

Structuration Theory and Self-Organization

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Social systems theory is dominated by a reductionistic individualism and a dualistic functionalism. Especially the latter does not, adequately integrate the human being. In order to avoid dualism, mechanistic determinism, and reductionism, a dialectical concept of social systems that is based on the notion of self-organization seems necessary. In order to establish a dialectical theory of social self-organization it is appropriate to integrate aspects of Anthony Giddens' structuration theory. Giddens acknowledges the importance of knowledgeable human actors in society and argues that structures are the medium and outcome of actions (theorem of the duality of structure). Structures both enable and constrain social actions. This idea corresponds to saying that social systems are re-creative, i.e., self-organizing social systems. Re-creativity is based on the creative activities of human beings. Social structures exist in and through the productive practices and relationships of human actors. The term evolution can be employed in a nonfunctionalist way that acknowledges the importance of knowledgeable human actors in social systems by conceiving the historical development of society based on a dialectic of chance and necessity and the principle of order through fluctuation in situations of instability and bifurcation. All self-organizing systems are information-generating systems. Giddens' concept of storage mechanisms that allow time-space distanciation of social relationships helps to describe the relationship of information and self-organization in social systems.

KEY WORDS: social self-organization; Anthony Giddens; structuration theory; re-creativity; emergence.

1. INTRODUCTION: SELF-ORGANIZATION THEORY

The aim of this paper is to point out that Anthony Giddens' theory of structuration fits well into the framework of a theory of social self-organization that stresses the role of human actors as creative beings. To do so, first an introduction to the sciences of complexity is given (Section 1), then it is shown that dualistic conceptions of society have some major errors (Section 2), and aspects are outlined

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that show the close conceptual relationship of structuration theory and a dialectical theory of social self-organization in terms of re-creation (Section 3), human history (Section 4), and the relationship of information and self-organization (Section 5). The sciences of complexity and the theory of self-organization suggest a dialectic of chance and necessity in the natural and social world as well as a dialectical relationship of human beings and society. The dominating line in social systems theory is that of Niklas Luhmann, which does not consistently explain the self-organization of society and, especially, is trapped in a dualism of human beings and social structures.

The theory of self-organization has led to a change of scientific paradigms: from the Newtonian paradigm to the approaches of complexity. There is a shift from predictability to nonpredictability; from order and stability to instability, chaos, and dynamics; from certainty and determination to risk, ambiguity, and uncertainty; from the control and steering to the self-organization of systems; from linearity to complexity and multidimensional causality; from reductionism to emergentism; from being to becoming; and from fragmentation to interdisciplinarity. This has been interpreted as a shift from modern to postmodern knowledge (Best and Kellner, 1997) and from nonclassical to postnonclassical science (Stepin, 1999).

The social sciences are still dominated by the Newtonian paradigm (Wallerstein, 1991): methodologically systematic and precise empirical investigations followed by inductive generalizations dominate instead of ascending from the abstract to the concrete; traditionally the social sciences have been fragmented into anthropology, economics, political science, and sociology; there is a lack of inter- and cross-disciplinarity. Still, social scientists' main concern is to discover universal rules that fully explain individual and social actions and that make it possible to plan and predict the development of society. Such views do not take into account the dialectics of generality and concreteness and of chance and necessity that are suggested by the sciences of complexity. A further flaw of classical approaches within the social sciences has been that human history has been conceived as inevitably progressive. Personally I think that during phases of instability and crises we find points at which the further development of history is not determined, but relatively open. Such points show up again and again, but it is not determined what the outcome will look like (Fuchs, 2002a).

In physics and chemistry, self-organization has been described as the spontaneous emergence of order out of chaos in thermodynamical systems (Nicolis and Prigogine, 1989; Prigogine, 1980). Similarly to Prigogine, Hermann Haken (1978, 1983) has described aspects of physical self-organization, but in terms of synergetic systems which can be characterized by synergies between their parts that result in the emergence of new qualities. In biology, self-organization has been conceived as the autopoietic self-reproduction of living systems (Maturana and Varela, 1992).

Concerning causality, the new sciences suggest a shift from reductionism and determinism to emergence and mutual as well as circular causality. Reductionism can be defined as epistemology that explains new properties of a system and the whole in terms of old properties and the system's parts. A system is seen as the agglomeration of its parts; a differentiation of a system, its structure, and its behavior in time and space are explained by reference to processes immanent to single parts of the system. Determinism can be defined as a mechanistic and rigid epistemological approach that argues that an event or a sum of events necessarily results in a certain way and in a certain output. In the social sciences, deterministic theories argue that a certain social system, subsystem, or category determines other events or systems necessarily and to a full extent. No autonomy or degree of freedom is granted to the category that is considered as the one being determined by a determining instance.

Phenomena in one system are completely reduced to events in other systems. Determinism argues that causes and effects can be mapped linearly—each cause has one and only one effect, similar causes have similar effects, different causes have different effects—and it assumes that small changes of causes necessarily have small effects and large changes of causes necessarily have large effects.

Emergentism, which can be considered as the philosophical level of the new sciences of complexity (see Corning, 2001; Goldstein, 1999; Krohn and Küppers, 1992; Stephan, 1999), argues, in opposition to reductionism, that the new and the whole are more than the old and the parts (of a system). A system is considered to be more than the sum of its parts. The qualities that result from temporal and spatial differentiation of a system are not reduced to the properties of the components of the system; it is maintained that the interactions between the components result in new properties of the system that cannot be fully predicted and cannot be found in the qualities of the components. Checkland (1981, p. 314) defines an emergent quality in similar terms “as a whole entity which derives from its component activities and their structure, but cannot be reduced to them.”

Self-organizing systems have a complex and circular causality. In such systems, causes and effects cannot be mapped linearly: similar causes can have different effects and different causes similar effects; small changes of causes can have large effects, whereas large changes can also result in only small effects (but, nonetheless, it can also be the case that small causes have small effects and large causes large effects). Thinking in terms of complexity and nonlinearity is opposed to determinism, which has dominated the sciences for a long time. In systems theory, the term “complexity” has three levels of meaning: (1) there is self-organization and emergence in complex systems (Edmonds, 1999); (2) complex systems are not organized centrally, but in a distributed manner—there are many connections between the system's parts (Kauffman, 1993; Edmonds, 1999); and (3) it is difficult to model complex systems and to predict their behavior even if

one knows to a large extent the parts of such systems and the connections between the parts (Heylighen, 1996, 1997; Edmonds, 1999). The complexity of a system depends on the number of its elements and the connections between the elements (the system's structure). According to this assumption, Kauffman (1993) defines complexity as the "number of conflicting constraints" in a system, Heylighen (1996) says that complexity can be characterized by a lack of symmetry (symmetry breaking), which means that "no part or aspect of a complex entity can provide sufficient information to actually or statistically predict the properties of the others parts," and Edmonds (1996) defines complexity as "that property of a language expression which makes it difficult to formulate its overall behaviour, even when given almost complete information about its atomic components and their interrelations." Aspects of complexity are things, people, number of elements, number of relations, nonlinearity, broken symmetry, nonholonic constraints, hierarchy, and emergence (Flood and Carson, 1993).

Not only does one find complex and multidimensional causality in self-organizing systems, but also such systems are, by definition, circular causal. Circular causality involves a number of processes p_1, p_2, \dots, p_n ($n \geq 1$), and p_1 results in p_2 , p_2 in p_3 , \dots , p_{n-1} in p_n , and p_n in p_1 . A simple example of this has been described by Manfred Eigen in what he calls a hypercycle (Eigen and Schuster, 1979): a hypercycle is a catalytic circuit of autocatalytic processes. Autocatalysis means a chemical process where a product is the catalyst of its own synthesis; a chemical product produces itself. In a hypercycle each process produces itself and the first produces the second, the second the third, \dots and the last produces the first. Eigen describes the emergence of life as a hypercycle of protein molecules and nucleic acid molecules. Speaking philosophically, it can be said that all self-organizing systems are circular causal because such a system is reason and cause of itself. It is not in need of other concepts to be explained; it is its own reason (*causa sui*); its essence involves its own existence. Friedrich Wilhelm Schelling pointed out early on that the whole universe and nature have their reality in themselves and are their own products. The evolution of the universe has its own reason; such arguments do not have to refer to some God-like, external creator, a mover that is not moved himself. Self-organization theory shows that materialism and atheism are right; the substance of the world is the permanent movement and self-organization of matter (Fuchs, 2002f).

The new sciences of complexity do not simply substitute determinism with complete indeterminism and do not suggest that all evolutionary processes (in the universe, nature, and society) are completely governed by chance (this would also have to result in a dismissal of the human capability of intervention and systems design that can increase the possibility that a system will develop in a desirable way). Rather it suggests a dialectic of chance and necessity: there are certain aspects of the behavior of a complex system that are determined and can be described by general laws, whereas others are governed by the principle of chance.

2. NIKLAS LUHMANN: DUALISTIC SOCIAL SELF-ORGANIZATION

One of the central themes in Anthony Giddens' works has been the opposition to one-sided solutions of the problem of how social structures and actions are related, which, e.g., can be found in functionalism, structuralism, and methodological individualism (see Giddens, 1981, pp. 15–20, 44, 53f, 64–68, 171, 215, 1984, pp. 1 ff, 6, 26, 207–221). Functionalism would try to study social systems synchronically in a sort of timeless snapshot, but in reality a social system would only exist in and through its reproduction in time; it would also be unable to see human beings as reasoning, knowledgeable agents with practical consciousness and would argue that society and institutions have needs and fulfill certain function.² This would sometimes result in views of a subjectless history which is driven by forces outside the actors' existence of which they are wholly unaware. The reproduction of society would be seen as something happening with mechanical inevitability through processes of which social actors are ignorant. Functionalism and structuralism would both tend to express a naturalistic and objectivistic standpoint and emphasize the preeminence of the social whole over its individual, human parts.

Hermeneutics and interpretative sociology would see the material world and constraints as something outside the subjective experience; there is not much talk about structural concepts and constraints, and quite frequently sociality is reduced to individuality. As one example of subjectivism that he is critical of, Giddens (1984, p. 220) mentions methodological individualism: "The methodological individualists are wrong in so far as they claim that social categories can be reduced to descriptions in terms of individual predicates." Giddens (1981, p. 64)³ wants

²As Giddens acknowledges, Marx was quite critical of the neglect of human subjects in functionalist thought. "*History does nothing*; it "possesses *no* immense wealth"; it "*wages no* battles." It is *man*, real, living man who does all that, who possesses and fights; "*history*" is not, as it were, a person apart, using man as a means to achieve *its own* aims; history is *nothing but* the activity of man pursuing his aims" (Marx and Engels 1844, p. 98). Nonetheless, Giddens argues that Marx quite frequently argued in a functionalist manner. As we will show, there are two tendencies in the works of Marx: a functionalist one and one that acknowledges a dialectic of freedom and necessity which adequately incorporates the important role of human beings in the world. One should not refute Marxism as a whole, but functionalist interpretations of Marxism, and one should accentuate the dialectical thought immanent in Marx's works that can help to overcome the dualistic tradition of Western science.

³Also during the 1970s and 1980s, Pierre Bourdieu developed a theory of society that is in some respects very similar to that of Giddens (for a discussion of Bourdieu's theory within the framework of a theory of social self-organisation see Fuchs [2002b]). His declared aim has also been to bridge the chasm between subjectivity/objectivity, society/individual, structures/action, and consciousness/unconsciousness. To do so, he has introduced the dialectical concept of the habitus that mediates between objective structures and subjective, practical aspects of existence. The habitus secures conditioned and conditional freedom; it is a structured and structuring structure that mediates the dialectical relationship of the individual and society. For Bourdieu, in the social world we find dialectical relationships of objective structures and the cognitive/motivational structures, of objectification

to avoid “the twin pitfalls of objectivism and subjectivism in explaining social reproduction.” “If interpretative sociologies are founded, as it were, upon an imperialism of the subject, functionalism and structuralism propose an imperialism of the social object. One of my principal ambitions in the formulation of structuration theory is to put an end to each of these empire-building endeavours” (Giddens, 1984, p. 2). For Giddens (1984, p. 26), both approaches are illegitimate forms of reduction. He considers the human being neither a determined object nor an unambiguously free subject. “All human action is carried on by knowledgeable agents who both construct the social world through their action, but yet whose action is also conditioned and constrained by the very world of their creation” (Giddens, 1981, p. 54).

Bridging strict oppositions and avoiding dualistic conceptions is one of the main aims of Giddens’ theory of structuration. Giddens has not commented much on Niklas Luhmann’s theory of self-reference, but much of what he says about functionalism is also true for Luhmann’s conception of society. This is especially the case for Luhmann’s neglect of human, knowledgeable agents. In his main work, *The Constitution of Society*. Giddens (1984) refers to Luhmann as one of the representatives of neo-Parsonianism whose work is sophisticated and important but, nonetheless, an example of the failures of functionalism. One of Giddens’ declared aims is to refute functionalism.

Society is a complex, self-organizing system. This suggests that the foundational problem of sociology, how structures and actions as well as society and the human being are related, should not be resolved in a determinist manner. As shown by Giddens, pure structuralistic conceptions which argue that social systems can be explained as the influence of social structures on actions and thinking, as well as pure action-based conceptions that explain social systems as the differentiation of structures that result from human actions, do not take into account this complex nature of society. The problem of how structures and actions are related is resolved in favor of either one of the both categories, whereas the thinking in terms of complex and multidimensional causality that is put forward by the new

and embodiment, of incorporation of externalities and externalization of internalities, of diversity and homogeneity, of society and the individual, and of chance and necessity. The habitus is medium and outcome of the social world; social structures only give orientation and limits to habitus’ operations of invention; they enable and constrain the creative dimension of the habitus. Bourdieu’s (1990, p. 140) suggestion that the habitus is a property “for which and through which there is a social world” means that the habitus is medium and outcome of the social world and that social structures can only exist in and through practices. Such formulations very much remind us of Giddens’ (1979, p. 69) main hypothesis, that “the structural properties of social systems are both the medium and the outcome of the practices that constitute those systems.” Although Bourdieu’s theory might be considered a more “structuralistic” conception than Giddens’, the similarities concerning aims and certain theoretical contents are very striking. To work out the exact similarities and differences between the two approaches, and how a synthesis could be achieved within the framework of a theory of social self-organization, is a challenging task for future work.

science of self-organization suggests a dialectic of structures and actions, (social) system and human being. Niklas Luhmann is the main sociological representative of the new sciences of complexity. He failed to incorporate adequately the conceptual apparatus supplied by the philosophical implications of self-organization theory that could help to overcome dual oppositions and dualistic conceptions in the social sciences. Luhmann (1984) conceives society in functional terms, applies Maturana's and Varela's autopoiesis concept sociologically, and sees society as a self-referential system with communications as its elements. He says that a system can only differentiate itself if it refers to itself and its elements. It generates a description of itself and a difference between system and environment. Self-observation means that a system/environment difference is introduced into the system. All social systems can observe themselves.

Luhmann argues that individuals are (re)produced biologically, not permanently by the social systems. If one wants to consider a social system as autopoietic or self-referential, the permanent (re)production of the elements by the system is a necessary condition. Hence Luhmann says that not individuals, but communications are the elements of a social system. A communication results in a further communication; by the permanent (re)production of communications a social systems can maintain and reproduce itself. "Social systems use communications as their particular mode of autopoietic reproduction. Their elements are communication which are recursively produced and reproduced by a network of communications and which cannot exist outside such a network" (Luhmann, 1988, p. 174). For Luhmann, human beings are sensors in the environment of the system. He says that the "old European humanistic tradition" conceives humans within, and not on the outside of, social systems. Systems theory would have no use for the subject, and the human being could not be the measure/standard of society. Luhmann stresses (communicative) processes instead of human beings.

He resolves the sociological problem of how social systems and human actors are related dualistically; this results in inconsistencies and theoretical lacks. He cannot explain how one communication can exactly produce other communications without individuals being part of the system: "There is no significant attempt to show how societal communication . . . emerges from the interactions of the human beings who ultimately underpin it. Without human activity there would be no communication. . . . It is one thing to say analytically that communications generate communications, but operationally they require people to undertake specific actions and make specific choices. . . . One communication may stimulate another, but surely it does not *produce* or *generate* it" (Mingers, 1995, p. 149f). Beermann (1991, p. 251) says that one could think of a social system as basal self-referential if there is not a self-reference of communications, but the reference of actions to persons. An autopoietic conception of society must show consistently that and how society produces its elements itself. Beyerle (1994, p. 137f) criticizes Luhmann for not showing how communications are produced. Luhmann only mentions that

communications *result* in further communications. he can explain that society is self-referential in the sense that one communication is linked to others, but he cannot explain that it is self-producing or autopoietic.

Luhmann does not conceive society as a dialectic process of social structures and human actors as suggested by Giddens' theory of structuration as well as the philosophical implications of the new sciences of complexity. He states that he is opposed to traditional Western science, but just as is frequently done in the dominating line of the Western worldview (see Jantsch, 1975), he solves the tension between opposites one-sidedly, not in terms of a unity or synthesis of the opposites.

3. STRUCTURATION THEORY AND RE-CREATIVE SOCIAL SYSTEMS

For Giddens (1984, p. 25) social structures do not exist outside of actions; they are "rules and resources, or sets of transformation relations, organised as properties of social systems." Structuration theory holds that the rules and resources drawn upon in the production and reproduction of social action are at the same time the means of system reproduction (p. 19). In this respect, human social activities are recursive because they are continually recreated by the actors whereby the latter express themselves as actors. In and through their activities agents reproduce the conditions that make these activities possible (p. 2). "According to the notion of the duality of structure, the structural properties of social systems are both medium and outcome of the practices they recursively organise" (p. 25) and they both enable and constrain actions (p. 26).

Rules of social life can be regarded as techniques or generalizable procedures applied in the enactment and reproduction of social practices. Those rules which have to do with the reproduction of institutionalized practices are the ones most important for sociology. Giddens defines the characteristics of these rules as intensive vs shallow, tacit vs discursive, informal vs formalized, weakly vs strongly sanctioned. Signification, domination, and legitimation are the three structural dimensions of social systems in the theory of structuration. Domination would depend upon the mobilization of the two types of resources: "Allocative resources refer to capabilities—or, more accurately, to forms of transformative capacity—generating command over objects, goods or material phenomena. Authoritative resources refer to types of transformative capacity generating command over persons or actors" (Giddens, 1984, p. 33). Allocative resources involve material features of the environment, means of material production and reproduction, and produced goods, whereas authoritative resources involve the organization of social time-space (temporal-spatial constitution of paths and regions), the production/reproduction of the body (organization and relation of human beings in mutual association), and the organization of life chances (constitution of chances of self-development and self-expression) (Giddens, 1984, p. 258, 1981, p. 51f).

The continuity of social reproduction is based on the duality of structure and, with it, on the reflexive monitoring of social activity by the agents. Intentional activities are necessary for social reproduction, but not all consequences of their actions can be foreseen by the actors, i.e., there are also unintended and unexpected aspects of human activity. A social system for Giddens has to do with continuity of social activities across time–space. That is why he defines it as “reproduced relations between actors or collectivities, organised as regular social practices” (Giddens, 1984, p. 25). Social systems involve social relationships reproduced across time and space; structures are moments recursively involved in the (re)production of social systems (Giddens, 1981, p. 26).

Ordinary life is possible by ontological security, which is based on the routinization of actions and is made to happen by the actors’ reflexive monitoring of their actions (Giddens, 1984, pp. 60–64). Actors are situated and positioned in space–time (pp. 83–92), i.e., they have social identities that carry with them certain prerogatives and obligations. Such identities are, e.g., age and sex. The positioning of actors within certain social frameworks and with respect to rules allows the routinization of actions. Institutions are the more enduring features of social life, i.e., “practices which ‘stretch’ over long time–space distances in the reproduction of social systems” (Giddens, 1981, p. 28). Giddens says that symbolic orders, forms of discourse, and legal institutions are concerned with the constitution of rules, political institutions deal with authoritative resources, and economic institutions are concerned with allocative resources. For Giddens, the reproduction of society is based on human practices (see Giddens, 1984, pp. 26–28, 375f). Actors reflexively monitor their actions, i.e., human behavior has an intentional and purposive character. But there are also unintended consequences of actions which, by way of causal feedback loops, form unacknowledged conditions of further actions. Giddens calls this type of reproduction homeostatic loops. Another type is reflexive self-regulation, which are causal loops that have a feedback effect in system reproduction, where that feedback is substantially influenced by knowledge which agents have. Social reproduction also has to do with a reciprocity of practices between actors or collectives. If these actors are copresent, Giddens speaks of social integration; if this reciprocity is maintained across extended time–space, he speaks of system integration.

In structuration theory, society is considered a social system where structural principles serve to produce a clustering of institutions across time and space, an association between the social system and a specific locale or territory can be found, normative elements exist that help to lay claim to the legitimate occupation of the locale, and there is some sort of common identity among the member of the society which does not necessarily involve a value consensus (Giddens, 1984, p. 164f).

I suggest that integrating aspects of the theory of structuration into a theory of social self-organization can help to avoid the dualistic shortcomings and the neglect

of the human subject that still dominates conceptions of social self-organization. Conceptual affinities between Giddens' theory and the philosophical assumptions of self-organization theory as outlined in Section 1 are quite obvious: Giddens is describing society in terms of mutual and circular causality and he is critical of reductionism. He has understood that conceptions that place a totality above its moments, reduce the totality to its moments, or conceive of the relationship of a totality and its moments as a dualistic one do not help in describing complex systems adequately. The concept of the duality of structure grasps the dialectical and complex nature of society and overcomes the structure/actor dichotomy that has long dominated the social sciences and that in systems theory has especially been sustained by Niklas Luhmann. That theories of self-organization and structuration theory are conceptually close has meanwhile sometimes been acknowledged (Mingers, 1995, 1996, 1999; Küppers, 1999). Both Giddens and concepts of self-organization "place the production and reproduction of systems at the center of their theories, in particular the idea that systems can be recursively self-producing" (Mingers, 1995, p. 136). Mingers (1999) says that the theories of Maturana and Giddens are highly compatible: "Maturana's natural social systems are Giddens' institutions within the social system, and Maturana's social organization is Giddens' structure. Both envisage similar closed relations between the two—for Giddens, system interaction reproduces social structure which enables interaction; for Maturana, system interaction constitutes social organization which selects interaction" (Mingers, 1996, p. 477).

If one compares Giddens' conception of social systems to Maturana's (1980, 1987), one will find many advances of the former. Whereas for Maturana society is just a structural network of interactions that results in consensual domains, Giddens explicates what structures are (you will not find rules and resources in Maturana's view of social systems) and relates structures and actions dialectically in order to avoid the shortcomings of functionalism, structuralism, and pure action theory. Giddens' achievement is the introduction of a dialectic of structures and actions into contemporary sociology. Mingers (1996) too says that Giddens gives a more detailed picture of social organizations than Maturana because there are not just networks of interactions, but also practices, rules, and resources. On the other hand, he suggests that Maturana's concept of structural coupling and his explanation of the biological foundations for language and social interaction could usefully support structuration theory.

Günter Kueppers (1999) argues that uncertainty is the driving power of social dynamics which forces individuals to reduce it by producing rules of interactions. By cooperation and communication, local interactions would produce global structures which regulate uncertainty and are emerging patterns of interaction. The global structures would regulate uncertainty and thereby influence local interactions and the reproduction of local interactions. In this process of social self-organization, global structures would emerge from local interactions by circular

causality. Küppers acknowledges that such a circular causality between social interactions and social structures can be found in the works of Anthony Giddens, but his own conception of social self-organization shows some faults that Giddens has frequently criticized as shortcomings of functionalism. Küppers speaks of circular causality and a reduction of uncertainty but does not mention that structures *enable and constrain* social interaction. Uncertainty seems to be a category that has an independent existence outside of human actions; Küppers speaks of certain functions that uncertainty fulfills and does not see that uncertainty is a phenomenon arising from social actions that only exist through and within social relationships. In line with functionalist conceptions of society, Küppers argues that the structural properties of society (in his conception a set of rules concerning economic exchange, sanctions in hierarchies, and solidarity in groups) exist outside local interactions as external principles on a macro level. It is Giddens' merit to have shown that such dualistic conceptions do not adequately reflect the importance of reasoning, knowledgeable agents in society and the fact that structures only exist within and through human practices. Nonetheless, Küppers' conception is important because it shows that circular causality and emergence play an important role in the self-reproduction of social systems.

Saying that social self-organization means the self-reproduction of a social system, one must specify what is being reproduced. Applying the idea of self-(re)production to society means that one must explain how society produces its elements permanently. By saying that the elements are communications and not individuals as Luhmann does, one cannot explain self-reproduction consistently because not communications, but human actors produce communications. One major problem of applying autopoiesis to society is that one cannot consider the individuals as components of a social system if the latter is autopoietic. "If human beings are taken as the components of social systems, then it is clear that they are not produced by such systems but by other physical, biological processes" (Mingers, 1995, p. 124). Applying autopoiesis to society nonetheless will result in subjectless theories such as the one of Luhmann that cannot adequately explain how individuals (re)produce social structures and how their sociality is (re)produced by these structures. Another alternative would be to argue that society can reproduce itself by the biological reproduction of the individuals. There have been some conceptions that have tried to describe the reproduction and autopoiesis of certain social systems such as the family in biological as well as sociological terms: "The components within the family (the family boundary) are produced through the family interactions. . . . Sons are transformed into fathers, fathers into grandfathers, mothers and fathers produce sons and daughters. . . . To become the 'head of the family' is an internal social production. . . . Men and women biologically produce children" (Zeleny and Hufford, 1992). Here, biological and social processes are confused and biological mechanisms are interpreted as fundamental sociological concepts; the *differentia specifica* of society is lost in such theories (even more

by the fact and Zeleny and Hufford continue their argument by saying that all autopoietic systems are social systems). Attempts to describe the reproduction of society and social systems should be located within the social domain. Society does not produce individuals biologically because this is mainly a biological, not a social, process of reproduction.

Neither assuming that society is a self-referential communication system nor describing society in terms of biological reproduction provides us with an adequate idea of how the self-reproduction of society takes place. Society can only be explained consistently as self-reproducing if one argues that man is a social being and has central importance in the reproduction process. Society reproduces man as a social being and man produces society by socially coordinating human actions. Man is the creator and created result of society; society and humans produce each other mutually. Such a conception of social self-organization acknowledges the importance of human actors in social systems and is closely related to Giddens' duality of structure. Saying that man is the creator and created result of society corresponds to Giddens' formulation that, in and through their activities, agents reproduce the conditions that make these activities possible (Giddens, 1984, p. 2).

The human being is a social, self-conscious, creative, reflective, cultural, symbols- and language-using, active natural, laboring, producing, objective, corporeal, living, real, sensuous, anticipating, visionary, imaginative, designing, cooperative, wishful, hopeful being that makes its own history and can strive toward freedom and autonomy (Fuchs, 2002g, h; Fuchs and Schlemm, 2002; Fuchs *et al.*, 2002).

Marx (1858/1859, p. 8) wrote, "In the social production of their existence, men inevitably enter into definite relations, which are independent of their will." For economic relationships this is surely true. But there are also social relationships such as cultural ones where humans often can choose whether or not they want to enter them. For example, I cannot choose if I want to enter a labor relationship because I have to earn a living, but I can choose which political party I want to belong to and which cultural relationships I want to enter. So one can say that concerning the totality of society, individuals enter social relationships that are partly independent of and partly dependent on their will. By social actions, social structures are constituted and differentiated. The structure of society or a social system is made up by the total of normative behavior. By social interaction, new qualities and structures can emerge that cannot be reduced to the individual level. This is a process of bottom-up emergence that is called agency. Emergence in this context means the appearance of at least one new systemic quality that cannot be reduced to the elements of the systems. So this quality is irreducible and it is also to a certain extent unpredictable, i.e., the time, form, and result of the process of emergence cannot be fully forecast by taking a look at the elements and their interactions. Social structures also influence individual actions and thinking. They constrain and enable actions. This is a process of top-down emergence where new

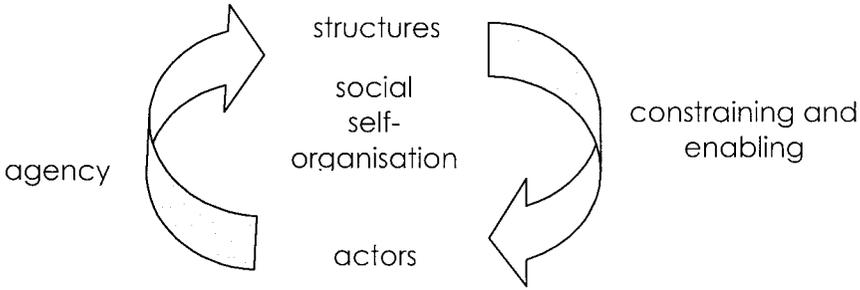


Fig. 1. The self-organization/re-creation of social systems.

individual and group properties can emerge. The whole cycle is the basic process of systemic social self-organization, which can also be called re-creation because, by permanent processes of agency and constraining/enabling, a social system can maintain and reproduce itself (see Fig. 1). It again and again creates its own unity and maintains itself. Social structures enable and constrain social actions as well as individuality and are a result of social actions (which are a correlation of mutual individuality that results in sociality).

Re-creation denotes that individuals that are parts of a social system permanently change their environment. This enables the social system to change, maintain, adapt, and reproduce itself. What is important is that the term re-creation also refers to the ability of humans to consciously shape and create social systems and structures, an ability that is based on self-consciousness and, in Giddens' terminology, the reflexive monitoring of action. As Erich Jantsch, (1979, p. 305) says, social systems are re-creative ones because they can create new reality; the sociocultural human being has the ability to create the conditions for his further evolution all by himself (p. 343). Creativity means the ability to create something new that seems desirable and helps to achieve defined goals. Man can create images of the future and actively strive to make these images become social reality. Individuals can anticipate possible future states of the world, society as it could be or as one would like it to become; and they can act according to these anticipations. Man has ideals, visions, dreams, hopes, and expectations which are based on the ability of imagination, which helps him to go beyond existing society and to create alternatives for future actions. Based on creativity, man designs society (see Banathy, 1996): design is a future-creating human activity that goes beyond facticity, creates visions of a desirable future, and looks for a solution to existing problems. Design creates new knowledge and findings. Man designs machines, tools, theories, social systems, physical entities, nature, organizations, etc. within social processes. Such an understanding of design as a fundamental human capability takes into account man's ability to have visions and utopias and to actively shape society according to these anticipated (possible) states of the world. It is opposed to an understanding

of design as a hierarchical process and as the expert-led generation of knowledge about the world and solutions to problems. As Ernst Bloch (1986) pointed out, desires, wishes, anxieties, hopes, fantasies, and imaginations play an important role in society and hence one should also stress the subjective, creative dimension in the constitution of human and social experience. Bloch has shown that hopes and utopias are fundamental motives in all human actions and thinking. These are also important differences between animals and humans.

Terming the self-organization of society re-creation acknowledges, as outlined by Giddens, the importance of the human being as a reasonable and knowledgeable actor in social theory. Giddens (1984, p. 2) himself has stressed that the duality of structure has to do with re-creation: "Human social activities, like some self-reproducing items in nature, are recursive. That is to say, they are not brought into being by social actors but continually *recreated* by them via the very means whereby they express themselves as actors." Saying that society is a re-creative or self-organizing system the way we do corresponds to the notion of the duality of structure because the structural properties of social systems are both the medium and the outcome of the practices they recursively organize and both enable and constrain actions.

By differentiating between homeostatic loops and reflexive self-regulation as two types of social reproduction, Giddens shows that circular causality and feedback loops are important for describing society. These are concepts that again show the close connection of the theory of structuration with philosophical and conceptual notions put forward by the theory of self-organization. Furthermore, these conceptions show that there are both intended and unintended consequences of human actions, which both are fundamental for the reproduction of a social system. Actors have a certain knowledge of society which helps them in achieving goals and guaranteeing their survival in the social world. This knowledgeability is a fundamental precondition for the creativity of actors which makes possible the overall re-creation of society. But as Giddens shows, this overall reproduction depends also on unintended consequences of human actions. Human actions are neither unconscious bearers and executioners of structures nor fully rational actors that can plan all aspects of social life (see Fuchs, 2003). Social systems and their reproduction involve conscious, creative, intentional, planned activities as well as unconscious, unintentional, and unplanned consequences of activities. Both together are aspects, conditions as well as outcomes of the overall re-creation/self-reproduction of social systems.

Giddens has frequently stated that functionalist thought argues that certain institutions, structures, or systems work or function in certain ways. These entities are often described in analogy to organisms and the descriptions often convey the impression that structural entities work as autonomous agents or even subjects. It is true that the reproduction of society only takes place within and through human social activities; hence when I speak of the *self*-organization of a social system, I

do not mean that social systems or structures are autonomous actors or subjects of social change. Structures do not act, they only exist within and through social actions, and the term *social self-organization* refers to the dialectical relationship of structures and actions which results in the overall reproduction of the system. The creativity and knowledgeability of actors are at the core of this process and secure the re-creation of social systems within and through self-conscious, creative activities of human actors. A social system and its structures do not exist outside of human activities, structures are the medium and outcome of actions, and this recursive relationship is essential for the overall re-creation/self-reproduction of society. The term *self-organization* refers to the role of the self-conscious, creative, reflective, and knowledgeable human beings in the reproduction of social systems. Durkheim's social facts have sometimes been interpreted as emergent properties of society because he says that social structures are different from individual consciousness and do not belong to the parts of society. Giddens (1984, pp. 169–174) is very critical of the notion of emergence because Durkheim's implicit usage of the term conveys the impression that structures exist outside of and external to actions. Giddens furthermore says that Durkheim seems to argue that human actors are separated and come together *ex nihilo* to form a new entity. I have mentioned that emergence is an important notion in self-organization theory and that social structures and individual ideas and actions are properties of social systems that result from bottom-up and top-down emergence. Emergence in society refers to the fact that social reproduction takes place by the constitution of new social and individual properties that cannot be reduced to prior existing properties. This does not mean that emergent properties exist outside of or external to social activities; in fact emergent social properties in a structural sense are the medium and outcome of social activities that can only exist due to the complex interactions of human beings and cannot be reduced to single actions or actors. Social emergence is due to the productive synergies that occur in the relationships between individual human actors and the relationships between collective actors (organizations). In top-down processes, there is the emergence of new aspects of actions and consciousness that is made possible by the enabling and constraining synergetic effects of social structures. These newly emerging properties cannot be reduced to single structural entities.

I have argued that Giddens' duality of structure as well as the notion of the re-creation of society suggests a *dialectical* relationship of structures and actors. One should clarify why exactly this is a dialectical relationship. Georg Wilhelm Friedrich Hegel has outlined that the purpose of dialectics is "to study things in their own being and movement and thus to demonstrate the finitude of the partial categories of understanding" (Hegel, 1874, note to Section 81). The dialectical method "serves to show that every abstract proposition of understanding, taken precisely as it is given, naturally veers round its opposite" (Hegel, 1874). The negative constitutes the genuine dialectical moment (Hegel, 1874, Section

68); “opposites [...] contain contradiction in so far as they are, in the same respect, negatively related to one another or *sublate each other* and are *indifferent* to one another” (Section 960) Opposites, therefore, contain contradiction insofar as they are, in the same respect, negatively related to one another or *sublate each other* and are *indifferent* to one another. But the negative is just as much positive (Section 62). The result of Dialectic is positive; it has a definite content as the negation of certain specific propositions which are contained in the result (Section 82).

An entity that exists in the world as pure being is an identity, an abstract empty being. Being is dialectically opposed to Nothing; the unity of the two is Becoming. In Becoming, Being and Nothing collapse and are absorbed in a unity. This unity as a result is Being Determinate, which can be characterized by quality and reality. Quality is Being-for-Another because in determinate being there is an element of negation involved that is at first wrapped up and only comes to the front in Being-for-Self. Something is only what it is in its relationship to another, but by the negation of the negation this something incorporates the other into itself. The dialectical movement involves two moments that negate each other, a somewhat and an other. As a result of the negation of the negation, “some becomes other, and this other is itself a somewhat, which then as such changes likewise, and so on ad infinitum” (Hegel, 1874, Section 94). “Something becomes an other; this other is itself somewhat; therefore it likewise becomes an other, and so on ad infinitum” (Section 93). Being-for-Self or the negation of the negation means that somewhat becomes an other, but this again is a new somewhat that is opposed to an other and as a synthesis results again in an other, and therefore it follows that something in its passage into other only joins with itself; it is *self-related* (Section 95). In becoming there are two moments (Hegel, 1812, Sections 176–179), coming-to-be and ceasing-to-be: by sublation, i.e., negation of the negation, being passes over into nothing, it ceases to be, but something new shows up, is coming to be. What is sublated (*aufgehoben*), on the one hand, ceases to be and is put to an end, but on the other hand, it is preserved and maintained (Section 185).

In society, structures and actors are two opposing, contradictory moments: a structure is a somewhat opposed to an other, i.e., actors; and an actor is also a somewhat opposed to an other, i.e., structures. The Becoming of society is its permanent dialectical movement, the re-creation or self-reproduction of society. The Being-for-Self or negation of the negation in society means that something social becomes an other social, which is again a social somewhat, and it likewise becomes an other social, and so on ad infinitum. Something social refers to aspects of a social system such as structures or actions; in the dialectical movement these two social moments in their passage become an other social moment and therefore join with themselves—they are self-related. The permanent collapse and fusion of the relationship of structures and actors result in new, *emergent* properties or

qualities of society that cannot be reduced to the underlying moments. In the recreation process of society, there is coming-to-be of new structural and individual properties and ceasing-to-be of certain old properties. “Becoming is an unstable unrest which settles into a stable result” (Hegel, 1812, Section 180). Such stable results are the emergent properties of society that are constituted by the dialectical process termed duality of structure by Giddens. With respect to Hegel, the term *social self-organization* also gains meaning in the sense that by the dialectical process, where structures are the medium and outcome of social actions, a social somewhat is self-related or self-referential in the sense of joining with itself or producing itself. By dialectical movement, social categories opposing each other (structures and actions) produce new social categories. A social something is opposed to a social other, and by sublation they both fuse into a unity with emergent social properties that again produces an opposition. So this unity is again a social somewhat opposed to a social other, etc. By coming-to-be and ceasing-to-be of social entities, new social entities are produced in the dialectical social process.

To explain the *Science of Logic* and dialectical movement, Herbert Marcuse, in the more prominent of his two detailed Hegel studies,⁴ refers to the relationship of structures and (individual) actors as an example of dialectics in the social realm. For Hegel, all being “must even transgress the bounds of its own particularity and put itself into universal relation with other things. The human being, to take an instance, finds his proper identity only in those relations that are in effect the negation of his isolated particularity—in his membership in a group or social class whose institutions, organisation, and values determine his very individuality. The truth of the individual transcends his particularity and finds a totality of conflicting relations which his individuality fulfils itself” (Marcuse, 1941, p. 124).

Human beings are social beings; they enter social relationships which are mutually dependent actions that make sense for the acting subjects. Individual being is only possible as social being; social being (the species-life of man) is only possible as a relationship of individual existences. This dialectic of individual and social being (which roughly corresponds to that of actors and structures) has also

⁴*Reason and Revolution* was published in 1941, when Marcuse had already fled to the United States. His first Hegel study, “Hegel’s Ontologie und die Theorie der Geschichtlichkeit” [Hegel’s Ontology and Theory of Historicity], should have been his habilitation thesis, but in 1933 Marcuse had to flee from Germany due to his Jewish origin and political background. The use of the term historicity in the title shows that this first Hegel study was heavily influenced by the thinking of Martin Heidegger. The second Hegel study does not contain any reference to Heidegger because Marcuse turned away from Heidegger’s influence in the early 1930s and was deeply disappointed by Heidegger’s active participation in National Socialism. *Reason and Revolution* was the first Hegel study of its kind published in the United States and introduced Hegel’s thinking to a lot of American scientists.

been pointed out by Marx (1844, p. 538f): “The individual *is the social being*. His manifestations of life—even if they may not appear in the direct form of communal manifestations of life carried out in association with others—are therefore an expression and confirmation of *social life*. Man’s individual and species-life are not *different*, however much—and this is inevitable—the mode of existence of the individual is a more *particular* or more general mode of the life of the species, or the life of the species is a more *particular* or more general individual life.” Marx said one must avoid postulating society again as an abstraction vis-à-vis the individual as, e.g., today individual/society dualism does. “Man, much as he may therefore be a *particular* individual (and it is precisely his particularity which makes him an individual, and a real *individual* social being), is just as much the *totality*—the ideal totality—the subjective existence of imagined and experienced society for itself; just as he exists also in the real world both as awareness and real enjoyment of social existence, and as a totality of human manifestation of life” (Marx, 1844, p. 538f). Saying that man is the creator and created result of society as well as Giddens’ formulation that, in and through their activities, agents reproduce the conditions that make these activities possible, corresponds to Marx’s (1844, p. 537) formulation that “the social character is the general character of the whole movement: just as society itself produces man as man, so is society produced by him.”

For Hegel, dialectical categories are moments within totalities and are themselves totalities. All concrete categories are formed by more abstract ones and are themselves abstract ones forming more concrete ones. This means that the dialectical logic involves the ascending from the abstract to the concrete as also outlined by Marx (1857/1858) in the introduction to the *Grundrisse*. Hegel (1874, Section 86) also pointed out himself that “the logical Idea is seen to unfold itself in a process from the abstract to the concrete” and that what “philosophy has to do with is always something concrete in the highest sense present” (Section 94). For a dialectical social theory this means that speaking about the dialectical relationship of structures and actions only in a very general sense, without ascending toward concreteness, is not sufficient because the endless dialectical movement where some becomes other, and this other is itself a somewhat, which then as such changes likewise, and so on ad infinitum, ultimately results in more concrete social relationships such as the antagonistic ones constituting modern, capitalist society. So the abstract level outlined here only describes society in a very general sense, whereas social analysis is also in need of additional levels of analysis such as relationships of production and political and cultural relationships as a further distinction on the most abstract level as well as on all other levels of description, the level of concrete social formations such as capitalism and the level of the modes of development, i.e., phases of a social formation (for the dialectics of society see also Fuchs and Schlemm, 2002).

4. EVOLUTION AND SELF-ORGANIZATION

Anthony Giddens (1984, Chap. 5)⁵ opposes evolutionary theories of society because he says that almost all of them are based upon some notion of adaptation, in which societies adapt to the material conditions of the environment (Giddens, 1981, pp. 20–22) and where adaptation would be conceived in almost-mechanical fashion (p. 82). Societies would not “adapt” because it would be their conscious, knowledgeable human members that influence social and historical change. Evolutionary theories would conceive change as endogenous change and “unfolding” models.

Giddens writes that evolutionary theories are based on stage conceptions of history, in which one type of society would supplant another.⁶ For him such models cannot explain the simultaneous existence of different types of society, therefore he speaks of episodes as processes of social change that have a definite direction and form and in which structural transformations occur and of time–space edges as forms of contact between different types of society which are edges of potential or actual social transformation (Giddens, 1981, pp. 23, 82f, 1984, pp. 244–256). The structural transformations included in episodes would not have mechanical inevitability. History would not be a “world-growth story” (Giddens, 1984, p. 237); it could be defined as “the structuration of events in time and space through the continual interplay of agency and structure: the interconnection of the mundane nature of day-to-day life with institutional forms stretching over immense spans of time and space” (p. 362f). Conjunctures understood as interaction of influences which, in a particular time and place, have relevance to a given episode would play an important role in social change (Giddens, 1984, p. 251). Similar results could have quite different causes.⁷ For Giddens (1981, p. 167), there are no universal laws in society independent from time–space; all such laws would be historical ones and history would be open to human self-transformation. Giddens is rather opposed to sociological generalization and says that there are no universal laws in society and that one should not speak of laws in the social sciences. But this

⁵Giddens (1984, p. 239ff) summarizes his criticism of evolutionism in four points: unilinear compression, homological compression, normative illusion, and temporal distortion.

⁶Only certain Marxist theories describe historical development as one in clear-cut stages and as a “world-growth story.” Giddens does not acknowledge that Marx himself was quite critically of such assumptions and that in Marxist theory uneven time–space development has been considered by authors such as Ernst Bloch. Marx (1867, p. 391) wrote, e.g., in the *Capital* that “epochs in the history of society are no more separated from each other by hard and fast lines of demarcation, than are geological epochs.” Ernst Bloch (1963, 1975) showed that presence is a mixture of past, now, and future and he speaks of asynchronism and nonconcurrence of geological, astronomic, natural, and human-historic time.

⁷“The conjuncture of circumstances in which one process of development occurs may be quite different from that of another, even if their ‘outcomes’ . . . are similar” (Giddens, 1984, p. 251).

also would not mean that everything happens due to pure accident; he says that the actors' reason in the context of a mesh of intended and unintended consequences of action plays an important role concerning causality in the social sciences (Giddens, 1984, pp. 343–347).

Time–space–distanciation achieved by storage mechanisms of allocative and authoritative resources would be an important general mechanism of social and historical change. For Giddens, due to human knowledgeability there are no dominant continuities over human history as a whole. He suggests what he calls a discontinuist interpretation of *modern* history: “According to this perspective, the emergence of modern capitalism does not represent the high point (thus far) of a progressive scheme of social development, but rather the coming of a type of society radically distinct from all prior forms of social order. . . . [In Western Capitalism] there has occurred a series of changes of extraordinary magnitude when compared with any other phases of human history” (Giddens, 1985, p. 31ff).

Giddens says that Historical Materialism is a determinist conception of history because it would believe—as typical for evolutionary theories—in an automatically progressive development from Asiatic society, ancient society, feudalism, capitalism to (finally) communism. “Marx never abandoned the idea that a progressive evolutionary process can be traced out from the initial dissolution of tribal society to the developments which bring humankind to the threshold of socialism” (Giddens, 1981, p. 76; see also pp. 235f and 240 and Giddens, 1977, pp. 188, 192–202). Evolutionary theories would be highly prone to merge progression with progress (Giddens, 1984, p. 232).

Marx argued that economical changes in the forces of production are a medium of social change. Giddens says that class struggle and the dialectic of productive forces and relations of production are important in social transformations of capitalism, but not in overall history, because in other types of society political power would have been a more important influence than economic power.

The ideology of modernity has, since the Enlightenment, been coined by a belief in linear progress and history as progress (see Fuchs, 2002d). Giddens rightfully criticizes deterministic conceptions of history and social change, and it is true that there are certain formulations by Marx and Engels that, without careful consideration, could make one believe that their conception of history is a deterministic one. For example, Marx says that “the Asiatic, ancient, feudal and modern bourgeois modes of production may be designated as epochs marking progress in the economic development of society”; that the “bourgeois mode of production is the last antagonistic form of the social process of production” (Marx, 1858/1859, p. 9); and that “capitalist production begets, with the inexorability of a law of Nature, its own negation” (Marx, 1867, p. 791). Engels argued that “with the same certainty with which we can develop from given mathematical principles a new mathematical proposition, with the same certainty we can deduce

from the existing economic relations and the principles of political economy the imminence of social revolution” (Engels, 1845, p. 555) and that revolution and socialism would result with inevitable necessity from the existing conditions of society (Engels, 1850, p. 242). Nonetheless, I, contrary to Giddens, think that Marx’s and Engels’ conception of history is not a deterministic one because they frequently stressed the role of revolutionary action in history. But if history depends on agency and the subject, it cannot be a linear, but only a discontinuous, broken process that is, though conditioned, relatively open and does not automatically result in progress. Marx, e.g., stresses that “the greatest productive power is the revolutionary class itself” (Marx, 1846/1847, p. 181), that all social life is essentially practical, and that the coincidence of the changing of circumstances and of human activity or self-changing can be conceived and rationally understood only as *revolutionary practice* (Marx, 1845, p. 371f). Decisive is the “historical self-initiative” [“self” is missing in the English translation, although it can be found in the German original] (Marx and Engels, 1848, p. 490) of the dominated, and that history is “the history of class struggles” (p. 462). Engels (1883, p. 323) stresses the role of the human being in history by saying that, in contrast to animals, for which history is made and for which it occurs without their knowledge, “the more that human beings become removed from animals in the narrower sense of the word, the more they make their own history consciously, the less becomes the influence of unforeseen effects and uncontrolled forces of this history, and the more accurately does the historical result correspond to the aim laid down in advance.” Marx and Engels in fact acknowledged the importance of conscious, creative human beings in the historical process as another quotation from old Engels (1886, p. 297) shows: “Men make their own history, whatever its outcome may be, in that each person follows his own consciously desired end, and it is precisely the resultant of these many wills operating in different directions, and of their manifold effects upon the outer world, that constitutes history.” Writings such as the *Economical and Philosophical Manuscripts*, *Holy Family*, *German Ideology*, *Poverty of Philosophy*, and *Theses About Feuerbach* show a lot of concern for the importance of the creative human being in social processes and social theory.

Although Marx (1867, p. 535) conceived progress in the *Capital* quantitatively as “progress in the productiveness of labour,” he and Engels knew that the development of the productive forces does not automatically result in humane, qualitative progress. Marx (1894, p. 270) says that capitalism means “progress here, and retrogression there,” and Engels (1884, p. 68) mentions that capitalism is “the period that has lasted until today in which every step forward is also relatively a step backward.” In a letter from Engels to Marx the first argues that, against the enlightened prejudice that since the dark Middle Ages there has been a steady progress to the better, one should stress not only the antagonistic character of progress, but also the retrogressions (MORX/Engels 1985, p. 128). History is

not fully determined for Marx and Engels and not an automatically progressive process; it is conceived in relationship to social practice that can result, but will not automatically result, in qualitative progress. If all social life is essentially practical and human beings make their own history, the subject cannot be seen as a simple bearer of structures who carries out universal laws.

Certainly many Marxists have *interpreted* Marx in a determinist manner, but this does not mean that Marx's own conception of history is a deterministic one. Statements such as "Marx's evolutionism is a 'world-growth story'" (Giddens, 1984, p. 243) do not adequately acknowledge the importance of human practice in Marx's writings. Giddens (1984, p. 243f) says himself that Historical Materialism's assumption that human beings make history correspond to the theory of structuration, but the common Marxist corresponds use of the term would be a deterministic and economically reductionistic one. Giddens also suggests that history is neither pure accident nor fully determined. Marx himself suggested a dialectic of chance and necessity that shapes social change. Knowledgeable human beings make history, but the conditions and possibilities of these changes are *conditioned* by the existing social structures and the material world. This dialectic of freedom and necessity is an important fact about Marx's works that should not be forgotten; capitalist development conditions and triggers situations in which history is relatively open and agency is very important for attaining a desirable result. "Men make their own history, but they do not make it as they please; they do not make it under self-selected circumstances, but under circumstances existing already, given and transmitted from the past" (Marx, 1852, p. 115). The term evolution does not necessarily, as Giddens assumes, imply a deterministic conception of progress and historical change. In recent years, there have been usages of the term in systems theory that acknowledge the importance of human creativity in social change. Francois (1997) defines evolution in a very general sense as "the accumulative transformation of systems undergoing irreversible changes," and Bela Banathy (1996) coined the terms evolutionary systems design and social systems design in order to stress that the creativity of human beings allows them to intervene in social processes and enables them to give direction to evolution, although a complete steering of social systems is not possible due to their complex nature. Self-organization theory as a theory of evolutionary systems puts forward the idea that the development of complex systems is neither fully determined nor fully accidental. Complex systems are dynamic systems in which nonequilibrium states and discontinuity are important aspects of development. Such systems are not in permanent stability as concepts such as adaptation or homeostasis suggest; they are permanently becoming, process-like, and change is taking place permanently. Self-organization theory tries to employ the term evolution in a nondeterministic manner and corresponds much more to Giddens' structuration theory than one might imagine at first glance.

Ervin Laszlo (1987), one of those system theorists keen on employing the term evolution in a nondeterministic and non-Darwinian⁸ manner, argues that in the development of complex systems, the latter do not remain stable; if certain parameters are crossed, instabilities emerge. These are phases of transition where the system shows a high entropy and high degrees of indetermination, chance, and chaos. Evolution would not take place continuously, but in sudden, discontinuous leaps. After a phase of stability a system would enter a phase of instability; fluctuations intensify and spread out. In this chaotic state, the development of the system is not determined; it is only determined that one of several possible alternatives will be realized. Such points in evolution are called bifurcation (Laszlo, 1987). Social self-organization can, on the one hand, be understood as self-reproduction or re-creation; on the other hand, the concept as used by Ilya Prigogine, Laszlo, and others refers to the emergence of order from chaos when a system enters a phase of instability that results in bifurcation.

I argue that the principle of order through fluctuation can also be found in society, but that this does not deprive human beings of agency and intervention in social systems (see also Fuchs, 2002a, c). Social systems are self-reproducing ones, and from time to time they enter phases of crisis which have a nondetermined outcome. Due to the antagonistic structure of modern society that Giddens (1981, pp. 230–239) also tries to grasp in structuration theory⁹ and the complex interplay

⁸Trying to apply evolution in the biological, Darwinian sense to society will result in false inferences that cannot adequately reflect the *differentia specifica* of society (Fuchs, 2003). Human beings are knowledgeable, self-conscious, intentional beings that can make sense of the world and activity design their future. They can anticipate the future and choose between various alternative actions. Speaking of mutation, selection, or survival of the fittest as social mechanisms is not only, as history and Social Darwinism have shown, very dangerous; it also does not recognize the importance of the active human being in society. General system theories should try to work out the differences as well as the similarities between different types of systems; in doing so it is important to avoid direct analogies or inferences from one system type to another.

⁹Giddens (1981, p. 231) defines contradiction as “the existence of two structural principles within a societal system, whereby each depends upon the other but at the same time negates it” and argues in line with Marx that modern society is a contradictory one. He says that there is a fundamental existential contradiction in all types of society and that capitalistic structures are based on a contradiction between private appropriation and socialized production. As I have tried to show elsewhere (Fuchs, 2002a, c), capitalism is not based on just one general contradiction, but on several general antagonisms; the antagonistic structure of a mode of capitalist development such as Fordism or post-Fordism is a concrete expression of several of these general economic, political, and cultural antagonisms. When speaking of contradictions, one should also acknowledge that in dialectical thinking there is a difference between a contradiction and an antagonism: contradictions between dual categories are forms of movements of matter, life, and society that drive the development of systems. Such categories are, on the one hand, opposed to each other; on the other hand, they also require each other and they push forward toward sublation in the threefold Hegelian sense of preserving, eliminating, and lifting up. Contradictions are constitutive for the movement of all systems, whereas an antagonism is a dialectical

of human actions, it is not determined when such phases of crisis emerge, what the exact causes and triggers will be, and what will result from them; it is only determined that crises will show up again and again and that order will emerge. Phases of instability are not separate from human actions, but result from their complex interplay. Social evolution is not determined by fortune and chance; human beings can consciously design evolution. This means that the objective conditions of social existence condition a field of possibilities (for this concept see Hörz, 1974) that consists of several possible alternative ways of development a system can take in a phase of crisis. Human beings cannot fully steer which alternative will be chosen, but by agency and human intervention they can try to increase the possibility that a desirable alternative will be taken and decrease the possibilities that less desirable ones will be taken. Human history is guided by dialectic relationships of chance and necessity as well as of subjectivity and objectivity. Reducing these complex, dialectical relationships to one side will result in reductionistic conceptions that see social change as fully determined either by chance or by full conscious steering.

The overall self-reproduction of society is not a smooth, permanently stable process; it is in constant flux and, from time to time, enters phases of crisis. These are periods of instabilities where the further development of the overall system is not determined. In modern, capitalist society, periods of crisis are caused by structural economic, political, and cultural antagonisms. Social complexity results from the numerous social relationships individuals enter and which change historically. Due to the complexity of society, capitalist crises have economic, political, and cultural aspects and are not caused by one universal antagonism. Due to the material base of society, economic antagonisms play an important and dominating role, but they do not fully determine the occurrence and outcome of crises. Capitalism is itself a sequence of different phases, i.e., the structure of capitalism changes on a certain level and new qualities emerge. It is determined that the evolution of capitalism changes on a certain level and new qualities emerge. It is determined that the evolution of capitalism will sooner or later result in a large societal crisis, but it is not fully determined which antagonisms will cause the crisis and what the result of the crisis will look like. Concerning a point of bifurcation in society, the historical development is relatively open; it depends on subjective factors, i.e., on agency and human intervention, which can increase the possibility that certain paths will be taken and that others will be avoided. But there can be

relationship of colliding forces that cannot be sublated in a simple way. An antagonism “emanates from the individuals’ social conditions of existence” (Marx, 1858/1859, p. 9). The sublation of antagonisms is only possible by a substantial change of the foundational structures of the system that embeds them and which is constituted by them. The principle of contradiction is a continuous one; that of antagonism, a transitory one.

no certainty; the sciences and hence also the social sciences are confronted with an end of certainties (Wallerstein, 1997).

I would not say as Giddens does that there are no universal laws in society. The dialectic of chance and necessity that shapes society is a very general evolutionary law because it describes social change as taking place in discontinuous ruptures which are called points of bifurcation, where human agency plays an important role and the outcome is relatively open. The modern world is shaped by antagonistic structures as Giddens also suggests; human agency takes place within and through these contradictions. So what I call necessity, the fact that capitalism enters crisis again and again, is also a result of human action and the duality of the antagonistic structures of the modern world. Self-organization theory shows that human beings make their own history, but that history and human possibilities are conditioned. Such a concept of evolution acknowledges the importance of agency in social change and refutes notions such as adaptation and homeostasis, which describe the development of systems in terms of stability and equilibrium. The term evolution should not be refuted; it can be used in nondeterministic ways which include the concept of the duality of structure. Giddens stresses that modern history develops discontinuously, and this assumption is very much in line with the notion of social change by order through fluctuation in points of bifurcation which mark discontinuous breaks in the development of society. But I would add that the evolutionary principle which includes the dialectic of chance and necessity and order through fluctuation is in fact a continuous principle in history and that, therefore, there are in fact a few universal laws in society. Assuming this does not automatically imply that human agency is unimportant for social change, in fact this general principle only operates within and through the principle of the duality of structure. Evolution can be defined as the process of transformation of a system in space–time.

What Giddens calls conjuncture refers to the fact that similar results of social development can have quite different causes. With this concept he tries to avoid determinism in the social sciences. It very much resembles the assumption of self-organization theory that causes and effects cannot be mapped linearly: similar causes can have different effects and different causes similar effects; small changes of causes can have large effects, whereas large changes can also result in only small effects (but, nonetheless, it can also be the case that small causes have small effects and large causes large effects). Self-organization theory questions, just like structuration theory, mechanistic causality.

Giddens argues that evolutionary theories frequently see change as being caused fully endogenously, without external influences. In the social sciences, using the terms endogenous and exogenous ultimately brings up the question of the borders of the system to which one is referring. Arguing, e.g., that economic

changes are fully endogenous excludes the fact that, as the French school of regulation has shown, political regulation and ideological influences have important effects on economic development. Arguing that a nation-state develops autonomously from external influences ignores the fact that the modern world is a global, networked society where nation-states are heavily influenced by global processes. Only at the level of the world social system can causality be described as, to a large extent, endogenous.¹⁰ When I speak of self-organization of modern society in terms of the principle of order through fluctuation, I am referring to the global level of society that has been introduced by Immanuel Wallerstein's (1974ff) world system theory (see also Fuchs, 2002a). The concept of re-creation refers not only to the world society, but to social systems of all types and scopes. The process of self-reproduction of such a social system does not stick fully to endogenous processes; the dynamic development takes place in time and space due to influences from within as well as from outside the system. Which influences are stronger depends on the level of closure. This level itself is determined by the social relationships between the systems' members and between these people and others (outside of the system). So in fact agency is the decisive factor in determining to what extent the self-reproduction of a social system is shaped by internal and external factors. Giddens (1981, p. 166f) also acknowledges this fact by suggesting that endogenous and exogenous influences shape social change.

5. STEPS TOWARD A UNIFIED THEORY OF INFORMATION

Because of the existence of different levels of complexity in different types of systems, there can be no simple general definition of information that is applicable to all forms of systems. A dialectical concept of information would have aspects that apply to all types of systems and in all scientific disciplines. But at the same time, information would have a meaning peculiar to any of these types of systems and any of the sciences. This would be a unified concept of information which reflects the dialectic relationship of difference and similarity and could be the essence of a Unified Theory of Information (UTI) (see Hofkirchner, 1999; Fuchs and Hofkirchner, 2002). By merging semiotics and a theory of evolutionary systems (the latter being a synthesis of second order cybernetics and concepts of evolution as well as touching the relationship of information and emergence), a UTI seems feasible. A UTI could make use of the interdisciplinary character of the theory of self-organization.

A sign can be seen as the product of an information process. An information process occurs whenever a system organizes itself, that is, whenever a novel system or qualitative novelty emerges in the structure, state, or behavior of a given system.

¹⁰Of course human world society is not a closed system because the Earth is part of the universe, and on the astronomic level there are metabolisms of energy and matter that enable life on Earth.

In such a case information is produced. It is embodied in the system and may then be called a sign. Information is a fundamental aspect of all self-organizing systems.

Elsewhere, I have argued that the re-creation of society involves the bottom-up emergence of social information and the top-down emergence of individual information (Fuchs 2002e, h; Fuchs *et al.*, 2002). In social systems, individual values, norms, conclusions, rules, opinions, ideas, and beliefs can be seen as individual information. Individual information does not have a static character; it changes dynamically. Re-creative, i.e., social, systems reproduce themselves by creating social information. I consider the scientific–technological infrastructure (part of the technosphere), the system of life-support elements (part of the ecosphere) in the natural environment, and all that, in addition, makes sense in a society, that is, economic resources, political decision powers, and the body of cultural norms and values, and rules (part of the sociosphere), as social information. Social information stores information about past social actions and simplifies future social situations, because by referring to social information the fundamentals of acting socially do not have to be formed in each such situation by human agents. Social information can be seen as a durable foundation of social actions which nonetheless changes dynamically. In the re-creation process of society, the duality of structure based on human agency results in the bottom-up emergence of social information and the top-down emergence of individual information. Individual information and social information are basic aspects of social relationships and only exist within and through social activity. They do not have an existence external to society. Giddens' theory of structuration also suggests such a usage of the term information in the social sciences (Giddens, 1981, pp. 35, 39, 94f, 144, 157–181, 1984, pp. 180–185, 1985, pp. 13f, 172–197). He argues that there are storage capacities in society which enable the existence of institutional forms which persist across generations and shape past experiences that date back well beyond the life of any particular individual. Allocative and authoritative resources can be stored across time–space distances. Storage of authoritative resources involves the retention and control of information. In nonliterate societies the only “containers” storing information were human memory, tradition, and myths. Writing and notation have allowed a certain time–space distanciation of social relationships. Other forms of storing information that have followed and have caused further time–space distanciation are cities, lists, time tables, money, money capital, nation-states, communication and transportation technologies in general, and especially the rapid-transit transportation and electronic communication technologies (including electromagnetic telegraph-, telephone-, and computer-mediated communication).

Locales are power containers because they permit a concentration of allocative and authoritative resources. The development of cities, Giddens argues, was an indispensable locus of the transformation relations involved in the differentiation of class-divided societies from tribal societies. The city permits time–space distanciation beyond that characteristic of tribal societies. The latter were high-presence

societies, which means a fusion of social and system integration. Traditions and kinship relationships were the basic storage mechanisms of social information. Traditions and kinship still play a role as integrating mechanisms in class-divided societies, but the city plays a more important role, and there is a first differentiation of social and system integration due to the differentiation of city and countryside. With the rise of modern, capitalist society, Giddens argues, the nation-state and surveillance¹¹ have become the fundamental mechanisms of integration. “Surveillance as the mobilising of administrative power—through the storage and control of information—is the primary means of the concentration of authoritative resources involved in the formation of the nation-state” (Giddens, 1985, p. 181). With capitalism, a global world system emerges. The modern state would make use of surveillance in the sense of gathering information about the subject population in order to allow overall organization and control.¹² Information gathering would include data on births, marriages, and deaths, demographic and fiscal statistics, “moral statistics” (relating to suicide, divorce, delinquency, and so on), etc., and would result in the power of the state and bureaucratic organization. Computer technology would expand surveillance in the sense of information control. Modern technology would also allow a technical control and supervision of workers that is a much more anonymous form than the face-to-face supervision used in the early days of capitalism. The rise of the modern nation-state would also have meant the monopolization of the means of violence in the hands of the state, along with the extrusion of control of violent sanctions from dominating classes. Employers do not possess direct access to the means of violence; “dull economic compulsion” (Marx) and the concentration of labor within the workplace replace the direct coercive control of the workforce. In capitalist societies, administrative organizations such as business firms, schools, universities, hospitals, and prisons would be centers for the concentration of resources and the nation-state would be

¹¹By surveillance Giddens (1981, p. 169) refers to the accumulation of information defined as symbolic materials that can be stored by an agency of collectivity as well as to the supervision of the activities of subordinates by their superiors within any collectivity.

¹²Giddens is aware of the fact that the expansion of the means of control and surveillance in the hands of the state during the 20th century, and especially with the rise of computer technology, has resulted in the danger of totalitarian controls. But contrary to Foucault, he does not see surveillance, control, and coercion as something entirely negative and dangerous. He argues that these phenomena also enable modern organization and simplify human existence. Giddens does not make a clear distinction between technologies employed as means of organization and as means of surveillance/control, the latter in the repressive sense of the terms. Both surely enable and constrain human activities, but concerning means of surveillance this analysis is not satisfactory because, from a political perspective, it is important to analyze which dangers certain usages of these technologies pose and whether or not the degree of constraining is much larger than the degree of enabling. In fact, one of the fundamental political questions in the information society is whether the level of constraining caused by the state use of modern surveillance technologies can be limited to such an extent that basic rights are not violated.

the most important power container, allowing a massive concentration and control of resources. Aspects that have been involved in the consolidation of the administrative unity of the nation-state include the mechanization of transportation, the severance of communication from transportation by the invention of electronic media, and the expansion of documentary activities of the state. With electronic modes of storage, the second and third aspects would have increasingly merged.

Social structures are an incorporation and objectification of human activities and labor. Giddens' theory of structuration shows that social structures can be stored with the help of certain mechanisms that allow time-space distancing of social relationships. Based on the duality of structure, the re-creation of society generates and differentiates individual and social information which can be stored and controlled across time and space by making use of certain technologies. During the history of mankind these storage capacities and mechanisms have been improved and allowed an increase of time-space distancing. During the last decades, information storage and usage have become a major factor in all aspects of modern life. Information and information technologies today not only are major economic factors, but also have gained massive importance in political life, science, culture, administration, art, education, health, and media. Therefore we can also speak of the dominant mode of reproduction and re-creation of the modern world as the informational mode of capitalist development.

6. CONCLUSION

Many of the criticisms of functionalism that Anthony Giddens has pointed out are also true for existing theories of social self-organization. Niklas Luhmann has introduced a notion of society as a self-referential communication system that is based on a dichotomy between structures and actors. As I have tried to show in this paper, incorporating basic conceptual aspects of the theory of structuration into a theory of social self-organization can help in avoiding dualistic, deterministic, and reductionistic errors. The self-reproduction of social systems that has been described as a process of re-creation is based on a dialectic of actors and structures which Giddens grasps with the notion of the duality of structure. Avoiding functionalistic and deterministic shortcomings must not include the refuting of the notion of evolution. It is possible to employ this concept in such a way that it refers to social change that is due to the emergence of order through fluctuation in situations of instability and bifurcation. Such a concept of fundamental social change does not exclude human actors as subjects of history; it is based on the notion of the duality of structure that can also be described as a dialectic of chance and necessity. All self-organizing systems are information-generating systems. Giddens' concept of storage mechanisms that allow time-space distancing of social relationships helps to describe the relationship of information and self-organization in social systems.

Kenneth D. Bailey (1998) argues that there are many overlaps in Giddens' and Luhmann's theory concerning subject/object, synchrony/diachrony, reflexivity, and recursiveness. It is true that "recursiveness is a central notion in the theories of both Giddens and Luhmann" (Bailey, 1998, p. 151), but it is wrong to conclude that "the similarities in the two approaches are overwhelming" and that the "parallels between the two are really striking" (p. 152). The duality of structure and Luhmann's self-referentiality indeed are both an expression of circular, recursive causality that is typical for self-organization theory. But Bailey does not see that the decisive difference that makes a consistent integration of the two approaches a very hard task (but not an impossible one [see Fuchs and Stockinger, 2002]) is the role they assign to the human being in sociological theory. There is not a "clear point of overlap . . . evident in the objective/subjective distinction" (Bailey, 1998, p. 148). Giddens successfully employs a dialectic of object/subject by stressing the importance of knowledgeable, reflective human beings in society and pointing out a mutual, dialectical relationship of human subjects and objective structural conditions that permits the permanent self-reproduction of society. In Luhmann's theory the human subject is of no great importance; it is just considered as a factor external to social systems ("outsider observer"). Luhmann conceives this relationship as a dualistic one, whereas Giddens tries to avoid dualism. Concerning synchrony/diachrony, Giddens gives a lot of attention to the development of society in space-time, whereas Luhmann functionalistically describes snapshots of society. Also, the notion of reflexivity is used very differently by Giddens: for him reflection is a central aspect of the human being, whereas for Luhmann communications have reflexive aspects. Luhmann argues that structures like communicative patterns "do something" or function in a certain way, whereas Giddens is keen on stressing the importance of human actors. The components of a system are an important aspect of its constitution. In constructing a consistent social theory one has to decide in favor of assuming *either* actors *or* communications as elements. But this also means dropping some of either Giddens' or Luhmann's most fundamental theoretical assumptions.

John Mingers (2001) suggested in a recent paper that an adequate conception of social self-organization should synthesize the theories of Giddens and Luhmann because they seem to be quite complementary. His studies are a very important contribution to social systems science because he tries to connect aspects of social self-organization with modern sociological theories. However, I do not see how such a unification of the theories of Giddens and Luhmann could be achieved consistently because there are some major differences, such as the fact that one has to conceive either actors or communications as the parts of social systems. Doing the latter will ultimately result in functionalist shortcomings that do not adequately reflect the importance of knowledgeable, conscious, reasonable, creative human actors in the self-reproduction of social systems:

Concerning structure, Mingers combines the views of Bhaskar and Giddens and defines them as an entity that consists of positions, practices (Bhaskar), and the rules and resources (Giddens) that underlie them. Mingers (1999) sees society, just like Luhmann, as a self-referential system with communications as components of the system. "The people will come and go, and their individual subjective motivations will disappear, but the communicative dynamic will remain" (Mingers, 1999, p. 36). A communication is defined in this respect as a threefold selection of information, utterance, and understanding. He says that Luhmann cannot explain how communications are produced because the latter maintains that communications produce communications, but in reality communications are produced by human beings. To solve this problem, Mingers wants to combine Luhmann's with Giddens' theory and says that society is mutually related to the interactional domain where people interact. "Society selects interactions and interactions select society—this is their form of organizational closure. We can choose to observe society, and see networks of communications triggering further communications, and forming self-bounded subsystems that persist and reproduce, over time. Or, we can focus on particular episodes of interaction between individuals and groups" (Mingers, 1999, p. 38). The unity of society and interaction is recursively related to social structures in Mingers' model of self-producing social systems.

If one observes society or a social system, one will not find either communications or interacting individuals, but both at once. Separating communications and individuals into two separate domains results in a rather dualistic and nonconsistent conception. One has to decide if either individuals (as social beings) or communications are the elements of a social system. Mingers fails to explain precisely what his overall model describes ontologically. In sociological theories, society is normally conceived as a totality that consists of social systems and subsystems. For Mingers it is only one domain besides interaction and structures of a totality he cannot name. If society is a totality, individuals and social structures have to be considered as moments *inside* of society in order to construct a consistent theory.

Communication and social interactions do not constitute separate domains; they are part of the structure that relates social groups and individuals; they exist in between individuals as a connecting mechanism. To avoid shortcomings, one could conceive social structures as a unity of social relationships that take place in and through interaction and communication and social forms such as rules and resources. Defining communications as components of a social system will result in rather dualistic conceptions; it is a very hard task to integrate the theories of Luhmann and Giddens. Mingers does not think of defining individuals as social beings and components of social systems in such a way that society produces man as a social being just like man produces society as a necessary condition for his/her social being. In fact, man is the creator and created result of society.

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REFERENCES

- Bailey, K. D. (1998). Structure, structuration, and autopoiesis: The emerging significance of recursive theory. *Curr. Perspect. Soc. Theory* **18**, 131–154.
- Banathy, B. H. (1996). *Designing Social Systems in a Changing World*, Plenum Press, New York/London.
- Beermann, W. (1991). Luhmanns Autopoiesisbegriff—“Order from Noise”? In Fischer, H. R. (ed.) (1993). *Autopoiesis. Eine Theorie im Brennpunkt der Kritik*, Carl-Auer-Systeme, Heidelberg, pp. 243–262.
- Best, S., and Kellner, D. (1997). *The Postmodern Turn*, Guilford Press, New York.
- Beyerle, M. (1994). *Staatstheorie und Autopoiesis: über die Auflösung der modernen Staatsidee im nachmodernen Denken durch die Theorie autopoietischer Systeme und der Entwurf eines nachmodernen Staatskonzepts*, Lang, Frankfurt am Main.
- Bloch, E. (1963). *Tübinger Einleitung in die Philosophie*, Suhrkamp, Frankfurt am Main.
- Bloch, E. (1975). *Experimentum Mundi*, Suhrkamp, Frankfurt am Main.
- Bloch, E. (1986). *The Principle of Hope*, 3 vols., MIT Press, Cambridge, MA.
- Bourdieu, B. (1990). *The Logic of Practice*, Stanford University Press, Stanford, CA.
- Checkland, P. (1981). *Systems Thinking. Systems Practice*, John Wiley, Chichester.
- Corning, P. A. (2001). The emergence of “emergence”: Now what? The answer (in a word) is synergy. Paper prepared for the Annual Meeting of the Human Behavior and Evolution Society, London, June 14–17.
- Edmonds, B. (1999). What is complexity? The philosophy of complexity per se with application to some examples in evolution. In Heylighen, F., and Aerts, D. (eds.) (1999). *The Evolution of Complexity*, Kluwer, Dordrecht.
- Eigen, M., and Schuster, P. (1979). *The Hypercycle*, Springer, Berlin/Heidelberg/New York.
- Engels, F. (1845). *Zwei Reden in Elberfeld*, Dietz, Berlin, MEW, Vol. 2, pp. 536–557.
- Engels, F. (1850). *Die englische Zehnstundenbill*, Dietz, Berlin, MEW, Vol. 7, pp. 233–243.
- Engels, F. (1880). *Die Entwicklung des Sozialismus von der Utopie zur Wissenschaft*, Dietz, Berlin, MEW, Vol. 19, pp. 177–228.
- Engels, F. (1883). *Dialektik der Natur*, Dietz, Berlin, MEW, Vol. 20, pp. 305–570.
- Engels, F. (1886). *Ludwig Feuerbach und der Ausgang der klassischen deutschen Philosophie*, Dietz, Berlin, MEW, Vol. 1, pp. 259–307.
- Flood, R. L., and Carson, E. R. (1993). *Dealing with Complexity: An Introduction to the Theory and Application of Systems Science*, Plenum Press, New York.
- François, C. (ed.) (1997). *International Encyclopedia of Systems and Cybernetics*, Saur, München.
- Fuchs, C. (2001). *Soziale Selbstorganisation im informationsgesellschaftlichen Kapitalismus*, Libri BOD, Vienna/Norderstedt.
- Fuchs, C. (2002a). Aspekte der evolutionären Systemtheorie in ökonomischen Krisentheorien unter besonderer Berücksichtigung technikoziologischer Aspekte. In Fuchs, C. (ed.), *Krise und Kritik in der Informationsgesellschaft*, Libri BOD, Vienna/Norderstedt, pp. 82–401.

- Fuchs, C. (2002b). Some implications of Pierre Bourdieu's works for a theory of social self-organisation. *Eur. J. Soc. Theory* 6(4) (in press).
- Fuchs, C. (2002c). Modern society—A complex, evolutionary, self-organising, antagonistic system. INTAS Project "Human Strategies in Complexity" (<http://www.self-organization.org>) Research Paper, Vienna University of Technology, Vienna.
- Fuchs, C. (2002d). Die Bedeutung der Fortschrittsbegriffe von Marcuse und Bloch im informationsgesellschaftlichen Kapitalismus. *Utopie Kreativ* 141/142, 724–736.
- Fuchs, C. (2002e). Social information and self-organisation. In Trapp, R. (ed.), *Cybernetics and Systems 2002. Proceedings of the 16th European Meeting on Cybernetics and Systems Research*, Austrian Society for Cybernetic Studies, Vienna, Vol. 1, pp. 225–230.
- Fuchs, C. (2002f). Dialectical materialism and the self-organisation of matter. INTAS Project "Human Strategies in Complexity" Research Paper (<http://www.self-organization.org>) Ch: 7.
- Arshinov, V., and Fuchs, C. (2003). *Causality, Emergence, Self-organisation*, Moscow, Russian Academy of Sciences (in press).
- Fuchs, C. (2002g). Concepts of social self-organisation. INTAS Project "Human Strategies in Complexity" (<http://www.self-organization.org>) Research Report, Vienna University of Technology, Vienna. Online at <http://www.self-organization.org>.
- Fuchs, C. (2002h). The role of the individual in the social information process. FIS (Foundations of Information Science) Paper. In FIS 2002 Proceedings. *Entropy* (<http://www.mdpi.org/entropy>) 5(1), 34–60.
- Fuchs, C. (2003). Co-operation in complex, self-organising systems. *Triple C Cognit. Commun. Coop.* 1(1) (in press).
- Fuchs, C., and Hofkirchner, W. (2002). Information in social systems. Talk at the 7th International Congress of the International Association for Semiotic Studies, Dresden, 10/4/1999. In Schmitz, W. (ed.), *Sign Processes in Complex Systems. Proceedings of the 7th International Congress of the IASS-AIS*, Thelem, Dresden, ISBN 3-933592-21-6.
- Fuchs, C., and Schlemm, A. (2002). The self-organisation of society. INTAS Project "Human Strategies in Complexity" (<http://www.self-organization.org>) Research Paper. *Natur Ökonomie* 1(1) (in press).
- Fuchs, C., and Stockinger, G. (2002). The autocreativity of social communication systems and the re-creativity of social action systems. In *Causality, Emergence, Self-Organisation*, 1st Year Report, INTAS Project "Human Strategies in Complexity," Moscow, (in press).
- Fuchs, C., Hofkirchner, W., and Klauninger, B. (2002). The dialectic of bottom-up- and top-down-emergence in social systems. Talk at the Conference "Problems of Individual Emergence," Amsterdam, April, 16–20, 2001. In *Proceedings of the Conference Problems of Individual Emergence*. (in press).
- Giddens, A. (1977). *Studies in Social and Political Theory*, Hutchinson, London.
- Giddens, A. (1979). *Central Problems in Social Theory*, Macmillan, London.
- Giddens, A. (1981). *A Contemporary Critique of Historical Materialism. Vol. 1: Power, Property and the State*, Macmillan, London/Basingstoke.
- Giddens, A. (1984). *The Constitution of Society. Outline of the Theory of Structuration*, Polity Press, Cambridge.
- Giddens, A. (1985). *A Contemporary Critique of Historical Materialism. Vol. 2: The Nation-State and Violence*, Polity Press, Cambridge.
- Goldstein, J. (1999). Emergence as a construct: History and issues. *Emergence* 1(1), 49–72.
- Haken, H. (1978). *Synergetics*, Springer, Berlin/Heidelberg/New York.
- Haken, H. (1983). *Advanced Synergetics*, Springer, Berlin/Heidelberg/New York.
- Hegel, G. W. F. (1812). *The Science of Logic (trans., A. V. Miller)*, Allen & Unwin, London.
- Hegel, G. W. F. (1874). *The Logic of Hegel (transl., W. Wallace)*, 2nd ed., Oxford University Press, London.

- Heylighen, F. (1996). What is complexity? <http://pespmc1.vub.ac.be/COMPLEXI.html>.
- Heylighen, F. (1997). The growth of structural and functional complexity during evolution. In Heylighen, F., and Aerts, D. (eds.), *The Evolution of Complexity*, Kluwer, Dordrecht.
- Hofkirchner, W. (ed.) (1999). *The quest for a unified theory of information. Proceedings of the Second Conference on the Foundations of Information Science*, Gordon and Breach, Amsterdam.
- Hörz, H. (1974). *Marxistische Philosophie und Naturwissenschaften*, Pahl-Rugenstein, Köln.
- Jantsch, E. (1975). *Design for Evolution*, George Braziller, New York.
- Jantsch, E. (1979/1992). *Die Selbstorganisation des Universums. Vom Urknall zum menschlichen Geist*, Hanser, Munich/Vienna.
- Kauffman, S. (1993). *The Origins of Order*, Oxford University Press, Oxford.
- Krohn, W., and Kueppers, G. (1992). *Emergenz: Die Entstehung von Ordnung. Organisation und Bedeutung*. Suhrkamp, Frankfurt am Main.
- Kueppers, G. (1999). Self-organisation—The emergence of order. From local interactions to global structures. SEIN Project Paper No. 2. University of Bielefeld, Bielefeld.
- Luhmann, N. (1984). *Soziale Systeme*, Suhrkamp, Frankfurt am Main.
- Luhmann, N. (1988). The autopoiesis of social systems. In Geyer, F., and van der Zouwen, J. (eds.), *Sociocybernetic Paradoxes Observation, Control and Evolution of Self-Steering Systems*, Sage, London, pp. 172–192.
- Marcuse, H. (1941). *Reason and Revolution. Hegel and the Rise of Social Theory*, 2nd ed., Routledge & Kegan, London.
- Marx, K. (1844). *Economical and Philosophical Manuscripts of 1844*, Dietz, Berlin, MEW, Ergänzungsband 1, pp. 465–588.
- Marx, K. (1845). Thesen über Feuerbach. In *Gesammelte Schriften in zwei Bänden, Vol. II*, Dietz, Berlin, pp. 370–372.
- Marx, K. (1846/1847). *Das Elend der Philosophie*, Dietz, Berlin, MEW, Vol. 4, pp. 63–182.
- Marx, K. (1852). *Der 18. Brumaire des Louis Bonaparte*, Dietz, Berlin, MEW, Vol. 8, pp. 111–207.
- Marx, K. (1857/1858). *Grundrisse der Kritik der Politischen Ökonomie*, Dietz, Berlin, MEW, Vol. 42.
- Marx, K. (1858/1859). *A Contribution to the Critique of Political Economy*, Dietz, Berlin, MEW, Vol. 13, pp. 3–160.
- Marx, K. (1867). *Capital. Vol. 1*, Dietz, Berlin, MEW, Vol. 23.
- Marx, K. (1894). *Capital. Vol. 3*, Dietz, Berlin, MEW, Vol. 25.
- Marx, K., and Engels, F. (1844). *The Holy Family*, Dietz, Berlin, MEW, Vol. 2, pp. 3–223.
- Marx, K., and Engels, F. (1848). *Manifest der Kommunistischen Partei*, Dietz, Berlin, MEW, Vol. 4, pp. 459–493.
- Marx, K., and Engels, F. (1985). *Werke. Vol. 35, Briefe Jenuer 1881–März 1883*, Dietz, Berlin.
- Maturana, H. (1980). Man and society. In Benseler, F., Hejl, P., and Kock, W. (eds.), *Autopoiesis, Communication, and Society: The Theory of Autopoietic Systems in the Social Sciences*, Campus, Frankfurt, pp. 11–32.
- Maturana, H. (1987). Biologie der Sozialität. In Schmidt, S. J. (ed.), *Der Diskurs des Radikalen, Konstruktivismus*, Suhrkamp, Frankfurt am Main, pp. 287–302.
- Maturana, H., and Varela, F. (1992). *The Tree of Knowledge. The Biological Roots of Human Understanding*, Shambhala, Boston.
- Mingers, J. (1995). *Self-Producing Systems. Implications and Applications of Autopoiesis*, Plenum Press, New York/London.
- Mingers, J. (1996). A comparison of Maturana's autopoietic social theory and Giddens' theory of structuration. *Syst. Res.* **13**(4), 469–482.
- Mingers, J. (1999). Information, meaning, and communication: An autopoietic approach to linking the social and the individual. *Cybernet. Hum. Know.* **6**(4), 25–41.
- Mingers, J. (2001). Can social systems be autopoietic? *Warwick Business School Research Papers, No. 346*.

- Nicolis, G., and Prigogine, I. (1989). *Exploring Complexity*. Freeman, New York.
- Prigogine, I. (1980). *From Being to Becoming*, Freeman, New York.
- Schmidt, S. J. (ed.) (1987). *Der Diskurs des Radikalen Konstruktivismus*, Suhrkamp, Frankfurt am Main.
- Stephan, A. (1999). *Emergenz. Von der Unvorhersagbarkeit zur Selbstorganisation*, Dresden University Press, Dresden/München.
- Stepin, V. (1999). *Theoretical Knowledge*, Progress, Moscow (in Russian).
- Wallerstein, I. (1974ff). *The Modern World-System, Vols. 1–3*, Academic Press, New York.
- Wallerstein, I. (1991). *Unthinking Social Science: The Limits of Nineteenth Century Paradigms*, Polity Press, Cambridge.
- Wallerstein, I. (1997). The end of certainties in the social sciences, Talk at the Seminar “Conceptos en Ciencias y Humanidades, Mexico City, Oct. 16 (<http://fbc.binghamton.edu/iwendcrt.htm>).
- Zeleny, M., and Hufford, C. (1992). The application of autopoiesis in systems analysis. Are autopoietic systems also social systems? *Int. J. Gen. Syst.* **21**(2), 145–160.