How the Leopard Changed Its Spots : The Evolution of Complexity

Brian Goodwin
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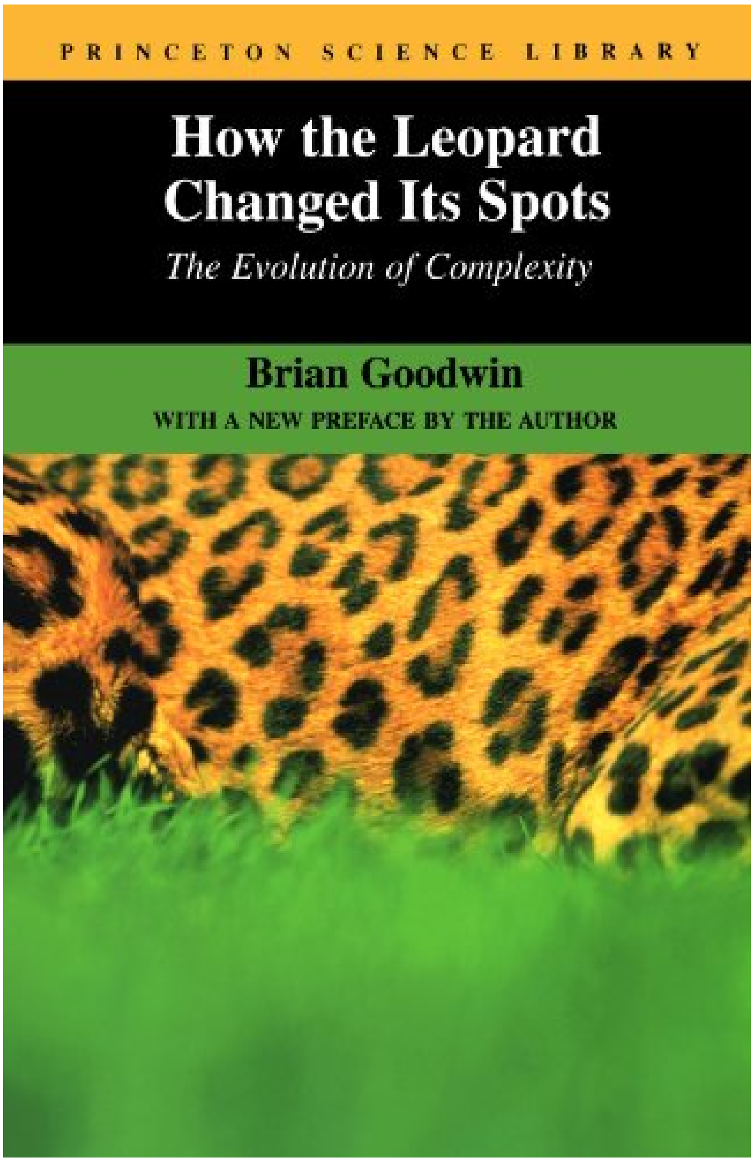

#1330161 in Books Brian Goodwin 2001-03-01 2001-02-18Original language:EnglishPDF # 1 9.21 x .64 x 6.14l, .87 #File Name: 0691088098275 pagesHow the Leopard Changed Its Spots The Evolution of Complexity | File size: 40.Mb

Brian Goodwin : How the Leopard Changed Its Spots : The Evolution of Complexity before purchasing it in order to gage whether or not it would be worth my time, and all praised How the Leopard Changed Its Spots : The Evolution of Complexity:

0 of 0 people found the following review helpful. Five StarsBy Charles P. BiggerThis is the very vest introducion to

morphogenetics1 of 1 people found the following review helpful. The New Biology of the emergence of complexityBy Dr. H. A. JonesHow the Leopard Changed Its Spots: The evolution of complexity by Brian Goodwin, Phoenix (Orion Books), 1997, 254 ffThis is a generously illustrated textbook of evolutionary biology that requires readers to get to grips with biological concepts and terminology. It is not for the faint-hearted general reader.Brian Goodwin was a theoretical biologist who died in 2009 after an eminent research and teaching career. Because the book is over a decade old now there are developments in the mechanism of action of DNA that are not mentioned here, and the Human Genome Project, started in 1990 by James D. Watson and completed in 2003, was still underway when this was written. The emphasis of Goodwin's approach was always holistic or ecological in the sense that he saw evolution in terms of interconnection between the constituents of a biological system and between these and the environment. He thus expands on the Darwinian organismal approach and on the preoccupation with the role of the gene favoured by Richard Dawkins and many other biologists, but does not reject either treatment.Although more than a decade old now, this book is by no means wholly outdated and irrelevant. It provides an excellent introduction to the application of mathematics, physics and computer modelling to biology. Goodwin begins by comparing the situation in biology with the 20th century revolution in physics, when Newtonian macro physics was supplemented by quantum physics of the micro world. Biology similarly in the 20th century shifted emphasis from Darwinian evolution based on organisms to focus on the cellular role of genes. The `leopard' of the title is a metaphor for the science of biology. Darwinian adaptation to environment alone cannot explain the origin and extinction of certain species or characteristics of organisms. Cells can undergo mutations that do not always start with changes in a gene: mutations can also arise from changes in cell structure and environment - ideas that have been established in this decade by researchers like Bruce Lipton and others researching in epigenetics.Goodwin accepts that complex structures like the eye can arise by a succession of small random changes that accumulate by virtue of the incremental adaptive improvement that each bestows upon the structure. This is the Darwinian approach adopted by biologists like Dawkins, but Goodwin proposes that complexity can also arise spontaneously by cooperation between components of a system. In fact, the emphasis in this presentation is on cooperation in biology rather than competition and `survival of the fittest'.The key in molecular terms to how such cooperation between biological components comes about lies in the physics of dissipative systems studied by Ilya Prigogine and Gregoire Nicolis. Goodwin uses the chemical Belousov-Zhabotinsky reaction (where a mixture of chemicals undergoes continual oscillating colour changes) to illustrate comparable interaction between biological cellular entities. Such organisation from seeming chaos is found also in the patterns produced by computer-generated Mandelbrot sets. As another example of mathematical order in nature, Goodwin describes the occurrence of the patterns of the Fibonacci series that are widespread in nature amongst fauna and flora, a connection inspired by D'Arcy Wentworth Thompson's seminal book On Growth and Form.This is a scientifically demanding but highly informative book for anyone interested in the spontaneous emergence of complexity in the natural world and is prepared to tackle the underlying biology, all explained in relatively simple terms. I've dropped a star in the rating only because there are now more modern books on the same subject. There are half a dozen pages of References and Further Reading, and an Index.Howard Jones is the author of The Tao of HolismThe Biology of Belief: Unleashing the Power of Consciousness, Matter, MiraclesThe Voice of the Earth: An Exploration of Ecopsychology0 of 0 people found the following review helpful. AN "ORGANOCENTRIC" APPROACH TO UNDERSTANDING STRUCTURESBy Steven H ProppBrian Carey Goodwin (1931-2009) was a Canadian mathematician and biologist, a Professor Emeritus at the Open University and a key founder of the field of theoretical biology. He wrote in the Preface to this 1994 book, "the large-scale aspects of evolution remain unexplained, including the origin of species... So Darwin's assumption that the tree of life is a consequence of the gradual accumulation of small hereditary differences appears to be without significant support." (Pg. viii) He adds, "What has developed ... is a new theory of dynamical systems collectively referred to as 'the sciences of complexity'... In this book I explore the consequences of these ideas as they apply to ... the origin and nature of the morphological characteristics that distinguish different types of organism... I take the position that organisms are as real, as fundamental, and as irreducible as the molecules out of which they are made. They are a distinct level of emergent biological order, and the one to which we most immediately relate." (Pg. x)He states, "there are basic areas where [genocentric biology] fails. One of these... concerns its claims that understanding genes and their activities is enough to explain the properties of organisms. I argue that this is simply wrong... The position I am taking in biology could be called organocentric rather than genocentric. We shall see that organisms live in their own space, characterized by a particular type of organization." (Pg. 3)He argues, "The trouble is that natural selection provides a very limited type of explanation, and it fails completely on some very important and interesting questions. Going back to the case of whorls, all that natural selection can offer by way of explanation is that whorls are useful in most members of the giant unicellular green algal order ... and they evidently do not 'cost' too much..." (Pg. 88)He explains, "I am now going to talk about morphogenetic fields... so it is important not to confuse them with the concept of morphic resonance used by Rupert Sheldrake in his book A New Science of Life: The Hypothesis of Morphic Resonance. His fields are nonphysical, whereas the concept of field used to describe pattern formation in biology ... refers to spatial organizing activities that involve clearly defined physical and chemical processes." (Pg. 94) Later, he admits, "Of course, the theory that I have been using is going to turn out to be wrong in certain respects, as with all theories, but that doesn't alter the logic of the argument: Generative principles provide a better foundation for understanding structure than historical lineages." (Pg. 154)He asserts, "Organisms are endowed with powerful particulars that give them the capacity to regenerate and reproduce their own natures under particular conditions, whereas inanimate systems cannot. This is an emergent property of life that is not explained by the properties of the molecules out of which organisms are made... organisms cannot be reduced to their genes or their molecules. The particular type of organization that exists in the dynamic interplay of the molecular parts of an organism... is always engaged in making and remaking itself in life cycles and exploring its potential for generating new wholes." (Pg. 176)This book will interest those studying new interpretations of evolutionary theory.

Do genes explain life? Can advances in evolutionary and molecular biology account for what we look like, how we behave, and why we die? In this powerful intervention into current biological thinking, Brian Goodwin argues that such genetic reductionism has important limits. Drawing on the sciences of complexity, the author shows how an understanding of the self-organizing patterns of networks is necessary for making sense of nature. Genes are important, but only as part of a process constrained by environment, physical laws, and the universal tendencies of complex adaptive systems. In a new preface for this edition, Goodwin reflects on the advances in both genetics and the sciences of complexity since the book's original publication.

From Publishers WeeklyArguing that Darwin's theory of natural selection cannot explain the emergence of distinctive species, British biologist Goodwin proposes an alternative theory of evolution. He views organisms as dynamic systems, themselves the primary agents of creative evolutionary adaptation and change that occurs in a matrix of relationships with other members of the same species. Instead of DNA as the carrier of inherited, survival-promoting factors from parent to offspring, he posits that "inherited particulars"-nucleic-acid sequences of DNA or specific structures of the parent organism-get transmitted, thereby generating form. As an organism matures from egg or bud to adult, characteristic types of order emerge from the chaotic interactions of genes, molecules and the environment, in his hypothesis. Goodwin buttresses his rigorous presentation with computer modeling and mathematics. His noteworthy, if complex, model implies that cooperation and webs of relationships play as important a role in evolution as competition, inheritance and the struggle for survival. From Library JournalGoodwin, a noted proponent of the complexity movement, bashes neo-Darwinists and molecular reductionists as holders of an untenable evolutionary view. Citing the research by himself and others, he compares life to the construct of "excitable media" and proposes that the driving forces determining an organism's form lie at the interface between chaos and order. Goodwin provides a compelling argument that an investigation of the development of complexity and "emergent properties" from chaos will yield a theory of biological evolution that will unify this process with concepts in the physical sciences and also provide an accurate means of explaining the diversity of morphologies found in living organisms. Although light on data, this is a serious presentation for the informed lay reader of the philosophical direction some avant-garde biological thought is taking. There is some overlap with Roger Lewin's more balanced Complexity: Life at the Edge of Chaos (LJ 12/92). Recommended for large science collections.Frank Reiser, Nassau Community Coll., Garden City, N.Y.From Kirkus sIt may come as a surprise that there are still scientific dissenters from Darwinism, but here's the proof, in a book that calls on biologists to put organisms, not molecules, at the center of the science. Goodwin (Biology/Milton Keynes College, England) begins with the proposition that specifying the chemical composition of a substance tells us nothing about its form: graphite, diamonds, and fullerenes all consist of pure carbon but differ radically in shape. Similarly, where many biologists assume that the makeup of an organism's DNA tells them all they need to know about it, Goodwin brings to the table the disciplines of physics and mathematics. He applies the insights of chaos theory to the activity of an ant's nest and to children's play, to the growth of slime molds and algae, and to fibrillation in the human heart. An older mathematical discovery, the Fibonacci series (in which each new number is the sum of its two immediate predecessors), appears to play a role in the position of leaves on a branch, as well as in the structure of quadruped limbs. But as important as his specific illustrations of his points is his contention that Darwinism has taken on a rhetoric not dissimilar to the Puritan ethic, with each organism struggling to overcome a harsh world and become fitter. Eventually, he believes, Darwinian natural selection will be seen as part of a larger physical and mathematical structure, in which the entire organism, as opposed to its DNA alone, is seen in context. In the concluding chapter, he cites several biologists who are working toward a comprehensive new biology, in which the rights of organisms and of nature are set against the claims of genetic engineering and other forms of meddling with the environment. An often exciting look at frontiers of biology beyond the well-tilled fields of gene research. (68 bw illustrations, not seen) --