

# Welcome Address by Hermann Haken

Dear participants, dear Marko, dear Theo,

I am sending you all my best wishes for a fruitful and pleasant meeting. Since I have wonderful reminiscences of Marko's previous meetings *Let's Face Chaos through Nonlinear Dynamics*, I regret it deeply that I am unable to participate, but I want to contribute by some, partly historical, remarks. Since some time we observe an ever increasing splitting of science and technology into more and more highly specialised disciplines. The production of an overwhelming amount of knowledge is accompanied by a decrease of mutual understanding.

How can we deal with the ever increasing information flood? Clearly, there are attempts at managing knowledge production and retrieval by all kinds of institutions serving science by policy, or by the development of efficient search machines. But in my opinion the most important instrument is our human mind. What I mean is this. The most important and influential contributions to science are unifying concepts and theories. Just think of Mendelejew's periodic table of chemical elements, Maxwell's unification of electricity and magnetism, eventually including optics, Einstein's theory of space, time and matter, the development of quantum theory by Heisenberg and Schrödinger which forms the basis of most of modern technology, or the actual attempts at unified field theories, e.g. leading to the discovery of the Higgs particle.

Besides providing us with deep insights into the fundamental laws of nature, these theories make our handling of knowledge more economic. For instance, understanding one specific phenomenon helps us to understand or even to discover a new one.

So far, these theories refer to physics and chemistry. But today, our scientific horizon widens.

We realize that concepts, models and mathematical methods originating from physics, can be fruitfully applied to biology, brain science, and many other fields ranging till economy and sociology. We discover that most of these disciplines are concerned with the collective behavior of the often numerous individual parts of a system. Nearly everywhere we deal with complex systems which in many cases share one surprising property: Their action is not a mere random superposition of the actions of their individual parts. Rather these systems are capable of forming spatial, temporal or functional structures, including those showing deterministic chaos.

How can we explain the spontaneous self-organized emergence of new qualities of a total system that are alien to its individual parts? Surely, while to a physicist some of these phenomena are strongly reminiscent of phase-transitions, today we also witness the development of exciting new ideas.

This and previous summer-schools and conferences *Let's face chaos through nonlinear dynamics* organized by Marko Robnik play a very important role in this scientific enterprise. The lectures and discussions among students and professors and the wonderful social frame will surely make also this meeting a great success.

Perhaps I may close with a personal reminiscence. In lectures I gave jointly with Robert Graham in 1969/70 I coined the term *Synergetics* to define an interdisciplinary field of research that studies the spontaneous formation of structures in non-equilibrium systems and tries to unearth underlying common principles.

You may understand my joy that your meeting contributes so much to the realisation of my original dream.