Synergetics By Hermann Haken

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Synergetics By Hermann Haken
Synergetics is an interdisciplinary science explaining the formation and self-organization of patterns and structures in open systems far from thermodynamic equilibrium. It is founded by Hermann Haken, inspired by the laser theory. Haken's interpretation of the laser principles as self-organization of non-equilibrium systems paved the way at the end of the 1960s to the development of synergetics. One of his successful popular books is Erfolgsgeheimnisse der Natur, translated into English as The

~~Synergetics (Haken) - Wikipedia~~
Over the past years the field of synergetics has been mushrooming. An ever increasing number of scientific papers are published on the subject, and numerous conferences all over the world are devoted to it. Depending on the particular aspects of synergetics being treated, these conferences can ... Haken, Professor Dr. Dr. h. c. Hermann ...

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Plenary lecture at CS-DC'15 World Conference as part of Interdisciplinary studies on Synergy. September 30, 2015

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Synergetics, an interdisciplinary research program initiated by H. Haken in 1969, deals with the systematic and methodological approach to the rapidly growing field of complexity.

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Hermann Haken (born 1927) is one of the “fathers” of the quantum-mechanical laser theory, formulated between 1962 and 1966, in strong competition with American researchers. Later on, he created Synergetics, the science of cooperation in multicomponent systems. The book concentrates on the development of his scientific work during the first thirty-five years of his career.

~~Hermann Haken: From the Laser to Synergetics | SpringerLink~~
Synergetics (Greek: "working together") is an interdisciplinary field of research originated by Hermann Haken in 1969 (see also Haken and Graham 1971). Synergetics deals with material or immaterial systems, composed of, in general, many individual parts (Haken 2004, see also Springer series in Synergetics, about 80 volumes).

~~Synergetics - Scholarpedia~~
Wilhelm Specht. Hermann Haken (born 12 July 1927 in Leipzig, Germany) is physicist and professor emeritus in theoretical physics at the University of Stuttgart. He is known as the founder of synergetics. He is a cousin of the mathematician Wolfgang Haken, who proved the Four color theorem .

~~Hermann Haken - Wikipedia~~
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This book is an often-requested reprint of two classic texts by H. Haken: "Synergetics. An Introduction" and "Advanced Synergetics". Synergetics, an interdisciplinary research program initiated by H. Haken in 1969, deals with the systematic and methodological approach to the rapidly growing field of complexity. Going well beyond qualitative analogies between complex systems in fields as ...

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The interpretation of the laser principles as self organization of non equilibrium systems paved the way to the development of synergetics, of which Haken is recognized as the founder. Hermann Haken has been visiting professor or guest scientist in England, France, Japan, USA, Russia, and China. He is the author of some 23 textbooks and monographs that cover an impressive number of topics from laser physics to synergetics, and editor of a book series in synergetics.

~~Synergetics : Hermann Haken : 9783642074059~~
Advanced Synergetics by Hermann Haken,, available at Book Depository with free delivery worldwide. One of his successful popular books is Erfolgsgeheimnisse der Naturtranslated into English as The Science of Snergetics Linear Ordinary Differential Equations. Table of contents 1. He is known as the founder of synergetics.

This text on the interdisciplinary field of synergetics will be of interest to students and scientists in physics, chemistry, mathematics, biology, electrical, civil and mechanical engineering, and other fields. It continues the outline of basic con cepts and methods presented in my book Synergetics. An Introduction, which has by now appeared in English, Russian, J apanese, Chinese, and German. I have written the present book in such a way that most of it can be read in dependently of my previous book, though occasionally some knowledge of that book might be useful. But why do these books address such a wide audience? Why are instabilities such a common feature, and what do devices and self-organizing systems have in common? Self-organizing systems acquire their structures or functions without specific interference from outside. The differentiation of cells in biology, and the process of evolution are both examples of self-organization. Devices such as the electronic oscillators used in radio transmitters, on the other hand, are man made. But we often forget that in many cases devices function by means of pro cesses which are also based on self-organization. In an electronic oscillator the motion of electrons becomes coherent without any coherent driving force from the outside; the device is constructed in such a way as to permit specific collective motions of the electrons. Quite evidently the dividing line between self-organiz ing systems and man-made devices is not at all rigid.

This book is an often-requested reprint of two classic texts by H. Haken: "Synergetics. An Introduction" and "Advanced Synergetics". Synergetics, an interdisciplinary research program initiated by H. Haken in 1969, deals with the systematic and methodological approach to the rapidly growing field of complexity. Going well beyond qualitative analogies between complex systems in fields as diverse as physics, chemistry, biology, sociology and economics, Synergetics uses tools from theoretical physics and mathematics to construct an unifying framework within which quantitative descriptions of complex, self-organizing systems can be made. This may well explain the timelessness of H. Haken's original texts on this topic, which are now recognized as landmarks in the field of complex systems. They provide both the beginning graduate student and the seasoned researcher with solid knowledge of the basic concepts and mathematical tools. Moreover, they admirably convey the spirit of the pioneering work by the founder of Synergetics through the essential applications contained herein that have lost nothing of their paradigmatic character since they were conceived.

The publication of this second edition was motivated by several facts. First of all, the first edition had been sold out in less than one year. It had found excellent critics and enthusiastic responses from professors and students welcoming this new interdisciplinary approach. This appreciation is reflected by the fact that the book is presently translated into Russian and Japanese also. I have used this opportunity to include some of the most interesting recent developments. Therefore I have added a whole new chapter on the fascinating and rapidly growing field of chaos dealing with irregular motion caused by deterministic forces. This kind of phenomenon is presently found in quite diverse fields ranging from physics to biology. Furthermore I have included a section on the analytical treatment of a morphogenetic model using the order parameter concept developed in this book. Among the further additions, there is now a complete description of the onset of ultrashort laser pulses. It goes without· saying that the few minor mis prints or errors of the first edition have been corrected. I wish to thank all who have helped me to incorporate these additions.

This book presents a novel approach to neural nets and thus offers a genuine alternative to the hitherto known neuro-computers. The new edition includes a section on transformation properties of the equations of the synergetic computer and on the invariance properties of the order parameter equations. Further additions are a new section on stereopsis and recent developments in the use of pulse-coupled neural nets for pattern recognition.

It is increasingly being recognized that the experimental and theoretical study of the complex system brain requires the cooperation of many disciplines, in cluding biology, medicine, physics, chemistry, mathematics, computer science, linguistics, and others. In this way brain research has become a truly interdis ciplinary endeavor. Indeed, the most important progress is quite often made when different disciplines cooperate. Thus it becomes necessary for scientists to look across the fence surrounding their disciplines. The present book is written precisely in this spirit. It addresses graduate students, professors and scientists in a variety of fields, such as biology, medicine and physics. Be yond its mathematical representation the book gives ample space to verbal and pictorial descriptions of the main and, as I believe, fundamental new insights, so that it will be of interest to a general readership, too. I use this opportunity to thank my former students, some of whom are my present co-workers, for their cooperation over many years. Among them I wish to mention in particular M. Bestehorn, L. Borland, H. Bunz, A. Daf fertshofer, T. Ditzinger, E. Fischer, A. Fuchs, R. Haas, R. Honlinger, V. Jirsa, M. Neufeld, M. Ossig, D. Reimann, M. Schanz, G. Schoner, P. Tass, C. Uhl. My particular thanks go to R. Friedrich and A. Wunderlin for their constant help in many respects. Stimulating discussions with a number of colleagues from a variety of fields are also highly appreciated.

This volume contains most of the invited papers presented at the International Work shop on Synergetics, Schloss E1mau, Bavaria, May 2 to.May 7, 1977. This workshop fol lowed an International Symposium on SynergetiGS at Schloss E1mau, 1972, and an Inter national SUl111lerschoo1 at Erice, Sicily, 1974. Synergetics is a rather new field of interdisciplinary research which studies the self-organized behavior of systems leading to the formation of structures and func tionings. Indeed the whole universe seems to be organized, with pronounced structures starting from spiral galaxies down to living cells. Furthermore, very many of the most interesting phenomena occur in systems which are far from thermal equilibrium. Synergetics in its present form focusses its attention on those phenomena where dra matic changes occur on a macroscopic scale. Here indeed Synergetics was able to re veal profound analogies between systems in different disciplines ranging from physics to sociology. This volume contains contributions from various fields but the reader will easily discover their cO111J1on goal. Not only in the natural sciences but also in ecology, sociology, and economy, man is confronted with the problems of complex sys tems. The principles and analogies unearthed by Synergetics will certainly be very helpfu~ to cope with such difficult problems. I use this opportunity to thank the Volkswagenwerk Foundation for its support of the project Synergetics and in particular for sponsoring the International Workshop on Synergetics.

Hermann Haken (born 1927) is one of the “fathers” of the quantum-mechanical laser theory, formulated between 1962 and 1966, in strong competition with American researchers. Later on, he created Synergetics, the science of cooperation in multicomponent systems. The book concentrates on the development of his scientific work during the first thirty-five years of his career. In 1970 he and his doctoral student Robert Graham were able to show that the laser is an example of a nonlinear system far from thermal equilibrium that shows a phase-transition like behavior. Subsequently, this insight opened the way for the formulation of Synergetics. Synergetics is able to explain, how very large systems show the phenomenon of self-organization that can be mathematically described by only very few order parameters. The results of Haken’s research were published in two seminal books Synergetics (1977) and Advanced Synergetics (1983). After the year 1985 Haken concentrated his research on the macroscopic foundation of Synergetics. This led him towards the application of synergetic principles in medicine, cognitive research and, finally, in psychology. A comprehensive bibliography of Hermann Haken’s publications (nearly 600 numbers) is included in the book.

This book addresses both multi robot systems and miniaturization to the nanoscale from a unifying point of view, but without leaving aside typical particularities of either. The unifying aspect is based on the concept of information minimization whose precise formulation is the Haken-Levi-principle. The authors introduce basic concepts of multi-component self-organizing systems such as order parameters (well known from equilibrium and non-equilibrium phase transitions) and the slaving principle (which establishes a link to dynamical systems). Among explicit examples is the docking manoeuvre of two robots in two and three dimensions. The second part of the book deals with the rather recently arising field of molecular robotics. It is particularly here where nature has become a highly influential teacher for the construction of robots. In living biological cells astounding phenomena occur: there are molecules (proteins) that literally walk on polymer strands and transport loads that are heavier than their carriers, or molecules that, by joint action, contract muscles. The book provides the reader with an insight into these phenomena, especially by a detailed theoretical treatment of the molecular mechanism of muscle contraction. At the molecular level, for an appropriate approach the use of quantum theory is indispensable. The authors introduce and use it in a form that avoids all the clumsy calculations of wave-functions. They present a model which is based on an elementary version of quantum field theory and allows taking into account the impact of the surrounding on the quantum mechanical activity of a single molecule. By presenting explicit and pedagogical examples, the reader gets acquainted with the appropriate modelling of the walking behaviour of single molecular robots and their collective behaviour. The further development of multi-robot systems and particularly of molecular robots will require the cooperation of a variety of disciplines. Therefore the book appeals to a wide audience including researchers, instructors, and advanced graduate students.

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