Self Organization In Biological Systems Princeton Studies In Complexity

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Self Organization In Biological Systems
The system can generate rolls that ... laws in the origin of growth and form 5. Studying self-organization processes in cell biology forces us to focus on principles and collective behaviours ...

Self-organization in cell biology: a brief history
On a recent podcast about my book Extraterrestrial, I was asked whether extraterrestrial intelligence should be expected to follow the rational underpinning of morality, as neatly formulated by the ...

How to tell if extraterrestrial visitors are friend or foe
Self-Organization in Complex Ecosystems ... or culling animals for conservation purposes, efficient management of biological systems requires quantitative analysis of population growth and harvesting.

Monographs in Population Biology
The colonies of social insects are complex systems that are entirely self ... structure of ant colonies were able to show how this self-organization works in practice. The study was supported ...

The complex organization of an ant colony
Our cells have abilities that go far beyond the fastest, smartest computer. They generate mechanical forces to propel themselves around the body ...

Beyond CAR-T: New Frontiers in Living Cell Therapies
The self-organization of stress patterns we have observed in a model system can have direct implications for biological functions. The cell cortex is a quasi–two-dimensional (2D) dissipative structure ...

Self-organized stress patterns drive state transitions in actin cortices
Aviv Clinics will welcome the launch of its U.A.E. Vision 2021 National Agenda with the opening of the Aviv clinic. The initiative is to ...

Aviv Clinics officially opens in JLT, Dubai, U.A.E
artificial life and self-organization. It also provides overviews of complexity in several applied areas, including parallel computation, control systems, neural systems and ecosystems. Some of the ...

Complex Systems
Molecular Self-Organization ... by encapsulating lifeless biological building blocks within a deformable lipid membrane and put life into them by energizing the system with ATP/GTP chemical ...

What termites and cells have in common
The Africa Higher Education Centers of Excellence Projects (ACE I and ACE Impact) supported the Africa Higher Education Center of Excellence for Genomics of Infectious Diseases (ACEGID) at the ...

Africa ' s Scientific Solutions and Innovation in the Fight Against COVID-19
This is the second guest post discussing Abigail Shrier's Irreversible Damage: The Transgender Craze Seducing Our Daughters solicited from experts in transgender medical care. In this p ...

Irreversible Damage to the Trans Community: A Critical Review of Abigail Shrier ' s book Irreversible Damage (Part One)
Those who are incarcerated are suing for their right to gender confirmation surgery—if deemed necessary. Meet the psychiatrist who almost always says it's not.

Prisoners, Doctors, and the Battle Over Trans Medical Care
Researchers decipher the basic biology of neutrophil swarming and ... also inform other categories of collective behavior and self-organization in cells and insects. Max Planck Institute of ...

Start-stop system of hunting immune cells
The Origins of Our Discontents, " author Isabel Wilkerson explains that the racial discrimination that has always existed in the U.S. is best characterized as a caste system, like that in India and ...

Not broken, working as intended: Wilkerson reveals and challenges America ' s racist caste system
Standardized biological–behavioural surveillance, in which both disease outcome data – self-reported and biological – and behavioural risk factors are measured, would complement traditional ...

Integrated biological–behavioural surveillance in pandemic-threat warning systems
Ticks, chiggers and countless other insects lay hidden among the native grasses at Taberville Prairie Conservation Area one recent afternoon, but the half-dozen men and women wielding ...

Reintroduction of burying beetles continues in Southwest Missouri
Akoya Biosciences Inc., The Spatial Biology Company, has announced partnerships with microscope providers Nikon, CrestOptics and Andor to enable the development of new spatial biology applications, ...

Business Digest: Akoya forms partnerships on spatial biology
Neutrophils belong to the first responders of our immune system ... basic biology of neutrophil swarming and now show that the cells also evolved an intrinsic molecular program to self-limit ...

Biological structures built through mechanisms involving self-organization are examined in this text. Examples of such structures are termite mounds, which provide their inhabitants with a secure & stable environment. The text looks at why & how self-organization occurs in nature.

The synchronized flashing of fireflies at night. The spiraling patterns of an aggregating slime mold. The anastomosing network of army-ant trails. The coordinated movements of a school of fish. Researchers are finding in such patterns--phenomena that have fascinated naturalists for centuries--a fertile new approach to understanding biological systems: the study of self-organization. This book, a primer on self-organization in biological systems for students and other enthusiasts, introduces readers to the basic concepts and tools for studying self-organization and then examines numerous examples of self-organization in the natural world. Self-organization refers to diverse pattern formation processes in the physical and biological world, from sand grains assembling into rippled dunes to cells combining to create highly structured tissues to individual insects working to create sophisticated societies. What these diverse systems hold in common is the proximate means by which they acquire order and structure. In self-organizing systems, pattern at the global level emerges solely from interactions among lower-level components. Remarkably, even very complex structures result from the iteration of surprisingly simple behaviors performed by individuals relying on only local information. This striking conclusion suggests important lines of inquiry: To what degree is environmental rather than individual complexity responsible for group complexity? To what extent have widely differing organisms adopted similar, convergent strategies of pattern formation? How, specifically, has natural selection determined the rules governing interactions within biological systems? Broad in scope, thorough yet accessible, this book is a self-contained introduction to self-organization and complexity in biology--a field of study at the forefront of life sciences research.

A clear and concise introduction to this new, cross-disciplinary field.

The growing impact of nonlinear science on biology and medicine is fundamentally changing our view of living organisms and disease processes. This book introduces the application to biomedicine of a broad range of interdisciplinary concepts from nonlinear dynamics, such as self-organization, complexity, coherence, stochastic resonance, fractals and chaos. It comprises 18 chapters written by leading figures in the field and covers experimental and theoretical research, as well as the emerging technological possibilities such as nonlinear control techniques for treating pathological biodynamics, including heart arrhythmias and epilepsy. This book will attract the interest of professionals and students from a wide range of disciplines, including physicists, chemists, biologists, sensory physiologists and medical researchers such as cardiologists, neurologists and biomedical engineers.

This book presents a novel molecular description for understanding the regulatory mechanisms behind the autonomy and self-organization in biological systems. Chapters focus on defining and explaining the regulatory molecular mechanisms behind different aspects of autonomy and self-organization in the sense of autonomous coding, data processing, structure (mass) formation and energy production in a biological system. Subsequent chapters discuss the cross-talk among mechanisms of energy, and mass and information, transformation in biological systems. Other chapters focus on applications regarding therapeutic approaches in regenerative medicine. Molecular Mechanisms of Autonomy in Biological Systems is an indispensable resource for scientists and researchers in regenerative medicine, stem cell biology, molecular biology, tissue engineering, developmental biology, biochemistry, biophysics, bioinformatics, as well as big data sciences, complexity and soft computing.

Stuart Kauffman here presents a brilliant new paradigm for evolutionary biology, one that extends the basic concepts of Darwinian evolution to accommodate recent findings and perspectives from the fields of biology, physics, chemistry and mathematics. The book drives to the heart of the exciting debate on the origins of life and maintenance of order in complex biological systems. It focuses on the concept of self-organization: the spontaneous emergence of order that is widely observed throughout nature Kauffman argues that self-organization plays an important role in the Darwinian process of natural selection. Yet until now no systematic effort has been made to incorporate the concept of self-organization into evolutionary theory. The construction requirements which permit complex systems to adapt are poorly understood, as is the extent to which selection itself can yield systems able to adapt more successfully. This book explores these themes. It shows how complex systems, contrary to expectations, can spontaneously exhibit stunning degrees of order, and how this order, in turn, is essential for understanding the emergence and development of life on Earth. Topics include the new biotechnology of applied molecular evolution, with its important implications for developing new drugs and vaccines; the balance between order and chaos observed in many naturally occurring systems; new insights concerning the predictive power of statistical mechanics in biology; and other major issues. Indeed, the approaches investigated here may prove to be the new center around which biological science itself will evolve. The work is written for all those interested in the cutting edge of research in the life sciences.

Technological systems become organized by commands from outside, as when human intentions lead to the building of structures or machines. But many nat ural systems become structured by their own internal processes: these are the self organizing systems, and the emergence of order within them is a complex phe nomenon that intrigues scientists from all disciplines. Unfortunately, complexity is ill-defined. Global explanatory constructs, such as cybernetics or general sys tems theory, which were intended to cope with complexity, produced instead a grandiosity that has now, mercifully, run its course and died. Most of us have become wary of proposals for an "integrated, systems approach" to complex matters; yet we must come to grips with complexity some how. Now is a good time to reexamine complex systems to determine whether or not various scientific specialties can discover common principles or properties in them. If they do, then a fresh, multidisciplinary attack on the difficulties would be a valid scientific task. Believing that complexity is a proper scientific issue, and that self-organizing systems are the foremost example, R. Tomovic, Z. Damjanovic, and I arranged a conference (August 26-September 1, 1979) in Dubrovnik, Yugoslavia, to address self-organizing systems. We invited 30 participants from seven countries. Included were biologists, geologists, physicists, chemists, mathematicians, bio physicists, and control engineers. Participants were asked not to bring manu scripts, but, rather, to present positions on an assigned topic. Any writing would be done after the conference, when the writers could benefit from their experi ences there.

It is man ' s ongoing hope that a machine could somehow adapt to its environment by reorganizing itself. This is what the notion of self-organizing robots is based on. The theme of this book is to examine the feasibility of creating such robots within the limitations of current mechanical engineering. The topics comprise the following aspects of such a pursuit: the philosophy of design of self-organizing mechanical systems; self-organization in biological systems; the history of self-organizing mechanical systems; a case study of a self-assembling/self-repairing system as an autonomous distributed system; a self-organizing robot that can create its own shape and robotic motion; implementation and instrumentation of self-organizing robots; and the future of self-organizing robots. All topics are illustrated with many up-to-date examples, including those from the authors ' own work. The book does not require advanced knowledge of mathematics to be understood, and will be of great benefit to students in the robotics discipline, including in the areas of mechanics, control, electronics, and computer science. It is also an important source for researchers who wish to investigate the field of robotics or who have an interest in the application of self-organizing phenomena.