE ARE WOULD BE WELL-FOUNDED GROUNDS TO CONSIDER SECOND ORDER CYBERNETICS BOTH AS AN ANTI-SCIENTIFIC AND AN ANTI PROGRESS INTELECTUAL MOVEMENT."

As noted, I see no quarrel between us about the doing of first order science. SOC, as set out in great detail in Pasks'conversation theory, provides very sophisticated models and understandings of what scientists do. (For an overview of conversation theory, see Scott, 2007). SOC (or, as I would prefer to say, cybemetics in general) provides metadisciplinary metatruths about the nature of ‚truth'. My own views about forms of ‚truth' are set out in some detail in Scott (2000).

P-L refers to the joy experienced when in conversation with Heinz von Foerster, the major explicator of the relations between FOC and SOC. Let us indeed agree that, ,,One thing is our personal relations and another thing our theoretical differences."

References

Scott, B. (2000). ,,Cybemetic explanation and development", *Kybernetes*, 29, 7/8, pp. 966-994.

Scott, B. (2007). ,,The cybemetics of Gordon Pask", in *Gordon Pask, Philosopher Mechanic: An Jntroduction to The Cybernetician's Cybernetician*, R. Glanville and K.H. Müller (eds.). edition echoraum, WISDOM, Vienna, pp. 29-52.

Scott, B. (2008). ,,Observing selves and others: outline of a methodology." *Proceedings of the 19th European Meeting on Cybernetics and Systems Research*, University of Vienna, March 2008, pp. 630-635.

Reply to the reply

Eva Buchinger

I appreciate fruitful, scholarly discussions and accordingly I appreciate this discussion. Since I am quite sorry that Francisco Parra-Luna has had reason to summarize in his reply to my comment on his paper that he has had "some difficulties to understand most of the objections", I repeat the core of my argumentation very briefly:

(i) The question presented in the title of Francisco Parra-Luna's paper - „Is it possible to use second-order cybernetics as a technological device in sociological research?" - is a relevant one.

(ii) Nevertheless, my impression is that Francisco Parra-Luna misinterprets some of the basic rationales of the concept second order cybernetics (SOC). Whereas he criticises the observer-focus of SOC and diagnoses a tendency "towards an unavoidable narcissistic perspective instead towards the definition of the object", SOC representatives have been emphasizing dependency and embeddedness.