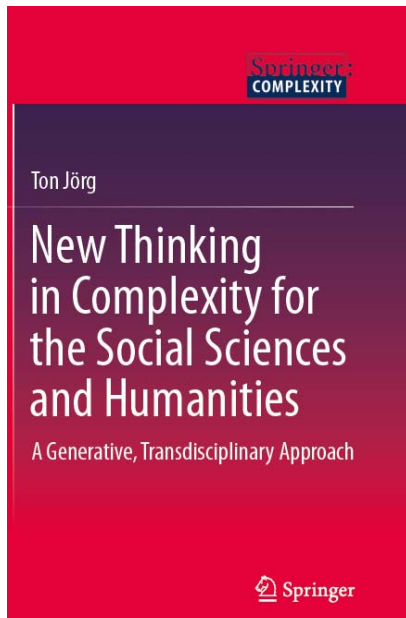




New Thinking in Complexity for the Social Sciences and Humanities

***A Generative, Transdisciplinary
Approach***

by Ton Jörg

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Mission Statement

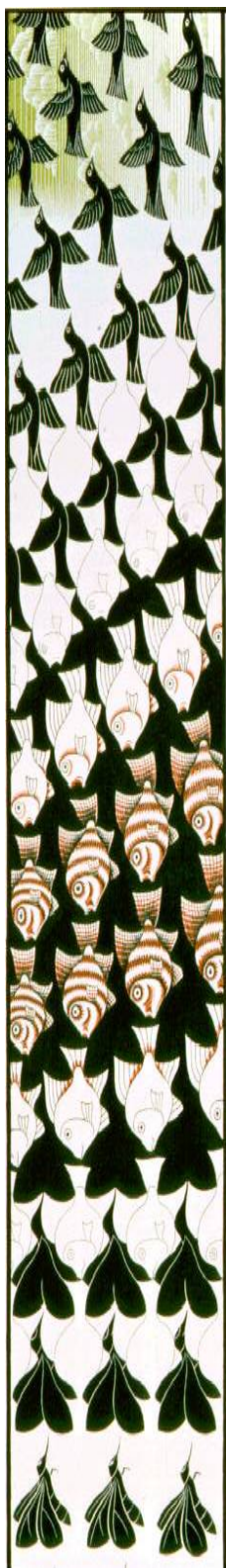
***“And the world’s complexity means that there is, now and always,
more to reality than our science is able to dream of”***

(Rescher, 1998, p. 28; emphasis added)



In this book, the aim is to develop the foundation of a new science of complexity (ScoC), with a new focus on what we take as ‘the complexity of real-world complexity’. Inspired by the work of Niklas Luhmann, the aim is to re-describe the foundation of our Social Sciences and Humanities. We argue that this should be the new focus for a new science within the scientific realms of our sciences with their different disciplines, i.e., within the Social Sciences and Humanities. This new science of complexity can be taken as a kind of complementary science, born out of dissatisfaction with the way sciences are ‘normally’ operating in our society, showing their incapacity to deal with real complexity as a serious topic of study. We think it is time to open the social sciences and to go beyond the habitual, limiting views of these sciences (Wallerstein et al., 1996). These social sciences have become entrapped in a kind of cul-de-sac in their viewing and doing science, as a result of the dominance of linear thinking in these sciences. Some speak about this critical situation in terms of a real crisis (e.g., Morin, 2001). We have come to the conclusion that we desperately need innovation in our dealing with the reality of real-world complexity, to put an end to this entrapped situation. With the new science, we may put an end to the common trivialization of complex phenomena in the field of these sciences, such as the unfathomably complex human being. This reduction of complexity is very common within the social sciences, such as in the field of learning and education (cf. von Foerster, 1993) but also in the field of brain research, with scientists being ‘prisoners of description’ (see, e.g., Edelman & Tononi, 2000).

In our effort of developing a new science of complexity, based on new thinking in complexity, we express the firm hope that this new science will open a new way of viewing and doing science within the social sciences. It



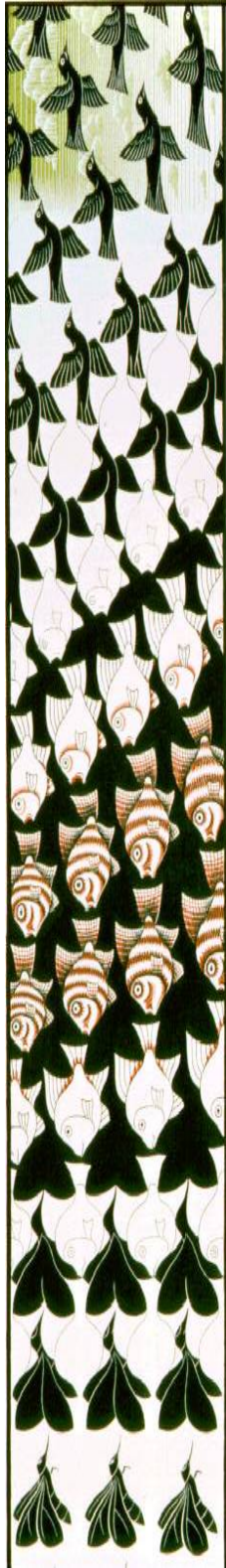
may make an end to the limiting way of viewing and doing science within the traditional scientific realms of the real.¹ The opening may lead to the innovation of the social sciences and humanities and may improve their quality by showing the unexpected and hitherto unknown 'world of the possible' (Kauffman, 1993, p. 375; *emphasis added*). This world is very much about the enlarged space of the possible (Osberg, 2009); that is, about the hitherto unknown realms of possibilities. This world, we argue, is the world of real-world complexity. This complex world, we argue, is still to be explored. With Nicholas Rescher (1998), we fully support the notion that "complexity is self-potentiating". Of course, this is not self-evident. It demands for explanation, in terms of how complexity may really 'work' in the scientific realms of the scientific enterprise. This is what this book is about: to build a new framework of complexity that is based on the reframing of complexity as a new concept and a new tool for use in our sciences. This demands for rethinking of our basic concepts in use in our doing science, like the concepts of 'causality' and that of 'interaction'. It also demands for a different ontology and epistemology, in their fundamental connectedness.

By adopting the new science of complexity, we are ready for enlarging our capacity to deal with the complexity of real-world complexity. This may imply the enlarging of the space of the possible, in terms of a more true understanding of the complexity of real-world complexity. We also focus on a better understanding of the forces, structures and mechanisms that drive and sustain the dynamics of complexity of the vast and complex dynamical systems in our complex real world. It is our hope for the future that we can convince the reader that we need a more practical kind of science for being able to deal with the big questions and issues in the real world (cf. Scheffer, 2009, p. 8, and p. 327). These are the questions and issues that are still unanswered and are still waiting for an answer. We support the challenging view of Marten Scheffer, that "we need good science to help us shape the future" (*ibid.*, p. 8). Although it remains questionable what 'good' science will be, we may actually know what 'bad' science is.

Only by linking the fundamental with the practical we may be able to shape the future of our society and humanity at large. This may result in a generative approach that can be developed into a general transdisciplinary approach, for use in the different scientific realms of our sciences and their disciplines. This generative approach is about the fundamental, generative nature of complexity. This is the reason why the focus is on generative complexity. The new approach involves the acceptance of the (hitherto) unknown, the unexpected and the unforeseeable².

¹ cf. mission of European initiative of Institute Para Limes.

² See 'Charter of Transdisciplinary', article 14, at <http://basarab.nicolescu.perso.sfr.fr/ciret/english/charten.htm>

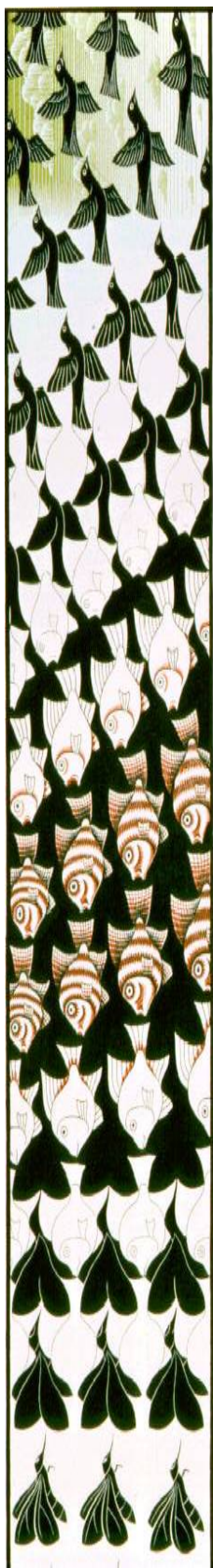


The new science of complexity has the aim to become explanatory about this generative nature of complexity. Only then we may become explanatory about the generativity of complexity, which we view to be the key to an understanding of complexity as self-potentiating (Rescher, 1998, p. 28; emphasis added). In explaining and understanding generativity as the key to a better understanding of real-world complexity, we may find an answer to the question “how we come to see things in new ways” (Schön, 1987, p. 138).

In our analysis of the crisis in our sciences we come to the conclusion that we are still the captives of old thinking. Although we may know that “nothing in the social world actually happens mechanistically” (Bhaskar, 2002, p. 249, fn. 39), we still seem to take “mapping mechanistic models to reality as the core of science” (Scheffer, 2009, p. 274). The rejection of this stance, we argue, may be opening for a different view of reality: as a complex, nonlinear reality (cf. Mainzer, 2004, p. 407). Although we may know that ‘the problem of causality’ is still an unsolved problem in our sciences, we are still operating on the basis of what Susan Oyama has described as “the Central Dogma of one-way flow of causality”, which is still our guiding metaphor in causal thinking about the real (see Oyama, 1989, p. 29). This is why our new science of complexity, in its fundamental critique on viewing and doing science as usual within the social sciences, may open a new window upon reality and possibly even a ‘re-enchantment of reality’ (Bhaskar, 2002, p. 242). We are also of the opinion that the new science offers a new opportunity “to humanize determinism”, in the words of the Russian psychologist Lev Vygotsky (Vygotsky, 1997). We fully support Edgar Morin’s statement that complexifying is a way of humanizing the sciences³ (Morin, 2002, p. 9).

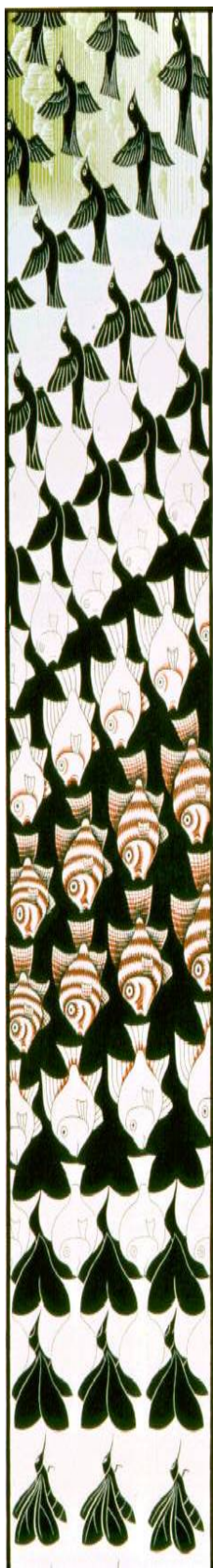
We argue in this book that determinism can be viewed differently: as more dynamic and fluid than has always been done in our history of philosophy and the sciences. We introduce the complex notion of ‘fluid determinism’. This fluid version of determinism is about the processes of causal influencing in interaction within interactive relationships, showing a fluid interplay of forces as a kind of shaping forces over time, with (causal) effects as “reciprocal effects of one on the other” (Follett, 1924; emphasis added). These effects may cumulate over time: both in a linear and in a potential non-linear way! The shaping of one another in dyadic human interaction may happen by those impelling causal forces that interpenetrate each other’s systems as complex systems (cf. van der Veer & Valsiner, 1994, p. 213; Luhmann, 2002, p. 182). The causal dynamics

³ “complexifier, c’est humaniser les sciences” (Morin, 2002, p. 9).



involved in this emergent kind of interaction, evolving over time, can be described as a kind of complex process of dynamic interweaving. This complexity of interweaving can and better should be linked to network thinking for new thinking in complexity in our sciences (cf. Barabási, 2003). The complexity involved can be characterized by different individual and interpersonal parameters (see Smith & Stevens, 1999, p. 408). From our new complexity perspective, this kind of fluid determinism through complex, dynamic interweaving is taking place within webbed networks with their webbed interactions within relational networks. It is the interweaving of the relationships within these dynamic loop networks that is generating potential nonlinear multiplier effects over time, such as Snowball Phenomenon, Butterfly Effect, as examples of bootstrapping effects. More specifically, we focus on complex, hypercyclic webs, with dynamic, web-like structures; that is, structures of dynamically interconnected loops with nonlinear, hypercyclic couplings and their hypercyclic organization (Kauffman, 1993, p. 359, p. 361). These couplings of cycles itself, with their coupled activity as emerging from the causal dynamics of impelling forces and causal effects, exerted within the causal loops of interactive relationships, can be taken as dynamic unities of ensembles. The responses of the activities involved are complex responses to a reciprocal kind of relating (see Follett, 1924; see also Follett, in Drucker et al., 1995, pp. 42, 43). For the case of dyadic human interaction, with interaction within a context or environment being part of the functioning of a whole, this implies a kind of tri-angular model of a fundamental, complex unity, with reciprocal interdependence (cf. Mainzer, 2004, pp. 115-117). The human development can be modelled as a kind of spiral development towards higher levels, potentially generating such a spiral of development for both partners. This is how human beings can make one another by shaping each other in their communicative human interaction (see Kauffman, 1993, p. 371). This description of the complexity of human interaction is way beyond that of the machine metaphor, linked to the mechanistic version of determinism. We may conclude that the kind of new thinking in complexity is what humanizing such determinism is really about for the social sciences and humanities.

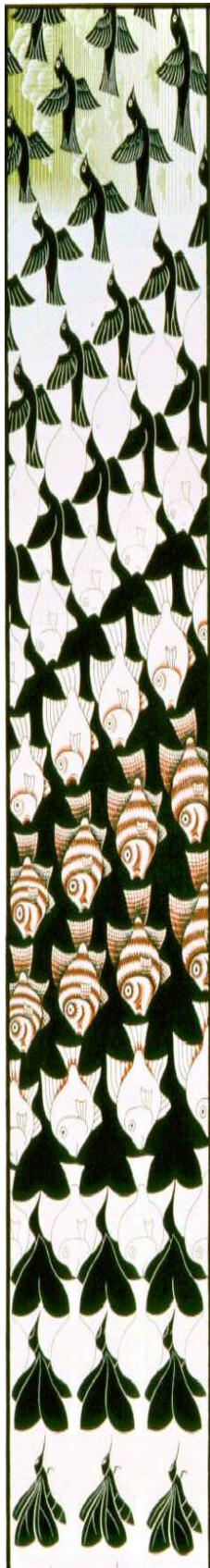
As we argue below, the new approach may also bring with it a humanizing of these sciences and humanities themselves. We believe this is of special importance for the study of the lived realities of human being in these fields of science, in terms of realizing themselves. This is especially of significance for the field of learning and education, by opening and enlarging the space of the possible within a world of the possible (Kauffman, 1993; italics in original; see also Osberg, 2009; Jörg, 2009).



We are of the opinion that the new science of complexity may deliver the new tools of thinking needed for becoming descriptive and explanatory about the unfathomable complexity of human beings as part and parcel of real-world complexity within our social world. These tools are of relevance for all the disciplines of our social sciences. These tools of thinking include a reframing of complexity and a new framework for dealing with this real complexity. The new science is founded on a different ontology about real-world complexity and on new ways of knowing about this complexity. This epistemology is fundamentally an epistemology of the possible. With this epistemology about real-world complexity, we think we are able to open the world of the possible. This epistemology may offer the opening to address what Niklas Luhmann has described as the fundamental 'uncertainty of knowledge' (Luhmann, 2002, p. 152). With Luhmann, we must realize that we cannot reach certainty of knowledge about the very complexity of complexity itself. We think, we may address this hitherto unknown complexity of real-world complexity, with this uncertainty included. This epistemology of complexity, which is simultaneously an epistemology of the possible, is opening new spaces of the possible, within a new world of the possible. Consequently, the new science of complexity offers an enlarged worldview about a richer sort of reality.

The new thinking in complexity of the new science offers a new lens for viewing and doing science within the different disciplines: of viewing systems with new eyes. This can offer a real and realistic opening for a new kind of research. With Robson (2002), this kind of research may be described as 'real world research' about real-world problems within the real world, which is commonly related to real-world complexity: see Box A, about the triangular, reciprocal interdependency between the new science and the problems at hand, with a 'natural' complexity involved. These problems are often about the so-called 'big questions' that are still unanswered in our sciences (Morin, 2008). To find the answers, we need to become more inventive and creative in our way of thinking. This new real world research, with a focus on big questions and complex phenomena, may bring with it an opening of the social sciences. This can be the very opening as desired by different groups of various kinds of scientists all over the world (cf. Wallerstein et al., 1996; the Santa Fé group in the USA; the corresponding European initiative of Para Limes; the European Committee of Complex Systems; NWO, 2008 and more local initiatives by universities).

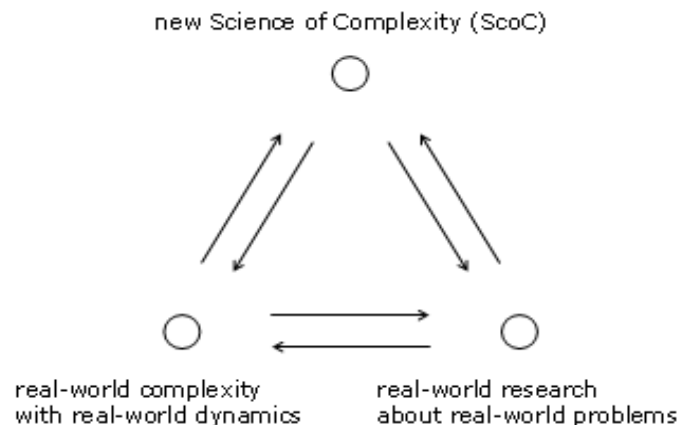
We are deeply convinced that we need a reframing of complexity to be able to generate a better understanding of real-world complexity and to deal with this natural complexity. Only by reframing complexity, we are



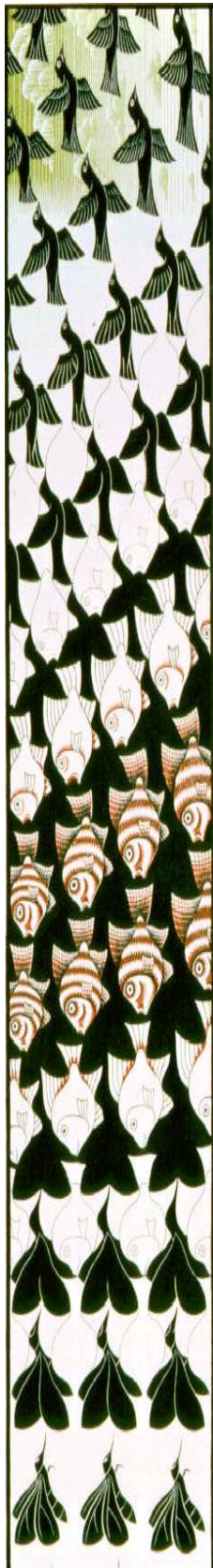
able to understand how we may turn complexity into effective complexity. The ultimate challenge is to become more knowledgeable about how we may turn this effective complexity into a kind of advantageous complexity, for the benefit of humanity and society at large. So, we come to the conclusion that we need a true understanding of complexity to tackle the problems of complexity of real-world complexity.

Because of its deep connection with real-world complexity, we think we may present our theorizing about complexity in terms of a so-called 'grounded theory': a grounded theory of complexity, which is fundamentally grounded in the causal power of causal forces, exerted in causal interaction within interactive causal relations (cf. Craver, 2006, p. 224). These causal relations are reciprocal causal relations in our modelling of the causal processes involved in causal interaction between the fluid entities of the new dynamic unit of the ensemble, as a kind of system.

Box A *Triangular, reciprocal interdependency between the new Science of Complexity (ScoC), real-world complexity and real-world research*



The new science, with its grounded theory of complexity, is opening for a true understanding of the forces operating in the complexity of forces exerted in causal interaction within interactive relationships (cf. Scheffer, 2009b, p. 8). The new science offers an explanatory framework of nonlinear causality about complex phenomena like those of bootstrapping, the known 'Matthew effect' and unknown 'Jörg effect' and other nonlinear effects, which may fuel transitions and transformations in the real world. These are complex phenomena that thrive on the shaping forces exerted through causal influences in interaction. The mechanisms at 'work' in this, are kind of causal, generative mechanisms within the extended causal framework, which are enabling for the driving forces that may enforce

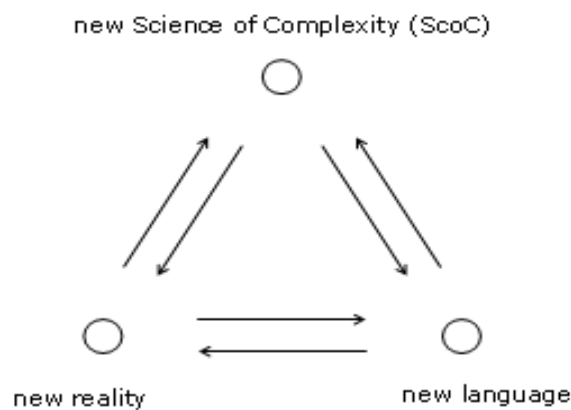


complex, nonlinear phenomena in our complex nonlinear reality.

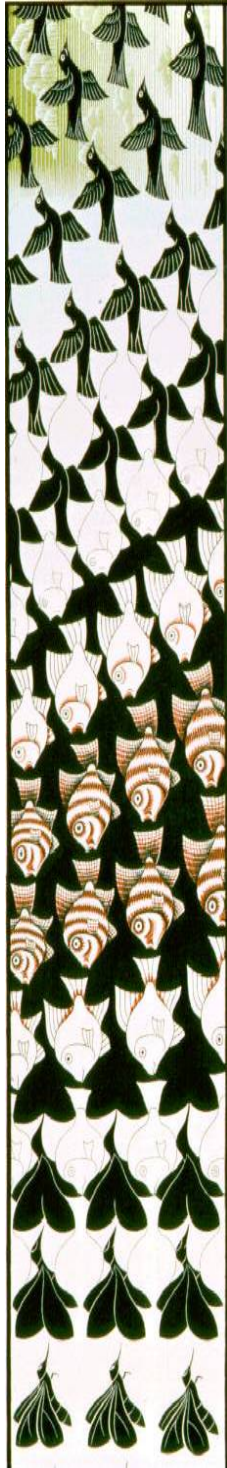
The new science, with the grounded theory of complexity, can be taken as an integrative science, because the same tools of thinking may be of use for the tackling of complexity in the variety of scientific realms and disciplines. What helps for this integration, is the creation of a new language, with new metaphors, like generative mechanisms, generative spaces and generative power as examples of 'the generative metaphor' (Schön, 1993). This new language, with a new vocabulary and new metaphors, is constitutive for how we view reality in our new science of complexity: see Box B below. We believe this language has the power of inducing a language-effected reality, which is very much about the richer sort of reality: that is, the nonlinear complex reality of real-world complexity (cf. Mainzer, 2007).

Although we may speak about our new science as a shift of mind, we think it is of importance to stress that the new science of complexity should not be taken as a shift of paradigm, in terms of Thomas Kuhn. Our shift of mind, grounded in new thinking in complexity, has not the intention to replace the 'normal' science, as Kuhn viewed such a shift of paradigm. Although we do propose a shift of focus on complexity and a new thinking in complexity, resulting in a reframing of complexity, we would like to

Box B *Triangular, reciprocal interdependency between the new science of complexity (ScoC), the new reality and the new language*



propose the new science of complexity as a complementary kind of science, which is a fundamental and foundational kind of science. The new science of complexity (ScoC) is fundamental, because of the new method, which is of relevance for all our scientific realms and disciplines and foundational because the new ScoC offers a new tool for deepening our



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view of doing science. It offers the perspective of a kind of retooling of our sciences by new ways of thinking about the complexity of real-world complexity (see Kuhn, 1970). We do have the intention to present our new science of complexity as a keystone for the social sciences. We are of the opinion that this is the stone that has been disdained by the builders of these sciences. The new science presents not only complexity as a serious object of study for the different scientific realms of our sciences but also with a complementary method for constructing models of nonlinear complex systems in the natural and social sciences (cf. Mainzer, 2004, p. 406). These complex models are the models we need for 'modelling collective behaviour' (ibid., p. 407; see also Kauffman, 1993, 1995, 2008). We think all of this is i.e., of relevance for the social sciences, with their variety of disciplines. The new science of complexity, with its fundamental and foundational generative approach, can therefore be regarded as a transdisciplinary science. It will be a science with a generative, transdisciplinary approach of complexity as generative complexity.

We hope the new science of complexity may expand the viewing and doing of science within the various fields and disciplines of our sciences, by taking into account the very complexity of various subjects of study in these scientific realms. Of course, by taking the complexity of real-world complexity as a serious subject of study, it may have consequences for the agenda of our sciences. Although our focus has been very much on the social sciences and humanities, we think it may bring with it unexpected openings to the natural sciences as well. Our modelling of the complexity of complex systems can be of use for the functioning of complex systems as wholes, in their interaction with one another, with the potential of transitory, transactional processes and patterns of development, generated through the (causal) power of bootstrapping (Kauffman, 1993, 1995; Scheffer, 2009a,b). Although our modelling diverges from the main roads of modelling in biology, this modelling, based on the modelling of nonlinear causality within the extended causal framework (ECF), shows an unexpected explanatory power. As such, the new science may be the foundation for "good science that is needed to shape the future in the best way" (Scheffer, 2009, p. 8). By the use of the generative power of generative complexity, for the use of shaping the future of our social sciences and humanities, it may become 'a science of hope'.

"The fact is that complexity is self-potentiating"

(Rescher, 1998, p. 28; emphasis added)

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