

SELF-ORGANIZATION

M.Chernyakova, *PM-51*

Self-organization is the spontaneous often seemingly purposeful formation of spatial, temporal, spatio-temporal structures or functions in systems composed of few or many components. In physics, chemistry and biology self-organization occurs in open systems driven away from thermal equilibrium. The process of self-organization can be found in many other fields also, such as economy, sociology, medicine, technology.

Many objects in our surrounding and daily life such as furniture, houses, cars, TV-sets, computers are man made. On the other hand, especially in the animate world, objects grow, acquire their form, and function without being created by humans. The animal kingdom abounds of examples. It is increasingly recognized that even the human brain may be considered as a self-organizing system as well as quite a number of manifestations of human activity, such as in economy and sociology. But processes of self-organization can be found also in the inanimate world: formation of cloud streets, planetary systems, galaxies etc.

A fundamental question is: Are there general principles for self-organization? In the inanimate world a positive answer could be found for large classes of phenomena. In the animate world so far at least some insights could be gained. In biology there is a controversy: are there general principles or do we need special rules and mechanisms in each individual case?

History. The concept of self-organization was discussed in ancient Greek philosophy. In more modern times, self-organization was discussed by the German philosopher Immanuel Kant, as well as by the German philosopher Schelling. In more modern times, self-organization was discussed by W. Ross Ashby and by Heinz von Förster within his "Cybernetics of second order". It was also discussed in thermodynamics.

A systematic study of self-organization phenomena is performed in the interdisciplinary field of synergetics that is concerned with a profound mathematical basis of self-organization as well as with experimental studies of these phenomena.

Theoretical Treatments: microscopic, macroscopic phenomenological. The theoretical treatment of self-organization is based both on microscopic, as well as macroscopic phenomenological approaches.

Of particular interest is the question, whether there are general principles of self-organization, irrespective of the nature of the individual parts of the system. In synergetics such principles could be found, at least for self-organization of the first kind, as outlined above. They are based on general concepts, such as order parameters and the slaving principle. The main issue is

the reduction of complexity. In large classes of systems their dynamics can be described by few order parameters. This serves also as a basis for the application of catastrophe theory as well as of chaos theory because both theories are based on the use of few variables.

The mathematical theory of synergetics provides an algorithm by which the order parameters and their equations can be derived, provided the basic microscopic equations are known, and it allows one to formulate model equations in terms of order parameters if the basic equations are unknown.

Applications. Self-organizing systems are adaptive and robust. They can reconfigure themselves to changing demands and thus keep on functioning in spite of perturbations. Because of this, self-organization has been used as a paradigm to design adaptive and robust artificial systems. The main idea is to engineer elements of a system so that they find a solution or perform a desired function. This approach is useful in non-stationary or very large problem domains, where the solution is not fixed or is unknown. Thus, the engineer does not need to reach a solution, as this is sought for constantly by the self-organizing elements.

Outlook. In the science community there is an increasing awareness of the importance of the concept of self-organization and quite a number of phenomena are now seen under this aspect.

A.M. Dyadechko, *ELA*

A BRAND-NEW YOU

Kholodion I., *group E-53*

Companies invest an enormous amount of time and money to develop, promote and sustain their corporate brands. Think of Coca-Cola, Apple, BMW or McDonalds. Branding is a powerful way to shape customer perceptions of products or services and to influence their buying behaviour. So, if branding works for companies, why can't it work for you as an individual? Take a few minutes to think about the following questions.

1. Why you need a personal brand. Tom Peters defined brand primarily as what other people think about us - the ideas and associations we stimulate in their minds by the way we look, sound and behave. He said that everyone has a personal brand, whether they like it or not. Some aspects of our brand will be positive, others negative.

Some benefits of personal branding: 1) greater visibility and opportunities for promotion; 2) better working partnerships inside your company; 3) higher salary; 4) the ability to attract and retain more customers; 5) greater self-confidence; 6) clearer focus on what really matters for you at work.