The Autopoiesis of Social Systems

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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, 1932; 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 self-reproduction. ln 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, organizations, interactions) as different kinds of autopoietic systems (see Figure 1).

FIGURE 1

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 kind of 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 produces 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 turbo charger 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.

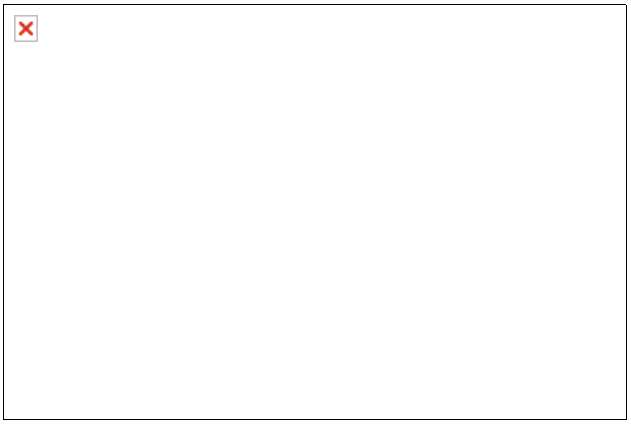
Autopoietic systems, then, are sovereign with respect to the constitution of identities and differences. They do not create a material world of their own. They presuppose other levels of reality. Human life, for example, presupposes the small scope of temperature in which water exists as a liquid. But whatever they use as identities and as differences is of their own making. 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 utterance(1) 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 produces 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 something 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 cen 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 case 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 he negated. Further communication can very well separate



pieces of information, utterances and understandings and discuss them separately, 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 favored 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. lt 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

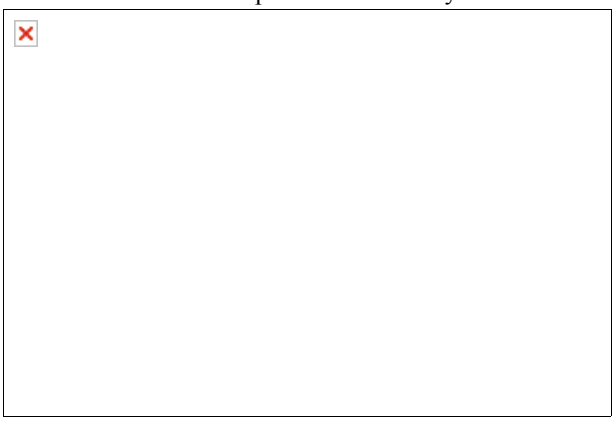
Social systems, then, are recursively closed systems with respect to communication. However, there are two different meanings of 'closure' which make it possible to distinguish between societies and interactions as different types of social systems. Societies are encompassing systems in the sense that they include 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 includes 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 communications 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 cen 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 unpredictability. 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 vanish 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. (12) 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 only 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, and 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 possibilities. 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 instability. 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)
If autopoiesis bases itself on events, a description of the system needs not just one, but two dichotomies: the dichotomy of system and environment, and the dichotomy of event and situation. (17) Both dichotomies are 'world' formulas: system-plus-environment is one way, and event-plus-situation is another way, to describe the world. If the system (or its observer) uses the event/situation dichotomy, it can see the difference between system and environment as the structure of the situation, the situation containing not only the system, but also its environment from the point of view of an event. Processing information by producing events-in-situations, the system can orient itself to the difference of internal and external relevancies. As the horizon (Husserl) of events, the situation refers to the system, to the environment and to its difference - but it does all this selectively, using the limited possibilities to produce the next event as a guideline. (18) Thus, the double dichotomy describes the way in which the system performs the 're-entry' of the difference between system and environment into the system. On the other hand, the difference between system and environment structures

the limitation of choice which is needed to enable the system to proceed from one event-in-situation to another event-in-situation.

Systems based on events need a more complex pattern of time. For them, time cannot be given as an irreversibility alone. Events are happenings which make a difference between a 'before' and a 'thereafter'. They can be identified and observed, anticipated and remembered only as such a difference. Their identity is their difference. Their presence is a co-presence of the before and the thereafter. They have, therefore, to present time within time and to reconstruct temporality in terms of a shifting presence which has its quality as presence only owing to the double horizons of past and future which accompany the presence on its way into the future. (19) On this basis conscious time-binding can develop. (20) The duality of horizons doubles as soon as we think of a future present or a past present, both of which have their own future and their own past. The temporal structure of time repeats itself within itself, and only this reflexivity makes it possible to renounce a stable and enduring presence (Luhmann, 1982a). By a slow process of evolution, the semantics of time has adapted to these conditions. For a long time it used a religious reservation - aeternitas, aevum, or the co-presence of God with all times - to avoid the complete historization of time. Only modern society recognizes itself - and consequently all previous societies - as constituting its own temporality (Luhmann, 1980). The structural differentiation of society as an autonomous autopoietic system requires the co-evolution of corresponding temporal structures with modern historicism as the well-known result.

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 tho 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.

In addition, the concept of autopoietic closure makes it possible to understand the function of enforced binary choices. The system can continue its autopoiesis or it can stop it. It can continue to live, to produce conscious states or to

communicate, or it can choose the only alternative: to come to an end. (24) There are no third states. This is a powerful technical simplification. On the other hand, the system lacks any self-transcending power. It cannot enact operations from the outer world. A social system can only communicate. A living system can only live. Its autopoiesis as seen by an observer may have a causal impact on its environment. Bul autopoiesis is production in the strict sense of a process which needs further causes, not produced by itself, to attain its effect. The binary structure of autopoiesis seems to compensate for this lack of totality. It substitutes this kind of 'internal totality'. To be or not to be, to continue the autopoiesis or not, serves as an internal representation of the totality of possibilities. Everything which can happen is reduced for the system to one of these two states. The system emerges by inventing this choice, which does not exist without it. The negative value is a value not of the world but of the system. But it helps to simplify the totality of all conditions to one decisive question of how to produce the next system state, the next element, the next communication under the constraints of a given situation. Even unaware of the outer world, the living system 'knows' that it is still alive and chooses its operations in using life for reproducing life. A communicative system too can continue to communicate on the base of the ongoing communication. This requires no reliable knowledge about outside conditions but simply the distinction between system and environment as seen from the point of view of the system. The unity of the autopoietic system is the recursive processing of this difference of continuing or not which reproduces the difference as a condition of its own continuity. Every step has its own selectivity in choosing autopoiesis instead of stopping it. This is not a question of preference, nor a question of goal attainment. Rather, it has to be conceived as a 'code' of existence, if code is taken as an artificial duplication of possibilities with the consequence that every element can be presented as a selection.

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 lo 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 lo 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, 1993b). 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 autopoiesis of communication at even higher costs. (27)

The Epistemological Consequences of Autopoietic Closure

A final point of importance remains: the epistemological consequences of autopoietic closure. This problem also has to be discussed with respect to the present situation of scientific evolution in which the theory of autopoietic systems seems to offer advantages.

For many decades, scientific research has no longer operated under the guidance of an undoubted orthodoxy - be it a theory of cognition or a theory of science in particular. The universally accepted expedient is 'pragmatism'; the results are the only criteria of truth and progressive knowledge. This is clearly a self-referential, circular argument, based on a denial of circularity in theory and on its acceptance in practice. The avoidance of circularity becomes an increasingly desperate stance - a paradox which seems to indicate that the condemned solution, the paradox itself, is on the verge of becoming accepted theory.

One way to cope with this ambiguous situation is to test whether methodologies have the capacity to survive the coming scientific revolution. Functional analysis is one of them. It can be applied to all problems, including the problem of paradox, circularity, undecidability, logical incompleteness, etc. Stating such conditions as a problem of functional analysis invites one to look for feasible solutions, for strategies of de-paradoxization, of hierarchization (in the sense of

the theory of types), of unfolding, of asymmetrization and so on. Functional analysis, in other words, reformulates the constitutive paradox as a 'solved problem' (which is and is not a problem) and then proceeds to compare problem solutions. (28)

In addition to this kind of preadaptation in scientific evolution to an expected change of the paradigm of the theory of cognition itself, the theory of autopoietic systems constructs the decisive argument. It is a theory of self-referential systems, to be applied to 'observing systems' as well - 'observing systems' in the double sense that Heinz von Foerster (1981) used when he chose the phrase as the title of a collection of his essays. The theory distinguishes autopoiesis and observation, but it accepts the fact that observing systems themselves are autopoietic (at least, living) systems. Observation comes about only as an operation of autopoietic systems, be it life, consciousness or communication. If an autopoietic system observes autopoietic systems, it finds itself constrained by the conditions of autopoietic self-reproduction (again, respectively, life, consciousness and communication, e.g., language), and it includes itself in the fields of its objects, because as an autopoietic system observing autopoietic systems, it cannot avoid gaining information about itself.

In this way, the theory of autopoietic systems integrates two separate developments of recent epistemological discussion. It uses a 'natural' or even 'material' epistemology, clearly distinct from all transcendental aspirations (Quine, 1969) - transcendentalisrn being in fact a title for the analysis of the autopoietic operations of conscious systems. In addition, it takes into account the special epistemological problems of universal or 'global' theories, referring to a class of objects to which they themselves belong. (29) Universal theories, logic being one of them, have the important advantage of seeing and comparing themselves with other objects of the same type. In the case of logic, this would require a many-valued structure and the corresponding abstraction. Classical logic did not eliminate self-reference, but it did not have enough space for its reflection. "The very fact that the traditional logic, in its capacity of a place value structure, contains only itself as a subsystem points to the specific and restricted role which reflection plays in the Aristotelian formalism. In order to become a useful theory of reflection a logic has to encompass other sub-systems besides itself," (Günther, 1976: 310; emphasis added). Only under this condition does functional analysis become useful as a technique of self-exploration of universal theories.

The usual objection can be formulated, following Nigel Howard, as the 'existential axiom': knowing the theory of one's own behaviour releases one from its constraints (Howard, 1971: pp. xx, 2ff. and passim). For an empirical theory of cognition, this is an empirical question. The freedom, gained by self-reflection, can be used only if its constraints are sufficiently close at hand. Otherwise the autopoietic system simply will not know what to do next. It may know, for example, that it operates under the spell of an 'Oedipus complex' or a 'Marxist' obsession, but it does not know what else it can do.

A 'new epistemology' will have to pay attention to at least two fundamental distinctions: the distinction between autopoiesis and observation on the one hand, and the distinction between external observation and internal observation (self-observation) on the other. To combine these two distinctions is one of the unsolved tasks of systems theory.

Autopoiesis is the recursive production of the elements by the elements of the system. Observation, being itself an autopoietic operation, applies a distinction and indicates which side is used as a basis of further operations (including the operation of 'crossing' and indicating the other side). Self-observation is a special case of observation because it excludes other observers. Only the system can self-observe itself; others are by definition external observers. Therefore self-observation does not and cannot use criteria. It cannot choose between different perspectives. (30) It observes what it observes, and (31) can only change its fucus and the distinction it applies. It is always sure about itself. External observers, on the other hand, are always a plurality. They have to presuppose other observers. They can observe other observers and other observations. They can compare their observations with others. They can be seduced into a reflexive observing of observations, and they need criteria when different observations yield different results. (32)

Classical epistemology looks for a set of conditions under which external observations yield identical results. It does not include self-observation (the 'subjective' or 'transcendental' approach, meaning only that these conditions can be found by introspection). This excludes, however, societies as observed and as observing systems. For within societies all observations of the society are self-observations. Societies cannot deny the fact that the observation itself is an element of the system which is observed. It is possible to differentiate subsystems within the societal system, giving them the special function of 'observing society'. This still implies self-observation, because the subsystem can only operate within the society. It can look at its social environment, at political, economic, legal and religious affairs, but this observation itself (1) is part of the autopoiesis of the societal system and (2) becomes self-observation as soon as it tries to observe and control its epistemology. Somehow, a 'Third Position' (Braten, 1984) would be required, one which contains the possibility of shifting between external observation and self-observation and of defining rules which tackle the paradox of being at the same time inside and outside of the system. It is within this context that universal theories become relevant. They are designated for external observation but are generalized in a way that includes the observing system as well. The rules and methodologies of universal theories may become the nucleus from which the development of a truly social epistemology can start. At least, they provide a field of experience in which we are logically forced to oscillate between external observation and self-observation.

We may leave as an unresolved question whether this kind of argument can generate not only sociological (33) but also

biological (Maturana, 1978) and psychological (Campbell, 1970, 1974, 1975) epistemologies. This depends, last bot not least, upon the possibility of applying the concept of self-observation not only to social systems and conscious systems, but also to living systems. In any case, advances in substantial theory may have side-effects on the theories which are supposed to control the research. Until the eighteenth century these problems were assigned to religion - the social system specialized for tackling paradoxes. (34) We have retained this possibility, but the normalization of paradoxes in modern art and modern science seems to indicate our desire eventually to get along without religion (Dupuy, 1982: 162ff). Apparently, our society offers the choice of trusting religion or working off our own paradoxes without becoming aware that this is religion.

Notes

1. In German I could use the untranslatable term 'Mitteilung'.

2. The source of this threefold distinction (which also has been used by Austin and Searle) is Karl Bühler (1934). However, we modify 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 (1973: 43ff.), which had a lasting impact on the whole theoretical framework of the later Parsons.

7. To elaborate on this point, f 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 my Max Weber. See also Mills (1940), Burke (1945/50) and Blum and McHugh (1979).
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-level 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 scientist 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".

17. Using this theoretical framework, it is not permitted to speak of 'environment of events, of actions, etc.', or to speak of 'situations of a system'.

18. See Markowitz (1979) for further elaborations using the method of phenomenological psychology.

19. One of the best analyses of this complicated temporal structure remains Husserl (1928). For social systems see Bergmann (1981).

20. See Korzybski (1949). From an evolutionary point of view, see Stebbins (1982: 363 ff.).

21 See Ebeling (1976), and of course the extensive 'functionalist' discussion about 'systems maintenance'.

22. See Jantsch (198l), 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-refection 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).

24. 'End' in this theory, therefore, is not 'telos' in the sense of the perfect state, but just the contrary: the zero-state, which has to be avoided by reproduced imperfect and improbable states. In a very fundamental way the theory has an anti-Aristotelian drift.

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 its, but conscious system 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).

28. In a way, the problem remains a problem by 'over solving' it, by inventing several solutions which are of unequal value and differ in their appropriateness according
to varying circumstances. This gives us, by a functional analysis of functional analysis, an example of how deparadoxization can proceed. The happy pragmatist, on the other hand, would be content with stating that a problem becomes a problem only by seeing a solution; see Laudan (1977).

29. See Hooker (1975: 152-79). Many examples: the theory of sublimation may itself be a sublimation. Physical research uses physical processes. The theory of the Self has to take into account that the theorist himself is a Self (a healthy Self, a divided Self). For this last example see Holland (1977).

30. See, for the special case of conscious autopoietic systems (i. e. not for social systems!), Shoemaker (1963, 1968)

31. It can, of course, distinguish between self-observation and external observation, and it can observe external observation focusing on itself.

32. Not, of course, when different observations choose different objects; and the classical epistemology does not give useful criteria for the case in which different observations use different distinctions.

33. For a case study, using this mode controlled self-reference, see Cole and Zuckerrnann (1975).

34 See the impasse as formulated by Bishop Huet: "Mais lors que l'Entendement en vue de cette Idée forme un jugement de l'objet extérieur, d'ou cette Idée est partie, il ne peut
pas savoir très certainement et très clairement si ce jugement convient avec l'objet extérieur; et c'est dans cette convenance que consiste la Verité, comme je l'ai dit. De sorte qu'encore qu'il connoisse la Verité, il ne sçait pas qu'il connoit, il ne peut ètre assuré de l'avoir connue" (Huet, 1723: 180).

References

Allport, 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 Paradox et le Systèm: Essai sur le Fantastique Social. Grenoble: Presses Universitaires.

Bergmann, Werner (1981) Die Zeitstrukturen sozialer Systeme: Eine systemtheoretische Analyse. Berlin: Duncker und Humblot.

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

Braten, Stein (1984) 'The Third Position - Beyond Artificial and Autopoietic Reduction', Kybernetes, 13:157-63.

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

Bunge, Mario (1979) 'A Systems Concept of Society: Beyond Individualism and Holism', Theory and Decision, 10:13-30.

Burke, Kenneth (1954) A Grammar of Motives. Reprinted together with A Rhetoric of Motives (1950). Cleveland, Ohio: World Publishing Company.

Campbell, Donald T. (1970) 'Natural Selection as an Epistemological Model', pp. 51-85 in Raoul Naroll and Ronald Cohen (eds.), A Handbook of Method in Cultural Anthropology. Garden City, NY: Natural History Press.

Campbell, Donald T. (1974) 'Evolutionary Epistemology', pp. 413-65 in Raul A. Schilpp (ed.), The Philosophy of Karl Popper. Las Salle, IL. Open Court Publications.

Campbell, Donald T. (1975) 'On the Conflicts between Biological and Social Evolution and between Psychological and Moral Tradition'. American Psychologist, 30:1103-26.

Cole, Jonathon R. and Harriet Zuckerman (1975) 'The Emergence of a Scientific Specialty. The Self-exemplifying Case of the Sociology of Science', pp. 139-74 in Lewis A. Coser (ed.), The Idea of Social Structure: Papers in Honor of Robert K. Merton. New York: Harcourt, Brace, Jovanovich.

Dawkins, R. (1976) The Selfish Gene. New York: Oxford University Press.

Dupuy, Jean-Pierre (1982) Ordres et désordres: Enquète sur un nouveau paradigme. Paris: Seul.

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 Gotthard Günther (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.

Holland, Ray (1977) Self and Social Context. New York: St. Martin's Press.

Hooker, C. A. (1975) 'On Global Theories', Philosophy of Science. 42:152-79.

Howard, Nigel (1971) Paradoxes of Rationality: Theory of Metagames and Political Behaviour. Cambridge, Mass.: MIT Press.

Huet, Pierre Daniel (1723) Traité Philosophique de la Faiblesse de l'Esprit Humain. Amsterdam: Du Sauzet.

Husserl, Edmund (1928) 'Vorlesungen zur Phänomenologie des inneren Zeitbewusstseins', Jahrbuch für Philosophie und phänomenologische Forschung, 9:367-496.

Jantsch, Erich (1981) 'Autopoiesis: A Central Aspect of Dissipative Self-organization', pp. 65-88 in Milan Zeleny (ed.), Autopoiesis: A Theory of Living Organization. New York: North Holland.

Korzybski, Alfred (1949) Science and Sanity: An Introduction to Non-Aristotelian Systems and General Semantics, (3rd reprint ed.). Lakeville, Conn.: Institute of General Semantics.

Laudan, Larry (1977) Progress and its Problem: Toward a Theory of Scientific Growth. London: Routledge & Kegan Paul.

Luhmann, Niklas (1980) 'Temporalisierung von Komplexität: Zur Semantik neuzeitlicher Zeitbegriffe', pp. 235-300 in Niklas Luhmann, Gesellschaftsstruktur und Semantik, Vol. I. 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: Colombia University Press.

Luhmann, Niklas (1982b) 'World Time and System History: Interrelations between Temporal Horizons and Social Structures', 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: Routledge & 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 Systems in the Social Sciences. Frankfurt: Campus.

Maturana, Humberto R (1981) 'Autopoiesis', pp. 21-30 in Milan Zeleny (ed.), Autopoiesis: A Theory of Living 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 and 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.

Schoemaker, Sidney (1963) Self-Knowledge and Self-Identity. Ithaca, NY: Cornell University Press.

Schoemaker, Sidney (1968) 'Self-Reference and Self-Awareness', Journal of Philosophy, 65:555-67.

Spencer Brown, George (1971) Laws of Form (2nd ed.). London: Allen & Unwin.

Stebbins, G. Ledyard (1982) Darwin to DNA, Molecules to Humanity. San Francisco: Freeman.

Varela, Francisco J. (1979) Principles of Biological Autonomy. New York: North Holland.

von Foerster, Heinz (1981) Observing Systems. Seaside, CA.: Intersystems Publications.

Wilden, Antony (1972) System and Structure: Essays in Communication and Exchange. London: Tavistock Press.

Yates, Frances A. (1966) The Art of Memory. London: Routledge & Kegan Paul.