Self-Organisation

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This article will review the concept of self-organisation (SO). In particular, it will deal with (1) the historical origins, (2) basic elements, and (3) the possible importance of the concept for future developments in the science of complexity and beyond.

(1) Though there has been a discussion on whether or not the roots of the concept of SO can be traced back to philosophers like Schelling or Kant, it is a fact that the concept in the contemporary sense was first used by Heinz von Foerster during his investigations in cybernetics. The concept spread in a multitude of disciplines in (natural) science, until it spilled over to social science, humanities and arts too. This concept might be seen as the core concept of thinking in complexity. It ushered in a paradigm shift away from the so-called classical Newtonian worldview.

(2) There is not yet a unified theory of SO. There are different concepts due to different areas of investigation like physics, chemistry, life sciences, cosmology, social sciences, history, mathematics, fractal geometry. There are different concepts like those of dissipation (Prigogine), autopoiesis (Maturana, Varela, Mingers), re-creation (Jantsch). And there are different concepts as to which processes shall be defined as SO and which share only some of the features of fully-fledged SO processes (CSIRO, Collier, Bickhard).

But there is a potential of finding out what is common to the variety of SO concepts. Most of them are linked with the following concepts (cf. Christian Fuchs in Mark Bevir (ed.), Encyclopedia of Governance, vol. 2, Sage 2007, pp. 863): systemness, complexity, control parameters, critical values, fluctuation and intensification, feedback loops, circular causality, nonlinearity, bifurcation points, selection, emergence of order, information production, fault tolerance, openness, sysmmetry breaking, inner conditionality, relative chance, hierarchy, totalisation, unity through diversity.

The fundamental feature of the concept of SO is that it is emergentist and goes beyond the materialism–idealism divide. This can be discussed along the three dimensions of (a) ethical, (b) ontological, and (c) epistemological-methodological implications of the concept of SO.

(a) The practical implications of the SO concept is that neither an active stance nor a passive stance of the observer is apt.

(b) Theoretically, SO implies both deterministic and indeterministic features.

(c) In explanation and prediction, considering SO has to go beyond formal deductive logic.

(3) Evolutionary systems theory is the field in which the concept of SO is paid most attention. Evolutionary systems theory is a merger of evolutionary theory and systems theory. Evolutionary systems are self-organising systems and there is strong evidence that self-organising systems evolve and take part in evolution. The ethical, ontological, and epistemological-methodological aspects of evolutionary systems theory might be elaborated into evolutionary systems design, evolutionary systems modeling, and evolutionary systems methodology.

Basic concepts to be dealt with are: metasystem transition, suprasystem hierarchy; bottom-up- and top-down-emergence (dominance, downward causation), causes; phases and levels, stages; teleomatics, teleonomy, teleology; self-reference, self-maintenance, self-invention.