

M. Eigen P. Schuster

The Hypercycle

A Principle of Natural Self-Organization



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The Hypercycle A Principle Of Natural Self Organization

Esteban Domingo, Peter Schuster



The Hypercycle A Principle Of Natural Self Organization:

The Hypercycle M. Eigen, Peter Schuster, 2012-12-06 This book originated from a series of papers which were published in Die Naturwissenschaften in 1977¹⁷⁸ Its division into three parts is the reflection of a logic structure which may be abstracted in the form of three theses A Hypercycles are a principle of natural selforganization allowing an integration and coherent evolution of a set of functionally coupled self replicative entities B Hypercycles are a novel class of nonlinear reaction networks with unique properties amenable to a unified mathematical treatment C Hypercycles are able to originate in the mutant distribution of a single Darwinian quasi species through stabilization of its diverging mutant genes Once nucleated hypercycles evolve to higher complexity by a process analogous to gene duplication and specialization In order to outline the meaning of the first statement we may refer to another principle of material selforganization namely to Darwin's principle of natural selection This principle as we see it today represents the only understood means for creating information be it the blue print for a complex living organism which evolved from less complex ancestral forms or be it a meaningful sequence of letters the selection of which can be simulated by evolutionary model games *The Hypercycle. A Principle of Natural Self-organization* Manfred Eigen, Peter Schuster, 1979 *The Hypercycle* M Eigen, Peter Schuster, 1979-04-01

The Hypercycle Manfred Eigen, 197? *The Hypercycle. A Principle of Natural Self-organization. Part C: the Realistic Hypercycle* Manfred Eigen, Peter Schuster, 1978 **Physics of Self-Organization and Evolution** Werner Ebeling, Rainer Feistel, 2011-10-17 This thoroughly updated version of the German authoritative work on self organization has been completely rewritten by internationally renowned experts and experienced book authors to also include a review of more recent literature It retains the original enthusiasm and fascination surrounding thermodynamic systems far from equilibrium synergetics and the origin of life representing an easily readable book and tutorial on this exciting field The book is unique in covering in detail the experimental and theoretical fundamentals of self organizing systems as well as such selected features as random processes structural networks and multistable systems while focusing on the physical and theoretical modeling of natural selection and evolution processes The authors take examples from physics chemistry biology and social systems and include results hitherto unpublished in English The result is a one stop resource relevant for students and scientists in physics or related interdisciplinary fields including mathematical physics biophysics information science and nanotechnology

The Knowledge Grid Hai Zhuge, 2004 The Knowledge Grid is an intelligent and sustainable interconnection environment that enables people and machines to effectively capture publish share and manage knowledge resources It also provides appropriate on demand services to support scientific research technological innovation cooperative teamwork problem solving and decision making It incorporates epistemology and ontology to reflect human cognitive characteristics exploits social ecological and economic principles and adopts techniques and standards developed during work toward the future web This book presents its methodology theory models and applications systematically for the first time **Origins**

of Life: The Primal Self-Organization Richard Egel,Dirk-Henner Lankenau,Armen Y. Mulkidjanian,2011-08-31 If theoretical physicists can seriously entertain canonical standard models even for the big bang generation of the entire universe why cannot life scientists reach a consensus on how life has emerged and settled on this planet Scientists are hindered by conceptual gaps between bottom up inferences from early Earth geological conditions and top down extrapolations from modern life forms to common ancestral states This book challenges several widely held assumptions and argues for alternative approaches instead Primal syntheses literally or figuratively speaking are called for in at least five major areas 1 The first RNA like molecules may have been selected by solar light as being exceptionally photostable 2 Photosynthetically active minerals and reduced phosphorus compounds could have efficiently coupled the persistent natural energy flows to the primordial metabolism 3 Stochastic uncoded peptides may have kick started an ever tightening co evolution of proteins and nucleic acids 4 The living fossils from the primeval RNA World thrive within modern cells 5 From the inherently complex protocellular associations preceding the consolidation of integral genomes eukaryotic cell organization may have evolved more naturally than simple prokaryote like life forms If this book can motivate dedicated researchers to further explore the alternative mechanisms presented it will have served its purpose well **Animal Cell**

Biotechnology Hansjörg Hauser,Roland Wagner,2014-11-10 This book introduces fundamental principles and practical application of techniques used in the scalable production of biopharmaceuticals with animal cell cultures A broad spectrum of subjects relevant to biologics production and manufacturing are reviewed including the generation of robust cell lines a survey of functional genomics for a better understanding of cell lines and processes as well as advances in regulatory compliant upstream and downstream development The book is an essential reference for all those interested in translational animal cell based pharmaceutical biotechnology **Variable Quality in Consumer Theory** W.M. Wadman,2016-07-01

Examines consumer decision making on products and services of variable quality at the level of retail markets Addresses for the first time consumer producer interaction at the level of the individual consumer issues of quality consumption experience and willingness to pay as exhibited by individual consumers and how these issues affect the decision making process

Models and Applications of Chaos Theory in Modern Sciences Elhadj Zeraoulia,2011-09-07 This book presents a select group of papers that provide a comprehensive view of the models and applications of chaos theory in medicine biology ecology economy electronics mechanical and the human sciences Covering both the experimental and theoretical aspects of the subject it examines a range of current topics of interest It consid *Physics in Molecular Biology* Kim Sneppen,Giovanni Zocchi,2005-08-25 This book first published in 2005 is a discussion for advanced physics students of how to use physics to model biological systems *Protocells* Steen Rasmussen,Mark A. Bedau,Liaohai Chen,David Deamer,David C.

Krakauer,2022-06-07 The first comprehensive general resource on state of the art protocell research describing current approaches to making new forms of life from scratch in the laboratory Protocells offers a comprehensive resource on current

attempts to create simple forms of life from scratch in the laboratory These minimal versions of cells known as protocells are entities with lifelike properties created from nonliving materials and the book provides in depth investigations of processes at the interface between nonliving and living matter Chapters by experts in the field put this state of the art research in the context of theory laboratory work and computer simulations on the components and properties of protocells The book also provides perspectives on research in related areas and such broader societal issues as commercial applications and ethical considerations The book covers all major scientific approaches to creating minimal life both in the laboratory and in simulation It emphasizes the bottom up view of physicists chemists and material scientists but also includes the molecular biologists top down approach and the origin of life perspective The capacity to engineer living technology could have an enormous socioeconomic impact and could bring both good and ill Protocells promises to be the essential reference for research on bottom up assembly of life and living technology for years to come It is written to be both resource and inspiration for scientists working in this exciting and important field and a definitive text for the interested layman

Feature Papers Michael Henson, 2018-10-04 This book is a printed edition of the Special Issue Feature Papers that was published in Processes **Complexity and Complex Thermo-Economic Systems** Stanislaw Sieniutycz, 2019-11-24 Complexity and Complex Thermo-economic Systems describes the properties of complexity and complex thermo economic systems as the consequence of formulations definitions tools solutions and results consistent with the best performance of a system Applying to complex systems contemporary advanced techniques such as static optimization optimal control and neural networks this book treats the systems theory as a science of general laws for functional integrities It also provides a platform for the discussion of various definitions of complexity complex hierarchical structures self organization examples special references and historical issues This book is a valuable reference for scientists engineers and graduated students in chemical mechanical and environmental engineering as well as those in physics ecology and biology helping them better understand the complex thermodynamic systems and enhance their technical skills in research Provides a lucid presentation of the dynamical properties of thermoeconomic systems Includes original graphical material that illustrates the properties of complex systems Written by a first class expert in the field of advanced methods in thermodynamics Chemical Evolution: Origin Of Life Julian Chela-Flores, PhD, Cyril Ponnampertuma, PhD, 1992-12-31 This book addresses some important open questions in this interdisciplinary field of research In spite of its broad scope ranging from the earliest evidence of life on earth to the search for extraterrestrial intelligence the main focus is on chemical evolution Once the macromolecules of life were formed the evolution of the earliest life forms enhanced the importance of chirality This led to the highly asymmetric environment of the macromolecules of the living cell the hallmark of life itself The subject of chirality in particular is discussed in depth the status of the weak force as the only true chiral influence is presented A substantial number of papers review both the theoretical as well as the experimental basis of the origin of biochirality A second broad area discussed in

detail is the RNA world Some successes of this hypothesis are highlighted the hierarchy of previous evolutionary stages leading to the origin of life such as the pyrophosphate world are considered The question is raised whether useful hints may still be inferred from molecular fossils existing in contemporary cells Contents The Origin Evolution and Distribution of Life in the Universe C Ponnampersuma Chemical Origin and Early Evolution of Biological Energy Conversion H Baltscheffsky Phosphate in Models for Chemical Evolution G Arrhenius B Gedulin and Mojzsis Evolution in an RNA World P Schuster Small Pathogenic RNAs of Plants Living Fossils of the RNA World T O Diener The Weak Force and the Origin of Life A J MacDermott The Origin of Chirality the Role of Phase Transitions and Their Induction in Amino Acids A Salam Spontaneous Regulating Mechanisms That May Have Led to the Origin of Life J Chela Flores Chirality and the Origin of Life R Navarro Gonzalez R K Khanna and C Ponnampersuma Search for Phase Transitions Changing Molecular Chirality A Figureau E Duval and A Boukenter Theoretical and Experimental Studies on the Possibility of Chirality Dependent Time Direction in Molecules A S Garay Extraterrestrial Intelligences J Heidmann Discussion Sessions Biochemical Markers in Precambrian Sediments Indian Subcontinent S S Rane A V Patankar M S Chadha B Udayraj and S M Naqvi Practicabilities and Limits of Stereospecific Autocatalysis An Experimental Approach T Buhse W Thiemann D Lavabre and J C Micheau Ionizing Radiation and Chemical Processing of Waters on Early Earth I G Draganic and S I Vujosevic Chemical Effects of Ionizing Radiation and Sonic Energy in the Context of Chemical Evolution A Negrón Mendoza and G Albarran Differences in Radiolysis Behavior of D L Amino Acid in Primary Stage and Thermodynamic Equilibrium State W Q Wang J L Wu and J Jiang Experimental Searches for the Origin of Biomolecular Asymmetry L Keszthelyi True and False Chirality L D Barron Chiral Interaction and Biomolecular Evolution G Gilat Chiral Forces and Molecular Dissymmetry R Mohan Viroids and Viruses at the Origin of Organized Life L J Boya and P Boya The Role of Neoteny and Sociogenesis in the Evolution of Cell Structure V J A Novak

The Emergence of Organizations and Markets John F. Padgett, Walter W. Powell, 2012-10-14 A dynamic framework for studying social emergence The social sciences have sophisticated models of choice and equilibrium but little understanding of the emergence of novelty Where do new alternatives new organizational forms and new types of people come from Combining biochemical insights about the origin of life with innovative and historically oriented social network analyses John Padgett and Walter Powell develop a theory about the emergence of organizational market and biographical novelty from the coevolution of multiple social networks They demonstrate that novelty arises from spillovers across intertwined networks in different domains In the short run actors make relations but in the long run relations make actors This theory of novelty emerging from intersecting production and biographical flows is developed through formal deductive modeling and through a wide range of original historical case studies Padgett and Powell build on the biochemical concept of autocatalysis the chemical definition of life and then extend this autocatalytic reasoning to social processes of production and communication Padgett and Powell along with other colleagues analyze a very wide range of cases of emergence They look at the emergence

of organizational novelty in early capitalism and state formation they examine the transformation of communism and they analyze with detailed network data contemporary science based capitalism the biotechnology industry regional high tech clusters and the open source community

From Strange Simplicity to Complex Familiarity Manfred Eigen, 2013-05-23

This book presents a vivid argument for the almost lost idea of a unity of all natural sciences It starts with the strange physics of matter including particle physics atomic physics and quantum mechanics cosmology relativity and their consequences Chapter I and it continues by describing the properties of material systems that are best understood by statistical and phase space concepts Chapter II These lead to entropy and to the classical picture of quantitative information initially devoid of value and meaning Chapter III Finally information space and dynamics within it are introduced as a basis for semantics Chapter IV leading to an exploration of life and thought as new problems in physics Chapter V Dynamic equations again of a strange but very general nature bring about the complex familiarity of the world we live in Surprising new results in the life sciences open our eyes to the richness of physical thought and they show us what can and what cannot be explained by a Darwinian approach The abstract physical approach is applicable to the origins of life of meaningful information and even of our universe

Quasispecies: From Theory to Experimental Systems Esteban Domingo, Peter Schuster, 2016-03-18

This volume brings together recent developments in quasispecies theory extended to variable environments and practical applications in elucidating viral dynamics and treatment designs In particular the existence of an error threshold in rugged fitness landscapes has opened the way to a new antiviral strategy termed lethal mutagenesis which is now under intensive theoretical experimental and clinical investigation As such the book explains how an understanding of quasispecies dynamics within infected organisms has increased our knowledge of viral disease events From a clinical perspective population dynamics highlights important problems for viral disease control such as the selection of drug resistant mutants that often accompanies treatment failures and suggests means of increasing the effectiveness of antiviral treatments The book is intended for students and scientists interested in basic and applied aspects of biophysics chemistry biology evolution and medical virology

Evolution and Progress in Democracies Johann Götschl, 2013-03-09

In a ground breaking series of articles one of them written by a Nobel Laureate this volume demonstrates the evolutionary dynamic and the transformation of today's democratic societies into scientific democratic societies It highlights the progress of modeling individual and societal evaluation by neo Bayesian utility theory It shows how social learning and collective opinion formation work and how democracies cope with randomness caused by randomizers Nonlinear evolution equations and serial stochastic matrices of evolutionary game theory allow us to optimally compute possible serial evolutionary solutions of societal conflicts But in democracies progress can be defined as any positive gradual innovative and creative change of culturally used transmitted and stored mentifacts models theories sociofacts customs opinions artifacts and technifacts within and across generations The most important changes are caused besides randomness by conflict solutions

and their realizations by citizens who follow democratic laws These laws correspond to the extended Pareto principle a supreme socioethical democratic rule According to this principle progress is any increase in the individual and collective welfare which is achieved during any evolutionary progress Central to evolutionary modeling is the criterion of the empirical realization of computed solutions Applied to serial conflict solutions decisions evolutionary trajectories are formed they become the most influential causal attractors of the channeling of societal evolution Democratic constitutions legal systems etc store all advantageous present and past adaptive competitive cooperative and collective solutions and their rules they have been accepted by majority votes Societal laws are codes of statutes default or statistical rules and they serve to optimally solve societal conflicts in analogy to game theoretical models or to statistical decision theory Such solutions become necessary when we face harmful or advantageous random events always lurking at the edge of societal and external chaos The evolutionary theory of societal evolution in democracies presents a new type of stochastic theory it is based on default rules and stresses realization The rules represent the change of our democracies into information science and technology based societies they will revolutionize social sciences especially economics Their methods have already found their way into neural brain physiology and research into intelligence In this book neural activity and the creativity of human thinking are no longer regarded as linear deductive Only evolutive nonlinear thinking can include multiple causal choices by many individuals and the risks of internal and external randomness this serves the increasing welfare of all individuals and society as a whole Evolution and Progress in Democracies is relevant for social scientists economists evolution theorists statisticians philosophers philosophers of science and interdisciplinary researchers

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