

## New Books

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## Knihy došlé do redakce/Books received

*V. I. Grubov, V. S. Kirdan, S. F. Kozubovskij*: Spravočník po EVM. Naukova dumka, Kiev 1989. 544 stran; cena 2,60 Rb.

*Hans-Michael Voigt*: Evolution and Optimization — An Introduction to Solving Complex Problems by Replicator Networks. Akademie-Verlag, Berlin 1989. 236 pages; 83 figs.; M 45,—.

The Paradigm of Self-Organization — Current Trends in Self-Organization (*G. J. Dalenoort, ed.*). (Studies in Cybernetics 19.) Gordon and Breach Science Publishers, New York—London—Paris—Montreux—Tokyo—Melbourne 1989. xi + 332 pages; \$ 45,—.

*P. P. Masani*: Norbert Weiner, 1984—1964. Birkhäuser Verlag, Basel—Boston—Berlin 1990. 546 pages; SFR 98,—.

*V. V. Vasilev, V. V. Kuzmuk*: Seti Petri, paralelne algoritmy i moděli multiprocessornych sistem. (Akademija nauk Ukrainskoj SSR — Institut problem modělirovanija v energetike.) Naukova dumka, Kiev 1990. 216 stran; cena 3,20 Rb.

Computers in Science and Higher Education — Contributions to the Conference BIT' 89 held in Berlin, GDR, June 19—23, 1989 (*Jan Grabowski, ed.*). (Mathematical Research — Mathematische Forschung Band 57.) Akademie-Verlag, Berlin 1990. 324 pages; M 42,—.

*Andreas Brandt, Peter Franken, Bernd Lisek*: Stationary Stochastic Models. Akademie-Verlag, Berlin 1990. 344 pages; M 78,—.

*S. D. Pogorelych, T. F. Slobodjanjuk*: Programnoe obespečenie mikroprocessornych sistem: Spravočník. 2. přepracované a doplněné vydání. Technika, Kiev 1989. 304 stran; cena 1,50 Rb.

*A. G. Dodonov, M. G. Kuzněcova, E. S. Gorbačik*: Vvedenie v teoriju živučesti vyčislitelnych sistem. (Akademija nauk Ukrainskoj SSR — Institut problem registracii informacii.) Naukova dumka, Kiev 1990. 184 stran; cena 3,— Rb.

*B. Ja. Konkraščenko, S. D. Binničuk, M. Ju. Fedorov*: Modělirovanie gazovych i židkostnych raspredělitelnych sistem. (Akademia nauk Ukrainskoj SSR — Institut problem modělirovanija v energetike.) Naukova dumka, Kiev 1990. 184 stran; cena 2,70 Rb.

Nonlinear Dynamics and Quantum Dynamical Systems — Contributions to the International Seminar ISAM-90 held in Gaussig (GDR), March 10—23, 1990 (*Gennadij A. Leonov, Volker Reitmann, Werner Timmermann, eds.*). (Mathematical Research 59.) Akademie-Verlag, Berlin 1990. 168 pages; DM 24,—.

*Ladislav Kohout*: A Perspective on Intelligent Systems — A framework for analysis and design. (Chapman and Hall Computing Series.) Chapman and Hall, London—New York—Tokyo—Melbourne—Madras 1990. xiv + 255 pages.

*Leonid Jaroslavskij, Ivan Bajla*: Metódy a systěmy čislicového spracovania obrazov. ALFA — vydavateľstvo technickej a ekonomickej literatúry, Bratislava 1989. 528 strán; 133 obr., 15 tab., 1 príloha; cena 40,— Kčs.

*Mikuláš Popper, Jozef Kelemen*: Expertné systěmy. ALFA — vydavateľstvo technickej a ekonomickej literatúry, Bratislava 1988. 360 strán; 31 obr., 2 tab.; cena 32,— Kčs.

*Karol Hodinár*: Štandardné aplikačné programy osobných počítačov. ALFA — vydavateľstvo technickej a ekonomickej literatúry, Bratislava 1989. 272 strán; 132 obr., 4 prílohy; cena 30,— Kčs.

G. J. DALENOORT, ED.

## The Paradigm of Self-Organization

### Current Trends in Self-Organization

Studies in Cybernetics 19.

Gordon and Breach Science Publishers, New York—London—Paris—Montreux—Tokyo—Melbourne 1989.

xi + 332 pages; 87 figures; \$ 45,—.

This book contains a preface of the editor and sixteen papers. Most valuable is a common name-and subject index. Each paper has its own references. Altogether there are 468 references which constitute an important data base about the subject.

The editor, G. J. Dalenoort of the University of Groningen, The Netherlands, characterizes self-organization in systems as the emergence of order out of local interactions, without any general plan being present anywhere and without external supervising agent. He mentions some methods that are usually applied to specific types of phenomena, where self-organizing processes play a role, for example: autopoiesis (Maturana and Varela), synergetics (Haken), dissipative systems (Prigogine), catastrophe theory (Thom), evolutionary systems (Lotka-Volterra equations, population dynamics), chemical auto-catalytic systems (Eigen). In relation to the biological phenomena of evolution and morphogenesis which are typical of self-organization he points out to the seeming mystery of these processes in that they create states of relatively high order out of states of low order, without any external agent that controls them or guides into a desired direction. He considers points of view from classical cybernetics based on feedback as too restricted for a satisfactory description of these biological phenomena. In his second paper "Mechanisms of self-organization" G. J. Dalenoort makes a distinction between physical self-organization and cybernetic self-organization characterized by feedback- or feedforward interactions. He stresses the role of circular chains of chemical reactions which may be considered as classifiers of molecules and which are typical examples of cybernetic self-organization.

A. M. Andrew of the United Kingdom has contributed much to the high standard of this book by his papers "The paradigm of self-organizing systems" and "Simple substrates for self-organization". The first paper, besides giving an excellent survey of the development of the art and its relation to the topic of Artificial Intelligence and to neurophysiology (models of neural plasticity), contains an interesting information about the possible role of very fine nerve fibers, named C-fibres, in controlling the interconnections of larger nerve fibers running alongside them. This would be in agreement with the idea of an interplay of a controlling or learning automaton and the operating automaton in the sense of V. M. Glushkov (Introduction to Cybernetics, Russian original of 1964, p. 147). In the context of the dynamics of global environment the mention of the Gaia hypothesis of J. E. Lovelock about the global regulation of oxygen content of air and the salinity of oceans is certainly vivid.

D. L. Velkov from the University of Sofia, Bulgaria, in his paper "Self-organization in the context of cybernetics: Philosophical aspects" gives a thorough survey of the pertinent philosophical standpoints. Most interesting is his pointing to the principle of self-organization through complexity arising from noise of Henri Atlan which he criticises. He informs also about the suggestion of Atlan (1986) that the DNA should be considered not as a programme, but as inputs of probabilistic chemical automata.

Two papers are from Hungary: V. Csányi: "The replicative model of self-organization: a general theory of evolution", based on the recognition of the "biosocial" entity as a system. The other is by G. Kampis: "On problems of self-organization" which considers self-organizing systems as hierarchical systems with specific dynamics. The hierarchical structure of self-organizing systems is the object of two papers from FRG: D. Gernert: "The formation of hierarchical

structures as a key to self-organization" and J. D. Becker and E. Zimmermann: "On the dualism of dynamics and structure — with possible applications to social science". The paper of K. Kornwachs and W. von Lucadou (FRG): "Open systems and complexity" copes with the difficulty of description of complex systems and discusses a new kind of uncertainty relation for them.

The book contains four papers dealing specifically with psychological aspects and applications:

P. van Geert in his paper "Cognitive development: a process of organized self-organization" considers the cognitive development of man (a psychological system, characterized by selected variables) as a complex process, combining thus the educationalists point of view, stressing the necessity of an organized learning environment and the developmentalists point of view based on self-organization through proper activity of the developing person.

A. Goudsmit in "Organizational closure, the process of psychotherapy and the psychologist's fallacy" extends the theory of autopoietic systems to the study of psychotherapeutic processes. A system is called organizationally closed when its organization is characterized by processes which recursively depend on each other in the generation and realization of the processes themselves and when they constitute the system as a unity. The paper attempts to understand psychotherapeutic processes (interactions) as the behaviours of an organizationally closed system. The psychologist's fallacy means the confusion of his own standpoint with that of the mental fact which he describes. An alternative method is suggested.

A. Cornelis: "Depression as cultural illness. A social epistemology model of catastrophic learning." The notion of catastrophic learning is the search for solutions for problems in a system of learning that does not contain the steering instructions for finding a viable solution. It can lead to a rupture between the self-steering and self-organizing individual and his cultural environment. The cause of depression is presented as the lack of self-steering information in a cultural system of communication.

E. Steiner and L. Reiter in "Family therapy, therapy research, and the theory of self-referential systems" are concerned with the application of the theory of autopoietic systems to sociology in the particular field of family therapy. Consequences are discussed of the social and psychical system being closed, self-referential systems, acting as environment each one for the other. This leads to a new design of empirical therapeutic studies regarding the family system as environment.

J. Mowitz and A. Goudsmit in the important paper "Organizational closure and morphogenesis" deal with problems of changes of shape of closed configurations capable of parallel or concentric displacement. Two separate planes are used: one for geometric investigation of triangles and lines (using angular bisectors and bifurcation points), a second for circles and lines. Through entanglement between the processes in the two planes processes of growth and of increase of complexity are simulated. Most interesting is the relation of the geometry of displacing circles to the Voronoi tessellation (after G. F. Voronoi, 1868—1908), known in pattern recognition and communication technique.

K. Kornwachs in his paper "Self-reference and information" considers basic conditions for self-reproduction of systems, which for the Turing machine leads to the introduction of a second Turing machine.

The contents of the book is in conformity with its title and the meaning of the word paradigm in the sense of T. S. Kuhn from his book "Structure of Scientific Revolutions" (1962), maybe even in a wider aspect including its temporal development. The editor has succeeded to obtain from the authors contributions of high and homogeneous standard. The subject of the book is actual: there are now many efforts in the research of systems with autonomous automatic organization and of cybernetic systems with automatic control of organization (as the referee uses to call the main classes of self-organizing systems). The paradigm is evolving: there is a renaissance of this multidisciplinary subject, related to biochemical processes, neural nets, cognitive science and psychology. The attentive and receptive reader will find in this book many a stimulus for his own work in these forefront areas.

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