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Book Title	Social Morphogenesis	
Series Title		
Chapter Title	Self-Organisation as the Mechanism of Development and Evolution, in Social Systems	
Copyright Year	2013	
Copyright HolderName	Springer Science+Business Media Dordrecht	
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Abstract	This chapter explores how close the concepts of morphogenesis and self-organisation are. Both can be seen to have natural science origins, though applicable to the long-term history of societies, to events within societies and to the contemporary society into which modernity seems to be transforming. Both can be labelled descriptive, explanatory and normative at the same time. That view can be accomplished by integrating dialectical philosophy, evolutionary systems theory and critical social systems theory, each based upon the former. The argument starts with a discussion of revolution, proceeds to reflexivity and ends with the need to grasp unity-through-diversity in order to respond to the complexity of the global age.

Keywords (separated by '-')	Evolution in social systems - Concepts of morphogenesis and self-organisation - History of societies - Contemporary societies - Discussion of revolution - Integrating dialectical philosophy

Layout: T1 Standard SC | Book ID: 303651_1_En | Book ISBN: 978-94-007-6127-8
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Chapter 7
Self-Organisation as the Mechanism of Development and Evolution, in Social Systems

Wolfgang Hofkirchner

'Morphogenesis' is the core term that is used in the Morphogenetic Approach of Margaret Archer. It could be used in different contexts[1]:

- it might be used to describe and explain (the generative mechanism of) change in general, that is, evolution in general;
- it might be used to describe and explain (the generative mechanism of) change in societies, that is, the sequence of historical formations;
- it might be used to describe and explain (the generative mechanism of) change in a specific type of society, that is, contemporary society so as to make it distinct from previous historical formations—a research question Archer has begun to ask in the last 10 years;
- and it might be used to describe and explain (the generative mechanism of) change within society such as institutional change which is how Archer first developed the approach for educational systems (Archer 1979).

The question of how these different contexts can be related to each other resembles the question another term faces that has a systems theoretical background: 'self-organisation'. 'Self-organisation' can also be used to depict (the basic dynamic of) the general evolution of systems; to depict (the basic dynamic of) the evolution of social systems; to depict (the basic dynamic of) the development of a specific social system; and to depict (the basic dynamic of) institutional change.

[1] This list was induced by the intervention of Andrea Maccarini at the workshop in January 2012, see Chap. 3.

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M. S. Archer (ed.), *Social Morphogenesis*, DOI: 10.1007/978-94-007-6128-5_7,
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Layout: T1 Standard SC | Book ID: 303651_1_En | Book ISBN: 978-94-007-6127-8
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In the case of social systems, however, the formulation makes clear how these contexts can be related: they can be cast as different levels of abstraction by means of which different levels of real-world systems are explored with the purpose of different interventions in the systems. Thus, there is a meta-theoretical level on which the respective terms focus upon the general understanding of how evolution is possible; there is a theoretical level on which the terms try to describe, to explain and to a certain degree to forecast (often in vain) the conditions of the rise and fall of social systems in history; and there is a specific theoretical level on which the terms eventually attempt to provide the tools for enabling agents to switch current social system trajectories for the better.

Hence, the more concrete the levels, the more normative they are. 'Self-organisation' can be understood as a concept in which values such as democracy, participation and self-fulfilment inhere, which makes sense in relation to the current development of social systems and its institutions (the modern political meaning of self-organisation), whereas on the level of human history the term can be assigned to a succession of ever new quests for the progress of humanity in the formation of social systems (the historical meaning of self-organisation); concerning the level of systems in general, those quests are based on an increase in the degrees of freedom of material, living and social systems in the course of evolution (the most general meaning of self-organisation). Moving from level to level is to ascend from the abstract to the concrete that reflects an increase in real complexity; the more complex the level the later its appearance in evolution.[2]

Like the term 'self-organisation' the term 'morphogenesis' can be interpreted as one that has a meta-theoretical meaning and is applied to societies (or sectors of them) to yield a meaning at the level of 'grand theories', that is, in turn, applied in the attempt to understand the working of contemporary society on a more specific theoretical level.

It is worth noting that Archer does not look upon 'morphogenesis' as a biological term that is transposed from biology to sociology. Analogies like that would yield reductions of social phenomena to biotic phenomena. That is the mistake made by socio-biology. Such reductions cannot grasp that what makes the social realm distinctive from the biotic realm, although the social is rooted in the biotic and thus has features in common with the latter. An integrative way of thinking is needed because that is the only way to do justice to the complexity of the world. 'Self-organisation' can also be seen as a concept that should not carry over the particular meaning that it has in one field to another field. However, according to the hierarchy of ontological levels, a hierarchy is conceivable that specifies which aspects of meanings are shared across the levels to varying degrees.

Though the term 'self-organisation' entered scientific discourse only at the end of the 1950s, it might well be said that the concept itself was anticipated by Ludwig von Bertalanffy years before. Bertalanffy is known as the founding father

[2] This might be qualified as the grain of truth in Hegel's idealistic idea of evolution as the unfolding of a concept until its most concrete actualisation.

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of the General System Theory. His work on a theoretical biology lies at the foundation of the modern scientific approach of systems thinking.

In 1928, Bertalanffy published (in German) the book *Kritische Theorie der Formbildung* (Bertalanffy 1928). The literal translation of the title into English would result in 'Critical Theory of Morphogenesis'. The book, however, was published 5 years later in English under the title *Modern Theories of Development. An Introduction to Theoretical Biology* (Bertalanffy 1933). The German edition was part of the book series *Abhandlungen zur theoretischen Biologie* ('Studies on theoretical Biology', my translation), edited by Julius Schaxel in Jena. Pouvreau and Drack (2007, p. 302) mention that Bertalanffy was strongly influenced by Schaxel 'who strives from 1919 on for the development of a theoretical biology worthy of this name and able to open a third way between "mechanicism" and "vitalism"'. Publications in *Abhandlungen zur theoretischen Biologie* like Bertalanffy's *Kritische Theorie der Formbildung* recognised 'self-organization as an inherent and materially immanent principle of life' (Pouvreau and Drack 2007, p. 302). Also, Müller writes that Bertalanffy interpreted the phenomena in question as self-organisation processes (Müller 1996, p. 87). In 1930/1931, Bertalanffy published a paper that drew upon his book on morphogenesis but explicitly introduced the term 'Systemtheorie des Lebens' ('system theory of life', my translation) as theory of organic systems (Bertalanffy 1930/1931).

The chief controversy marring theoretical biology in his day was the deep cleft between mechanicism and vitalism, where mechanicism was the materialistic approach that tried to reduce life phenomena to phenomena that could be explained by physics and chemistry and vitalism was the idealistic conviction that there is something metaphysical that transcends being as explained by physics. General system theory was born when Bertalanffy attempted to overcome that deep cleft by formulating laws of organisation ruling biota as well as other ordered entities. By deliberating on the shortcomings of both positions, Bertalanffy developed a third view that tried to integrate the reasonable aspects of each of the two perspectives on life. Initially, he called it the 'organismic' perspective. This view took over the notion of wholeness from the vitalist standpoint by fundamentally accepting the relative autonomy of the living world. Thus, it refused to endorse the neo-positivist notion of a mechanistic morphogenesis and the possibility of a complete reduction of life to physico-chemical processes. However, at the same time Bertalanffy's organismic stance adopted the mechanistic critique of the vitalistic idea of a supra-material, transcendent entelechy. Actually, by searching for a tenable notion of wholeness Bertalanffy cleared this concept of its anthropomorphic implications and tried to put it on the firm ground of exact scientific thinking.

Bertalanffy laid the cornerstone for such an understanding within theoretical biology by advancing essential categories, namely between open and closed systems, between causality and organised complexity, and the role of entropy. In so doing, he generalised the laws formulated to grasp biota as organised systems and found himself able to apply them successfully to different domains such as medicine, psychology, psychotherapy and so forth. 'It seems legitimate to ask for a theory, not of systems of a more or less special kind, but of universal principles applying to systems in general […], irrespective of whether they are of physical, biological or sociological nature' (Bertalanffy 1955, p. 31).

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Bertalanffy not only disavowed reduction to physics and chemistry, which placed him in sharp contrast to attempts then in vogue in the Vienna Circle, he also explicitly repudiated biologism in relation to the explanation of social phenomena: 'This does not imply "biologism", i.e. reduction of social to biological concepts, but indicates system principles applying in both fields' (Bertalanffy 1968, p. 125). Besides his disapproval of, as it were, vertical reductionism regarding social science, he also argued against horizontal reductionism. In discarding the summative concept of systems as mere aggregates, criticising the methodological individualism then abounding in social science as doomed to fail because of the innumerable elements and interactions in which individuals might be involved and because of its losing sight of the autonomy of systems due to the feedback the system exerts on the elements (see Müller 1996, pp. 72–73).

On the other hand, Bertalanffy did not fall into the trap of holism because he stated that the whole is something that is inherent to the living system.

Altogether, when presenting the following features of morphogenesis as empirical generalisations of findings in the literature of his time and in accordance with, if not derivable from, his newly stated system theoretical assumptions, he anticipated the notion of self-organisation: the development of the organism is, in the first instance, determined by causes inherent in the germ; the differentiation of germ parts proceeds stepwise; the differentiation refers to the whole, as it is the function of the position of germ parts within the whole that determines their differentiation. Despite differentiation, there is pluripotency residing in many cell groups; the organism shows a tendency to maintain its form in changing environmental conditions; the organism can reproduce its form within certain limits (Bertalanffy 1930/1931, pp. 393–400).

Seen that way, the morphogenetic approach and an approach which revolves around self-organisation have more in common than at first sight. While concentrating on systems that are social and on the generative dynamic of their development and evolution, this contribution aims at elaborating on their striking similarity in three fields. The first section deals with the overall diachronic perspective in which social change constitutes an evolutionary process, the second with the synchronic perspective which illuminates the inner dynamic that propels the development of any given social formation and the third with the circumstances of globality and globalism that modify the dynamic of current societies as they become participants in an emerging world society.

Those kinds of self-organisation concepts that are quite mechanistic are not considered here. Rather, it is assumptions characteristic of the framework of a critical information society theory—as put forward by the author—that receive most attention.[3]

[3] As I elaborated that framework during my stay at the University of Salzburg 2004–2010, several authors referred to it as the 'Salzburg approach' (Hofkirchner et al. 2007; see, e.g. Wan 2011). It consists of different theoretical layers. Critical information society thinking is the application of, is based upon, and includes, critical social systems thinking which, in turn, is the application of, is based upon, and includes, evolutionary systems thinking which, eventually, is the application of, is based upon, and includes, a dialectical philosophy.

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7.1 Revolutions

The ideas of social morphogenesis and social self-organisation could share the same conception of historical formations as the outcomes of revolutions.

When characterising different views of change in history, Colin Wight (Chap. 5) discusses the following three options in principle[4]:

- Change as addition. That is the continuous view: something new is developing and adding to the old.
- Change as replacement. That is the discontinuous view: something new is replacing something old and this new kind is an antithesis of the old.
- Change as transformation. That is the dialectical view according to which continuity and discontinuity co-exist; change is more than additive, yet not total replacement: the old and the new co-exist in qualitatively new forms brought about by accumulated quantitative changes including residues or legacies of the old ones.

Another classification of social morphogenesis is provided by Pierpaolo Donati (Chap. 11). He discerns four possible pathways in the evolution of societies:

- The first is not morphogenesis, but 'morphostasis'. It is mere reproduction based upon invariant operations.
- The second is called development or adaptive morphogenesis and means a quantitative growth based upon invariant operations.
- The third is called unstable morphogenesis. It leads to the establishment of an interactional network, yet without structural stabilisation.
- The fourth is called creative morphogenesis because it is only in this case that the form of society transmutes and a new form emerges with a certain degree of temporal stability.

These two classifications are as close to each other as both are close to a self-organisation standpoint. In order to understand that they can connect to each other we have to ~~acknowledge neither merely classifies~~ views that could be true or false (as Wight might be interpreted) nor classify real social change in distinctive, and exclusive, categories (as Donati can be taken to imply). Rather, both are views that recognise certain features of real social change that combine in a cumulative way.

Philosophical, cross-disciplinary and grand-social-theory considerations might be of help to discuss this.

Let us first consider the philosophical dialectic of old and new. The new can develop in two different phases. In a first phase, the new is developing under the dominance of the old such that the overall quality of the whole does not change and changes are only quantitative. Then, there might come a single point in the development at which the new turns from something that is dominated by the old

[4] I do not literally follow the classification Wight gave at the January 2012 workshop but present my understanding of it.

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into something that becomes dominant over the old and represents the start of another phase. In this phase the old does not completely disappear. It disappears only when the (old) dominant quality is replaced by the new as the dominant quality of the whole. It is still there but under the dominance of the new.

In an ontological sense this dialectic makes views of change as addition, replacement or transformation become partially descriptive of real change. Note that no first-phase change needs to be complemented by a second-phase change. There is no such strict determinism at work.

Second, let us consider emergentist systemism[5] that cuts across real-world disciplines and assumes it to be founded on the dialectic discussed so far. Emergentist systemism is about the emergence of systems: systems come into being by emergence, which is known as 'meta-system transition' (Turchin and Joslyn 1999), and emergents are systems that manifest a 'suprasystem hierarchy', belonging to the synchronic aspect.

The logic by which the meta-system transition is reconstructed assumes the following phases:

- In a first phase a multitude of entities is developing, which later on will become elements of the system to be formed. In this phase they cannot be addressed as elements because there is no system yet. They have no linkages to each other. This phase may be called the individual phase.
- In the second phase these entities begin to develop relations among themselves: they interact with each other. But this interactive relationship need not be durable or stable, and can vanish according to the changing activities of the entities involved. In this interactional phase, processes may still be reversible.
- In a third phase, the interaction produces a system. Durable, stable relations are established among the entities, which by then become elements solely of that system. This integration phase makes the changes irreversible. A new system has emerged.

After the emergence of the meta-system, three different levels remain. They resemble the historical transition phases and express a supra-system hierarchy:

- an elementary level focussing on the elements that constitute the system; insofar as the elements are systems themselves, the system they constitute is the suprasystem;
- an intermediary level focussing on the interrelations between the elements of the system or of the systems in the suprasystem; these constitute the interactions of the elements;
- and a systemic level focussing on the system or suprasystem that is 'external' to the elements or (sub-)systems, respectively; the systemic level comprises the system's structure (the function its elements are expected to fulfil), the system's state (a property), and the system's behaviour (exhibited vis-à-vis the environment).

[5] As Wan 2011 nicely names it.

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Self-organisation may then be viewed as the way evolutionary systems arise or change their structure, state or behaviour. Emergentist systemism concretises the dialectic of old and new in the following ways:

- given the meta-system transition and the absence of a (supra-)system, the development of the new before becoming dominant is conceived of as the generation of possible proto-elements and interrelations among them, while the dominance of the new is conceived of as the subordination of the former proto- but still current elements under a new system;
- given the existence of a (supra-)system, the development of the new under the dominance of the old manifests itself either in the rise of new elements or in the rise of new interrelations among the elements, while the dominance of the new over the old is manifest in a new structure or state or behaviour of the system.

In the second case, self-organisation can work in several different ways.

- Morphostasis as reproduction constitutes the maintenance of a system, a process indispensable for prolonging the existence of a system. Whatever a system does, it is able to do because it is able to maintain itself. Maintenance depends on the proper functioning of the elements whose interaction brings about the results needed.
- Adaptive morphogenesis or growth can be interpreted as the process in which a system—on the basis of its maintenance—tends towards a more and more efficient fulfilment of its functions without change in these very functions. There is an attractor for the system's path given by the system's structure. Also, this process is essential for the self-organisation of a system, it is indispensable for propagating its order.
- Unstable morphogenesis is the appearance of something new on the elementary or intermediary level without being stabilised by a feedback working through the systemic level.
- Creative morphogenesis is self-organisation that goes beyond the elementary and intermediary levels and affects the systemic level such that the new is incorporated by the whole system. The structure changes and, with it, the attractor and the trajectory of the system.

This holds for systems in general, that is, for any system that is self-organsing, and not only for social systems. To proceed to how emergent systemism can be applied to social systems in general, let us, finally, consider the rise and fall of historical formations through revolutions. That might be called kind from an 'evo-revo' perspective (in contradistinction to 'evo-devo' biology). Evolution signifies the cumulative aspect of change in the sequence of historical formations, whereas revolutions signify disruptive social change. In sociological terms revolutions transform society, they turn the social order upside down. That is, they mark qualitative changes in the societal system in the course of its evolution. Revolutions change the fundamental form of the societal system, they constitute a system that differs in quality from the previous system. In doing so, the whole existing societal system is worked through and appropriately adapted to form the new

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system. In a sense, Revolution is permanently on-going through the conjoint impact of the processes of morphostasis and adaptive morphogenesis. Thus, calling the new system a 'social formation' or a 'historical formation' also has the connotation of a permanent process: the new system is permanently on the point of being formed.

In terms of a model of stages, insofar as the lower stages build the basis of the new stage, they are reworked so as to fit the emerging quality of the new whole. To give some examples, agriculturalism, industrialism and informationalism are contingent stages, generating social formations through the respective revolutions—the neolithic revolution, which was a shift from nomadism to sedentariness with crop growing and cattle breeding, introduced the techno-social formation of agricultural society; the industrial revolution drew upon machine tool inventions of engineers and coupled them to transmission mechanisms with energy-providers such as the steam engine—this yielded manufacturing machines that gave rise to the techno-social formation of industrial society; and, finally, the information revolution that is ushering in the techno-social formation of information society. Reworking of the old stages occurred in each case. Each new formation subjugated the one from which it had departed: agricultural society increased the control of natural resources such as plants and animals, industrial society industrialised agriculture, and the information society is informatising industry.

Yet the dialectic of evolution and revolution and the re-formation of preceding formations—their reformatting—goes beyond the emergence of systems in the course of evolution. Continuity and discontinuity are, for example, as characteristic of biological speciation[6] as of the restructuring of biotic systems. What is novel with social systems is the ease with which social formations can be tripped off by revolutions, while the basic substance of formations, the individuals, remain basically the same. Social systems are ephemeral. A breakdown of one system may be a breakthrough to another system organised by social agents who preserve their identity. They just change the system.

Individuals are the agents of change. Cells in an organism do not possess that order of magnitude in their degrees of freedom compared with human agents who have the capacity to change the system of which they are elements. In that respect, societal evolution resembles what is known as metamorphosis in biology, albeit with the proviso that a change of formation in the development of human societies is an order of magnitude that is much less determined than is a change of form in the development of 'states' in ants or bees, or the change of form in the development of a butterfly (which stands for the type of cases from which this biological metaphor originates).

That is how self-organisation works as 'mechanism' that brings forth social change by revolutions.

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[6] See the picture of the punctuated equilibrium cast by Stephen Jay Gould (2002).

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7.2 Reflexive Revolutions

Critical social systems thinking and the morphogenetic approach share a realist ontology within the social sciences. Not only are the individuals' bodies real—in a physical rather than a sociological sense, equally, the interactions of the individuals are real and the products of these interactions are real, even though they cannot be directly sensed. The proof of being real is the fact of possessing causal power, which can lead to exerting causal power, and not merely being subject to it. Reality is that which can be or is efficacious as well as that which is effected; that which can have or has an impact as well as the impact itself.[7]

In Hofkirchner 1998 the author presented how the self-organisation cycle working in social systems could be conceptualised (pp. 29–30):

> There are two levels. At the micro-level the elements of the system, namely agents, are located. They carry out actions, and by the interplay of the fluctuating individual actions they produce fairly stable relations among them which, in the form of rules, that is values, ethics and morals, and in the form of regularities which concern allocative and authoritative resources, gain a relative independence from the interactions. Structures like that emerge thus on a macro-level, where they exist in their own right insofar as they, in turn, influence the agents. On the one hand, they constrain the individual agency by setting conditions that limit the scope of possibilities to act and, on the other, just by doing so provide it with the potential for realizing options it would not otherwise have. In so far as the structures do not cause directly, and therefore cannot determine completely whether or not these options will be realized, for the actions are mediated by the individual agents, dominance cannot control the outcome, either. The structures are inscribed in the individual agents by an endless process of socialization and enculturation, but the engramms which are produced in the individuals serve as cognitive tools for the anticipation and construction of ever new actions which may or may not obey the rules and accept the values and recognize the ethics and follow the morals, and which may or may not fit the regularities and renew the allocative and authoritative resources and thus may or may not reproduce the structures. Either way, interaction reflects upon the conditions of its own emergence and may consciously be directed at the structures in order to maintain or alter them. In this sense only, that is, because in their recursive actions the agents refer to the structures, these structures play the dominant role in this relation of bottom-up and top-down causation. Nevertheless none of the relations in this causal cycle leads to plain results. Each influence has consequences which due to the inherent indeterminacy cannot be foreseen. By this, and only by this, qualitative change is possible. This reconceptualization of the central issue in social science—the issue of how agency and structure are to be related—in terms of dialectic, emergence and self-organisation is able to resort to and integrate important ideas and insights of recent attempts to overcome the dichotomy in social theory which (with the exception of Artigiani 1991) do not explicitly refer to an evolutionary systems theory of society (e.g. Giddens 1984; Alexander 1995; Mouzelis 1995; Reckwitz 1997). It promises to bring about a solution to the problem of how to deal with indeterminacy in the object domain of science.
>
> Seen from this angle, and taking into account the many reservations natural scientists manifest when confronted with the philosophical consequences of their own findings in self-organisation, one could almost state that it is the natural sciences which may learn from social sciences rather than vice versa.

[7] Note that the German term for reality is 'Wirklichkeit' which comes from the verb 'wirken' meaning 'to act', 'to affect', 'to take effect'.

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Thus, in social systems structure has to be conceived of as being as real as agency.

Let us again start with philosophical considerations—the dialectic of parts and whole. The whole is said to be 'more than the sum of the parts', but it may also be less (Morin 1992, p. 124). In either way, a leap in quality between the parts and the whole requires explication. The parts–whole relationship combines determinacy and indeterminacy, necessity and contingency. In neither direction does the cause strictly determine the effect—not from the parts to the whole, nor from the whole to the parts. This is because both the parts and the whole each possess subject status and degrees of freedom. Those parts belonging to a specific whole reflect this fact by possessing (at least) one property which they do not possess when being not part of this whole. At the same time, they are not completely absorbed by sharing that particular property. They have (at least) one other property which also makes them distinct. Thus, real-world parts are neither pieces or fragments that can do without the whole (just by taking away their property as a part) nor are they instances of the whole (meaning they share all properties of the whole). In turn, the whole possesses at least one property that it does not share with any of the parts (Hofkirchner 2012).

There is no determinacy without indeterminacy and no indeterminacy without determinacy—an assumption that is taken as less-than-strict determinism (Hofkirchner 2012). This assumption admits that nature itself is capable of spontaneously producing events and entities that are not describable in a mechanistic way. Besides and beyond clear-cut, one-to-one cause-effect-relations, there are also more flexible causal connections in the real world. In fact, the latter may well be more important as well as greater in number.

Aristotle recognised four types of causes: the effective (causa efficiens), the final (causa finalis), the material (causa materialis) and the formal (causa formalis) one. In striving for scientific standards that avoided resorting to the supernatural, post-medieval science abandoned the latter three causes. Nonetheless, it is worth reconsidering all four types of causes without the need to resort to the supernatural. We can sort them into two pairs of opposites and arrange them on two continua, i.e. scales that stand orthogonally to each other. One axis shows the processual, diachronic dimension of events and extends from drivenness to end-directedness, another shows the structural, synchronic dimension of entities and extends from materiality to formative power (Brunner and Klauninger 2003). We can arrange the effective and final causes on the first axis and the material and formal causes on the second one in the following way: effective cause enters the picture from the left and final cause, as opposed to effective cause, is directed to the left. This means: the further we move to the right on the x-axis, the less important effective cause becomes and the more important the final cause; material cause enters the picture from the bottom and formal cause, as opposed to material cause, is directed to the bottom. This means: the more we move towards the top on the y-axis, the less important material cause becomes and the more important formal cause becomes.

Effective cause connotes a driving force in the process, while final cause connotes a pull rather than a push. But final cause enters the picture from the left

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too and not from the right. Finality means influence 'from the future' as little as efficacy means the exertion pressure 'from the past'. Each process paves the way for the future by its own history. It creates a certain space of possibilities and a complementary space of impossibilities. Those possibilities do exist in the present and one of them will be selected and realised and will then open up another space of possibilities. Compared with the space of impossibilities, the process converges to one end after another through a series of concatenated spaces of possibilities.

Material cause connotes the substantial base in the structure, while formal cause connotes the shaping of it. Formal cause enters the picture from the bottom too, though its direction is top-down. It does not fall from heaven. Formal causation means influence 'by mind' as little as materiality means the exertion pressure 'by matter'. Each structure bears the stamp of how its constituents compose it. The constituents produce what they constitute by generating constraints as well as enablements that represent the form.

Having said this, the interplay of so-called upward and downward causation in hierarchical systems can be dealt with in more detail and the philosophical assumptions can be applied to self-organisation in a second step.

- In upward causation, the elements produce the system, and there is emergence because, on the macro-level, a quality is produced that does not appear on the micro-level. The micro-level comprises the elements and the interaction between the elements. The macro-level consists of relationships that express the effects of synergy.
- These relationships exert a downward causation (Campbell 1974) and feed back to the elements. This downward causation was formulated by Haken as the 'slaving principle' (1978). But the macro-level functions not only as a constraint but also as an enablement for the agency of the elements.

Elements and system work together as parts and whole. Bertalanffy, for example, took Nicholas of Cusa's idea 'ex omnibus partibus relucet totum' ('each part reflects the whole') as a point of departure. Bertalanffy wrote with regard to the organism that the characteristic of the organism is first that it is more than the sum of its parts and second that single processes are ordered for the maintenance of the whole (Bertalanffy 1928, p. 305). Here he anticipated Haken's slaving principle for the organic world (the parameters that change more slowly are those that enslave the rest of the parameters). With his empirical findings he laid the foundation for what Varela et al. (1974) later called autopoiesis (the system is a network of elements that produce new elements that maintain the network). Bertalanffy discovered that the maintenance of the organic system in a dynamical pseudo-equilibrium is produced through the change of its components (Bertalanffy 1932, p. 309).

When characterising this intra-systemic hierarchy, Bertalanffy asserted (Bertalanffy 1950, p. 135) 'the necessity of investigating not only parts but also the relations of organisation resulting from a dynamic interaction and manifesting themselves by the difference in behaviour of parts in isolation and in the whole organism'. Note that he distinguishes not only between the level of parts and the level

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of the whole, but also between the dynamic interaction of the parts and the relations of organisation. He clearly differentiates and relates the interaction on the level of the parts and the relations at the level of the whole. And he considers the following relationship between the interaction and the relations: the relations, on the one hand, result from the interaction and, on the other, are manifest in the behaviour of the parts in that their behaviour is different from their behaviour when in isolation. It therefore follows that there are two processes in systems:

- one bottom-up in which interactions at the level of the parts give rise to relations at the level of the whole, and
- one top-down in which relations at the level of the whole manifest themselves at the level of the parts, that is, in their behaviour.

In summary, the maintenance of a system functions such that the system (via downward causation exerted by the structure of the system) makes its elements (via upward causation that lets the structure emerge) (re-)produce the system itself.[8]

This account seems fully compatible with the concerns Tony Lawson (see Chap. 4) raises over emergence and downward causation. He stresses that, along with any emergent totality, there is a relational structure emerging that organises the components; and that it is the very structure of organising relations rather than the totality itself that causally affects the components. The totality consists of the components and the organising relations. Thus it seems inappropriate to say that the totality acts upon its components; rather, it acts through its components. It is the structure that acts upon the components. It is considered advisable here to understand the causal power of a system, which is a totality, as something working on the horizontal plane of interactions with the environment and (co-)systems, i.e. in the way effective and final cause are said to do; while downward causation is understood only as exerting causal power from one (higher) level to another (a lower one) in the way formal and material cause are said to do[9]; and to regard different views as making category mistakes.

Having discussed the dialectical determinism in the interplay of elements and (the structure of the) system, the ground is prepared for a third step: elaborating the dialectic between agency and structure in social systems and introducing reflexivity which is a *sine qua non* of human self-organisation along with empathy and collective intentionality.

Humans, individual agents that are elements of social systems, are self-organising systems themselves. Due to their self-organising capability they do not react in a completely foreseeable way but select one from a vast variety of possible alternatives and opportunities. And they have the capability to reflect upon these

[8] This is called self-organisation, as the system (the self) refers to itself, albeit by referring to its elements; this self-reference is found in each self-organising system.

[9] Which is opposed by Dave Elder-Vass (2010).

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possible ways. Archer has developed an in-depth analysis and a typology of human reflexivity (Archer 2007, 2012).

Reflexivity is an ability located at the cognitive (and emotive) level of the elements of social systems. It is the reason for contingency regarding agential decisions. This single contingency is doubled, as Luhmann showed, if two agents meet at the communicative level and form an unstable dyadic relation. Ego tries to understand alter and also to understand how alter is understanding ego, and vice versa. Going beyond Luhmann, this double contingency is topped by the triple contingency that arises if agents enter triadic relations, where the dyads are mediated by the structure of the social system and thus extend to the level of co-operation on top of communication. Not only do the agents not know exactly what to expect from each other, but also none of them really knows what to expect from the social system and what the social system expects from them. Equally, the social system does not possess sufficient knowledge about what to expect from the agents or what the agents expect from it. Despite this apparently nonlinear increase of contingency, when ascending the ladder from the cognitive to the communicative to the co-operative level, there is also an increase of necessity because of downward causation, which means contingency is limited and does not become a problem of chaos, indeterminacy and complete unpredictability. For cognition, communication and co-operation form a hierarchy working within the supra-system hierarchy. Cognition, communication and co-operation are information processes taking place at the elementary, intermediary and systemic levels respectively:

- cognition focuses on the internal generation and utilisation of information in individual systems that are elements of a supra-system,
- communication on the inter-relational processes of connected individual systems, on the interactional, interfacial generation and utilisation of information by co-systems,
- and co-operation on processes that are external to the individual systems but internal to the meta-/suprasystem they are integrated with, on the collective, external generation and utilisation of information by co-systems in conjunction.

Hierarchy always means that the higher level shapes the lower one, although the higher depends on the lower. Therefore, cognition is a necessary condition for communication, and communication is a necessary condition for co-operation. Given a system of systems, co-operation of these very systems shapes their communication. This, in turn, shapes the cognition in each of them and this is not only confined to the content of the information processes. In this way, cognition, communication and co-operation are mutually conditioning one another. Thus, reflexivity in humans is a precondition for capabilities of social information processing at higher levels. Simultaneously, it is also conditioned by these very higher level capabilities.

Compared with co-operative information processes in living systems that manifest collective intelligence (meaning that collectives can outperform single intelligent individuals), the topmost level in social systems is characterised by

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collective or shared intentionality. Shared intentionality means 'the participants have a joint goal in the sense that we (in mutual knowledge) do *X* together' (Tomasello 2009, p. 61). This enables joint action. Shared intentionality causes communicability as well as cognitive activity to become functional for the joint action.

A classic example is the hunter-beater in Aleksei N. Leontyev's activity theory (Leontyev 1981, p. 210–212). Human actions are distinct from animal behaviour in that they do not consist only in the direct satisfaction of biotic needs but are mediated by a societal detour; humans reflect upon this societal detour and are aware of it. They review (part of) the societal context and act accordingly. Actions make sense because of their embeddedness in commonly (societally) shared designs for relations involving activity. This is a result of being part of a chain of actions. Actions also make sense because they contribute to maintaining a whole system of interrelated actions.

In that respect, creative use of Charles Sanders Peirce's idea of firstness, secondness and thirdness can be made (Peirce 2000): firstness is identified as a property referring to the lower level of individual agents (and their contingency), secondness as a property referring to the intermediary level of dyads (and double contingency) and thirdness as referring to the topmost level of triads (and triple contingency). Thirdness shapes secondness shapes firstness:

- The level of thirdness is reached when humans co-operate—that is, when they share a common goal (the 'third'), communicating and deliberating accordingly. Social information assumes the form of expectations. Tomasello and Rakoczy (2009) estimate that by around four years old, most children are able to utter intentional propositions—that is, propositions made up of a meta-level proposition containing psychological verbs such as 'believe, think, know' and an object level proposition that complements the former (2009, pp. 721–724). This is the function of shared intentionality.
- The level of secondness, of human communicability, is shaped by shared intentionality. Co-operatively shared expectations make communication also take on the form of expectations. What does ego expect from alter? What does alter expect ego to do? What does alter expect ego to expect from alter? Mutual expectations are formed because they are constituted for undertaking joint action. The pre-linguistic capability of infants is sufficient for them to carry out proto-imperative and proto-declarative gestural communicative acts (Rakoczy and Tomasello 2008). This is the basis of empathy, as a necessary condition for shared intentionality.
- The level of firstness, human cognisability, is eventually shaped by empathy. Human reflexivity enables humans to reflect upon themselves, and to reflect themselves as part of a bigger picture, that is, being reflexive about their immediate social situation, but also all the way up to society itself. The actions of members towards other members of society are mediated by this 'third': the structure of society. What is expected from the very fact of being a member of society? This reflection itself is a model for every mode of (complex) thinking.

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It is a model for grasping the general relationship between elements and system, parts and whole, of which individual and society are merely the model instantiation. Human cognition is thus concept-dominated rather than sensation-focused (Logan 2007). This is reflexivity.

In short, collective intentionality is the ability to reach a consensus on the social system's goals that is sufficient to direct practices; empathy is the ability to reach an understanding of the other by adequately taking her perspective on the social system in question; reflexivity is the ability to reach a concept of the system in question that suffices for individual decision-making.

Given reflexivity, a critical account of the 'mechanism' that allows for revolutions can be formulated as follows: humans can reflect upon society. Because of their reflexivity they are in the position to consciously contribute to the reproduction of the social formation of which they are an element or to the transformation of the latter. However, the outcomes of revolutions are not the one-to-one consequence of intended actions. First, a 'quorum' of joint actions is needed to drive the system out of its current point of equilibrium; second, the new equilibrium toward which the system's development will tend is not identical with the intended one; and, third, the landscape of different possible equilibria is not fixed but changes over time. Hence derives the necessity for piecemeal engineering.

7.3 Reflexive Revolutions for Global Unity-Through-Diversity

Where contemporary societies are concerned, the question is whether or not circumstances are such as to require the 'mechanism' of reflexive revolutions described above in order to undergo some adaptation and modification.

What is different today is that after the second half of the last century we are faced with global challenges while trying to establish sustainable international relations that exclude the use of military violence, an ecologically sustainable use of nature, and a use of human resources that is sustainable in the socio-economic context. Global challenges have a 'dark' and a 'bright' side. The dark side is the imminent danger of the breakdown of interdependent societies with the possibility of exterminating civilised human life. The bright side marks a possible entrance to a new state of civilisation that brings about a peaceful, environmentally sound and socially and economically just and inclusive world society.

This is something that can be theorised by making use of both the self-organisation and the morphogenetic approach.

Let us start, as always, with the necessary philosophical assumptions. The part–whole relationship can be elaborated by considerations relating to diversity and unity. Diversity and unity condition each other. Diversity can produce unity (unity-through-diversity), but need not do so. Unity can enable diversity (diversity-through-unity), but it can constrain diversity to uniformity (eliminating

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unity-through-diversity). The world society needs a relation of unity and diversity that neither establishes unity at the cost of diversity nor diversity at the cost of unity but, instead, yields unity in line with diversity, unity in diversity, but also diversity in unity. Diversity is considered to be a necessary condition for unity. Thus it is termed 'unity-through-diversity'.

Unity-through-diversity is then the dialectical starting point for the reduction of complexity when giving consideration to the systems account of the current social order and its prospects.

Already in 1930/1931 Bertalanffy stated that morphogenesis in organic systems means differentiation until a point of maximum differentiation is reached. The evolution of self-organising systems in the universe gives evidence that new systems occur once the old systems are not able to cope with the requirements of higher complexity. Such requirements result from a mismatch between inner and outer states of a system. The bulk of species on Earth faced extermination for that reason. Those observable today found (new) ways to cope with the challenges. Higher complexity not only signifies a higher degree of differentiation. At least as importantly, it signifies a new quality of integration. Only a new level of integration can deal with an intensification of differentiation. That is how unity-through-diversity translates into the reduction of complexity through integration of the differentiated.

From the perspective of grand social theory, it might be stated that we are faced with a developmental crisis in the history of humanity. The multiplicity of crises experienced today witness to a more general crisis in the 'morphogenesis' of human societies. This 'grand' perspective is at the same time a critique of the contemporary social order.

Globalisation means that every society has the potential to become 'global'. Any evolutionary system has an inherent tendency to grow and reach out (Fuchs and Hofkirchner 2001, 2002a, b). That is what we discussed earlier under the heading of adaptive morphogenesis. However, globalising societies encountered each other and began to penetrate each other. Globality today characterises a state of strong interdependencies between societies that are nevertheless confined within the boundaries of nation states. Today they urgently need to change their operations because external effects no longer remain external. The clash of a multitude of societies hinders the development of each of them and could, eventually, lead to a disaster. What is at stake is the continuation of human life, given the existence of a network of societies that cannot be maintained any longer by means of the same operations with which those societies could survive hitherto. So far, that is what we labelled unstable morphogenesis. This unstable morphogenesis has to be stabilised and complemented by creative morphogenesis that yields a new type of integration to render world society a reality. Hence, what we are witnessing is the second stage of a meta-system transition—from fragmented, rudimentary social systems (the components of humanity-to-be) to a real-world society. We are witnesses of processes that presage the emergence of such a world suprasystem.

The human race has all the capabilities to be the first species on Earth to master the challenges that accrue from its own development. This is so because the agents

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it is made up of are endowed with reflexivity that enables them, in principle, to reflect on the causes for the rising complexity and to flexibly catch up with it by making the network of social systems sustainable. 'Sustainabilisation' is the process of society finding a way to avoid anthropogenic breakdown and safeguard a stable path of development by keeping global challenges below the threshold where the maintenance of society is endangered. The historical patterns of social evolution can be adapted to the new situation of a world society in *statu nascendi*, of a humane stage in the evolution of humanity. This adaptation is tantamount to a revolution. But it is not pre-determined that this revolution will come about. That is the situation the author calls the Great Bifurcation.

Unity-through-diversity is a systems theory principle that can inform the design of social systems. A higher order integration of all existing societies within a world society is needed to guarantee the sustainable development of civilisation. Claims of universalism, of particularism and of relativism are examples of ways of thinking that will not solve the problem. None of them can conceive of a convivial world society. Either (in universalism) the one is regarded as the necessary and sufficient condition for the many. Or the many (in particularism) are considered necessary and sufficient for the one. Or one and many (in relativism) are deemed independent. Cultural thinking that reconciles the one and the many in terms of unity-through-diversity is only achievable on the basis of an integrative way of thinking that does justice to the differences as well. It integrates the differences of the manifold cultural identities and differentiates what is common as well.

What makes the 'mechanism' of reflexive revolutions cover the specific circumstances of our time is the need for reflexivity to extend the 'third' that is reflected upon from the immediate social system and the immediate society of which the individual agent is an element, to the emerging world society. In the global age, the content of:

- co-operative goal-setting and -seeking;
- communicative negotiation;
- and cognitive reflection,

needs to be unique. It is constituted by the requirements of yet another—though unprecedented—leap in complexity in the history of humanity. The agents have to catch up with the complexity they have generated. They can do so, at the co-operative level, by anticipating the outline of the new rules that are to structure world society and necessitate modification of the rules currently governing the structure of the component societies. They can do so, at the communicative level, by distancing themselves from their immediate immersion in their proximate social systems, by relativising their being member of those, by adopting the perspective of world society. They can do so, at the cognitive level, by reflecting upon the whole they are becoming part of. That is the meaning of the reflexive revolution to come. Otherwise the metamorphosis of humanity will break down. In that sense, current society is as 'morphogenetic' as never before.

Thus the self-organisation approach presented here might well work as the focal point of a theory of contemporary morphogenetic society.

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We conclude that self-organisation can, in the same manner as morphogenesis, be interpreted as a term that is:

- a meta-theoretical one, significant for every system,
- a grand-theory one, significant for every social system and
- a theoretical perspective, significant for the contemporary state social systems are in.

At every level, it is descriptive, explanatory and normative with reference to the 'mechanism' of the development and the evolution of the respective systems.

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