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The Beauty of Fractals **MIT Press (MA)**
An accessible yet rigorous and generously illustrated exploration of the computational approach to the study of biological vision. Seeing has puzzled scientists and philosophers for centuries and it continues to do so. This new edition of a classic text offers an accessible but rigorous introduction to the computational approach to understanding biological visual systems. The authors of Seeing, taking as their premise David Marr's statement that " to understand vision by studying only neurons is like trying to understand bird flight by studying only feathers, " make use of Marr's three different levels of analysis in the study of vision: the computational level, the algorithmic level, and the hardware implementation level. Each chapter applies this approach to a different topic in vision by examining the problems the visual system encounters in interpreting retinal images and the constraints available to solve these problems; the algorithms that can realize the solution; and the implementation of these algorithms in neurons. Seeing has been thoroughly updated for this edition and expanded to more than three times its original length. It is designed to lead the reader through the problems of vision, from the common (but mistaken) idea that seeing consists just of making pictures in the brain to the minutiae of how neurons collectively encode the visual features that underpin seeing. Although it assumes no prior knowledge of the field, some chapters present advanced material. This makes it the only textbook suitable for both undergraduate and graduate students that takes a consistently computational perspective, offering a firm conceptual basis for tackling the vast literature on vision. It covers a wide range of topics, including aftereffects, the retina, receptive fields, object recognition, brain maps, Bayesian perception, motion, color, and stereopsis. MatLab code is available on the book's website, which includes a simple demonstration of image convolution.
Platforms and Cultural Production Springer Science & Business Media

Now approaching its tenth year, this hugely successful book presents an unusual attempt to publicise the field of Complex Dynamics. The text was originally conceived as a supplemented catalogue to the exhibition "Frontiers of Chaos", seen in Europe and the United States, and describes the context and meaning of these fascinating images. A total of 184 illustrations - including 88 full-colour pictures of Julia sets - are suggestive of a coffee-table book. However, the invited contributions which round off the book lend the text the required formality. Benoit Mandelbrot gives a very personal account, in his idiosyncratic self-centred style, of his discovery of the fractals named after him and Adrien Douady explains the solved and unsolved problems relating to this amusingly complex set.

The Origin and Nature of Life on Earth Cambridge University Press

In a book that is itself beautifully written, renowned philosopher Roger Scruton explores this timeless concept, asking what makes an object--either in art, in nature, or the human form--beautiful.--From publisher description.

Technological Nature MIT Press

Gary William Flake develops in depth the simple idea that recurrent rules can produce rich and complicated behaviors. In this book Gary William Flake develops in depth the simple idea that recurrent rules can produce rich and complicated behaviors. Distinguishing "agents" (e.g., molecules, cells, animals, and species) from their interactions (e.g., chemical reactions, immune system responses, sexual reproduction, and evolution), Flake argues that it is the computational properties of interactions that account for much of what we think of as "beautiful" and "interesting." From this basic thesis, Flake explores what he considers to be today's four most interesting computational topics: fractals, chaos, complex systems, and adaptation. Each of the book's parts can be read independently, enabling even the casual reader to understand and work with the basic equations and programs. Yet the parts are bound together by the theme of the computer as a laboratory and a metaphor for understanding the universe. The inspired reader will experiment further with the ideas presented to create fractal landscapes, chaotic systems, artificial life forms, genetic algorithms, and artificial neural networks.

Computational Artifacts Springer Science & Business Media

With contributions by E.Abraham, D.Barnes, R.Carpenter, L.Collado, P.Dodds, S.Dudgeon, D.Garbary, S.Gatti, B.Helmuth, M.R.Koehl, H.Lasker, R.Merks., W.Müller, S.Muko, B. Rinkevich, J.Sanchez, P.Sloot, M.Vermeij

Probably Approximately Correct No Starch Press

More than anything else, this book is a tribute to Edsger W. Dijkstra, on the occasion of his sixtieth birthday, by just a few of those fortunate enough to be influenced by him and his work and to be called his friend or relation, his master, colleague, or pupil. This book contains fifty-four technical contributions in different areas of endeavor, although many of them deal with an area of particular concern to Dijkstra: programming. Each contribution is relatively short and could be digested in one sitting. Together, they form a nice cross section of the discipline of programming at the beginning of the nineties. While many know of Dijkstra's technical contributions,

they may not be aware of his ultimate goal, the mastery of complexity in mathematics and computing science. He has forcefully argued that beauty and elegance are essential to this mastery. The title of this book, chosen to reflect his ultimate goal, comes from a sentence in an article of his on some beautiful arguments using mathematical induction: "... when we recognize the battle against chaos, mess, and unmastered complexity as one of computing sci- ence's major callings, we must admit that 'Beauty Is Our Business'."

Aesthetics and Material Beauty Oxford University Press, USA

A walkthrough of computer science concepts you must know. Designed for readers who don't care for academic formalities, it's a fast and easy computer science guide. It teaches the foundations you need to program computers effectively. After a simple introduction to discrete math, it presents common algorithms and data structures. It also outlines the principles that make computers and programming languages work.

Natural Computing: DNA, Quantum Bits, and the Future of Smart Machines Princeton University Press

By applying research in artificial intelligence to problems in the philosophy of science, Paul Thagard develops an exciting new approach to the study of scientific reasoning. This approach uses computational ideas to shed light on how scientific theories are discovered, evaluated, and used in explanations. Thagard describes a detailed computational model of problem solving and discovery that provides a conceptually rich yet rigorous alternative to accounts of scientific knowledge based on formal logic, and he uses it to illuminate such topics as the nature of concepts, hypothesis formation, analogy, and theory justification.

Seeing, second edition Oxford University Press

Computation permeates our world, but a satisfactory philosophical theory of what it is has been lacking. Gualtiero Piccinini presents a mechanistic account of what makes a physical system a computing system. He argues that computation does not entail representation or information-processing, although information-processing entails computation.

Fundamentals of Scientific Computing MIT Press

This title brings together work on embodiment, action, and the predictive mind. At the core is the vision of human minds as prediction machines - devices that constantly try to stay one step ahead of the breaking waves of sensory stimulation, by actively predicting the incoming flow. In every situation we encounter, that complex prediction machinery is already buzzing, proactively trying to anticipate the sensory barrage. The book shows in detail how this strange but potent strategy of self-anticipation ushers perception, understanding, and imagination simultaneously onto the cognitive stage.

Modelling Natural Action Selection Springer Science & Business Media

Presenting a theory of the theoryless, a computer scientist provides a model of how effective behavior can be learned even in a world as complex as our own, shedding new light on human nature.

The Computational Beauty of Nature Springer Science & Business Media

Drawing on interviews with 15 leading scientists, the authors present an unexpected vision: the future of computing is a synthesis with nature.

Thinking in Complexity Springer

NEW YORK TIMES BESTSELLER • Celebrated futurist Ray Kurzweil, hailed by Bill Gates as “the best person I know at predicting the future of artificial intelligence,” presents an “elaborate, smart, and persuasive” (The Boston Globe) view of the future course of human development. “Artfully envisions a breathtakingly better world.”—Los

Angeles Times “Startling in scope and bravado.”—Janet Maslin, The New York Times “An important book.”—The Philadelphia Inquirer At the onset of the twenty-first century, humanity stands on the verge of the most transforming and thrilling period in its history. It will be an era in which the very nature of what it means to be human will be both enriched and challenged as our species breaks the shackles of its genetic legacy and achieves inconceivable heights of intelligence, material progress, and longevity. While the social and philosophical ramifications of these changes will be profound, and the threats they pose considerable, The Singularity Is Near presents a radical and optimistic view of the coming age that is both a dramatic culmination of centuries of technological ingenuity and a genuinely inspiring vision of our ultimate destiny.

Computational Beauty of Nature Cambridge University Press

Computational complexity is one of the most beautiful fields of modern mathematics, and it is increasingly relevant to other sciences ranging from physics to biology. But this beauty is often buried underneath layers of unnecessary formalism, and exciting recent results like interactive proofs, phase transitions, and quantum computing are usually considered too advanced for the typical student. This book bridges these gaps by explaining the deep ideas of theoretical computer science in a clear and enjoyable fashion, making them accessible to non-computer scientists and to computer scientists who finally want to appreciate their field from a new point of view. The authors start with a lucid and playful explanation of the P vs. NP problem, explaining why it is so fundamental, and so hard to resolve. They then lead the reader through the complexity of mazes and games; optimization in theory and practice; randomized algorithms, interactive proofs, and pseudorandomness; Markov chains and phase transitions; and the outer reaches of quantum computing. At every turn, they use a minimum of formalism, providing explanations that are both deep and accessible. The book is intended for graduate and undergraduate students, scientists from other areas who have long wanted to understand this subject, and experts who want to fall in love with this field all over again.

The Origin of Consciousness in the Breakdown of the Bicameral Mind Cambridge University Press

Why it matters that our relationship with nature is increasingly mediated and augmented by technology. Our forebears may have had a close connection with the natural world, but increasingly we experience technological nature. Children come of age watching digital nature programs on television. They inhabit virtual lands in digital games. And they play with robotic animals, purchased at big box stores. Until a few years ago, hunters could "telehunt"—shoot and kill animals in Texas from a computer anywhere in the world via a Web interface. Does it matter that much of our experience with nature is mediated and augmented by technology? In Technological Nature, Peter Kahn argues that it does, and shows how it affects our well-being. Kahn describes his investigations of children's and adults' experiences of cutting-edge technological nature. He and his team installed "technological nature windows" (50-inch plasma screens showing high-definition broadcasts of real-time local nature views) in inside offices on his university campus and assessed the physiological and psychological effects on viewers. He studied children's and adults' relationships with the robotic dog AIBO (including possible benefits for children with autism). And he studied online "telegardening" (a pastoral alternative to "telehunting"). Kahn's studies show that in terms of human well-being technological nature is better than no nature, but not as good as actual nature. We should develop and use technological nature as a bonus on life, not as its substitute, and re-envision what is beautiful and fulfilling

and often wild in essence in our relationship with the natural world.

The Singularity Is Near John Wiley & Sons
"In A Taste for the Beautiful, Michael Ryan, one of the world's leading authorities on animal behavior, tells the remarkable story of how he and other scientists have taken up where Darwin left off, transforming our understanding of sexual selection and shedding new light on animal and human behavior. Drawing on cutting-edge science, Ryan explores the key questions: Why do animals perceive certain traits as beautiful and others not? Do animals have an inherent sexual aesthetic and, if so, where is it rooted? Ryan argues that the answers lie in the brain--particularly of females, who act as biological puppeteers, spurring the development of beautiful traits in males."--Back cover

Information—Consciousness—Reality Oxford University Press, USA
Computational Intelligence: Concepts to Implementations provides the most complete and practical coverage of computational intelligence tools and techniques to date. This book integrates various natural and engineering disciplines to establish Computational Intelligence. This is the first comprehensive textbook on the subject, supported with lots of practical examples. It asserts that computational intelligence rests on a foundation of evolutionary computation. This refreshing view has set the book apart from other books on computational intelligence. This book lays emphasis on practical applications and computational tools, which are very useful and important for further development of the computational intelligence field. Focusing on evolutionary computation, neural networks, and fuzzy logic, the authors have constructed an approach to thinking about and working with computational intelligence that has, in their extensive experience, proved highly effective. The book moves clearly and efficiently from concepts and paradigms to algorithms and implementation techniques by focusing, in the early chapters, on the specific con. It explores a number of key themes, including self-organization, complex adaptive systems, and emergent computation. It details the metrics and analytical tools needed to assess the performance of computational intelligence tools. The book concludes with a series of case studies that illustrate a wide range of successful applications. This book will appeal to professional and academic researchers in computational intelligence applications, tool development, and systems. Moves clearly and efficiently from concepts and paradigms to algorithms and implementation techniques by focusing, in the early chapters, on the specific concepts and paradigms that inform the authors' methodologies Explores a number of key themes, including self-organization, complex adaptive systems, and emergent computation Details the metrics and analytical tools needed to assess the performance of computational intelligence tools Concludes with a series of case studies that illustrate a wide range of successful applications Presents code examples in C and C++ Provides, at the end of each chapter, review questions and exercises suitable for graduate students, as well as researchers and practitioners engaged in self-study

Computational Philosophy of Science W. W. Norton & Company
All aboard The Coding Train! This beginner-friendly creative coding tutorial is designed to grow your skills in a fun, hands-on way as you build simulations of real-world phenomena with “The Coding Train” YouTube star Daniel Shiffman. What if you could re-create the awe-inspiring flocking patterns of birds or the hypnotic dance of fireflies—with code? For over a decade, The Nature of Code has empowered countless readers to do just that, bridging the gap between creative expression and programming. This innovative guide by Daniel Shiffman, creator of the beloved Coding Train, welcomes budding and seasoned programmers alike into a world where code meets playful creativity. This JavaScript-based edition of Shiffman’s groundbreaking work gently unfolds the mysteries of the natural world, turning complex topics like genetic algorithms, physics-based simulations, and neural networks into accessible and visually stunning creations.

Embark on this extraordinary adventure with projects involving: A physics engine: Simulate the push and pull of gravitational attraction. Flocking birds: Choreograph the mesmerizing dance of a flock. Branching trees: Grow lifelike and organic tree structures. Neural networks: Craft intelligent systems that learn and adapt. Cellular automata: Uncover the magic of self-organizing patterns. Evolutionary algorithms: Play witness to natural selection in your code. Shiffman's work has transformed thousands of curious minds into creators, breaking down barriers between science, art, and technology, and inviting readers to see code not just as a tool for tasks but as a canvas for boundless creativity. Whether you're deciphering the elegant patterns of natural phenomena or crafting your own digital ecosystems, Shiffman's guidance is sure to inform and inspire. The Nature of Code is not just about coding; it's about looking at the natural world in a new way and letting its wonders inspire your next creation. Dive in and discover the joy of turning code into art—all while mastering coding fundamentals along the way. NOTE: All examples are written with p5.js, a JavaScript library for creative coding, and are available on the book's website.

Information and the Nature of Reality

Houghton Mifflin Harcourt

Since the first edition sold out in less than a year, we now present the revised second edition of Mainzer's popular book. The theory of nonlinear complex systems has become a successful problem-solving approach in the natural sciences from laser physics, quantum chaos, and meteorology to computer simulations of cell growth in biology. It is now recognized that many of our social, ecological, and political problems are also of a global, complex, and nonlinear nature. And one of the most exciting contemporary topics is the idea that even the human mind is governed largely by the nonlinear dynamics of complex systems. In this wide-ranging but concise treatment, Prof. Mainzer discusses, in a nontechnical language, the common framework behind these endeavors. Emphasis is given to the evolution of new structures in natural and cultural systems and we see clearly how the new integrative approach can give insights not available from traditional reductionistic methods.

Fundamentals of Natural Computing

Springer

National Book Award Finalist: "This man's ideas may be the most influential, not to say controversial, of the second half of the twentieth century."—Columbus Dispatch At the heart of this classic, seminal book is Julian Jaynes's still-controversial thesis that human consciousness did not begin far back in animal evolution but instead is a learned process that came about only three thousand years ago and is still developing. The implications of this revolutionary scientific paradigm extend into virtually every aspect of our psychology, our history and culture, our religion—and indeed our future. "Don't be put off by the academic title of Julian Jaynes's The Origin of Consciousness in the Breakdown of the Bicameral Mind. Its prose is always lucid and often lyrical…he unfolds his case with the utmost intellectual rigor."—The New York Times "When Julian Jaynes . . . speculates that until late in the twentieth millennium BC men had no consciousness but were automatically obeying the voices of the gods, we are astounded but compelled to follow this remarkable thesis."—John Updike, The New Yorker "He is as startling as Freud was in The Interpretation of Dreams, and Jaynes is equally as adept at forcing a new view of known human behavior."—American Journal of Psychiatry