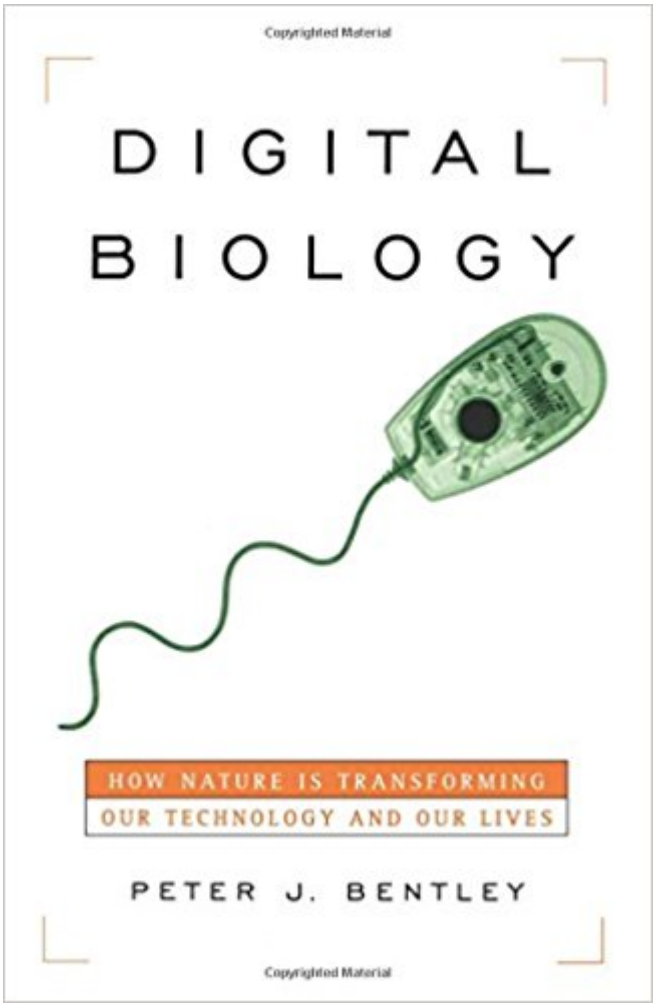
Digital Biology: How Nature Is Transforming Our Technology And Our Lives



Synopsis

Imagine a future world where computers can create universes -- digital environments made from binary ones and zeros. Imagine that within these universes there exist biological forms that reproduce, grow, and think. Imagine plantlike forms, ant colonies, immune systems, and brains, all adapting, evolving, and getting better at solving problems. Imagine if our computers became greenhouses for a new kind of nature. Just think what digital biology could do for us.Perhaps it could evolve new designs for us, think up ways to detect fraud using digital neurons, or solve scheduling problems with ants. Perhaps it could detect hackers with immune systems or create music from the patterns of growth of digital seashells. Perhaps it would allow our computers to become creative and inventive.Now stop imagining.digital biology is an intriguing glimpse into the future of technology by one of the most creative thinkers working in computer science today. As Peter J. Bentley explains, the next giant step in computing technology is already under way as computer scientists attempt to create digital universes that replicate the natural world. Within these digital universes, we will evolve solutions to problems, construct digital brains that can learn and think, and use immune systems to trap and destroy computer viruses.The biological world is the model for the next generation of computer software. By adapting the principles of biology, computer scientists will make it possible for computers to function as the natural world does. In practical terms, this will mean that we will soon have "smart" devices, such as houses that will keep the temperature as we like it and automobiles that will start only for drivers they recognize (through voice recognition or other systems) and that will navigate highways safely and with maximum fuel efficiency. Computers will soon be powerful enough and small enough that they can become part of clothing. "Digital agents" will be able to help us find a bank or restaurant in a city that we have never visited before, even as we walk through the airport. Miniature robots may even be incorporated into our bodies to monitor our health. Digital Biology is also an exploration of biology itself from a new perspective. We must understand how nature works in its most intimate detail before we can use these same biological processes inside our computers. Already scientists engaged in this work have gained new insights into the elegant simplicity of the natural universe.This is a visionary book, written in accessible, nontechnical language, that explains how cutting-edge computer science will shape our world in the coming decades.

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Customer Reviews

Viruses, bugs, bots, ants: the metaphors, language, and realities of the digital world increasingly parallel those of the biological world. This vigorous book shows why those parallels are appropriate, even natural. By studying the biological world and applying it to cyberspace and by using the natural processes responsible for life within computer systems, evolutionary biologist Peter Bentley writes, "we are overturning all preconceptions of what computers can and cannot do." They can do much, of course. Computers today can grow architectural models from digital "genes," can detect the difference between healthy and malignant cells, can even mimic certain behaviors of living beings. Tucking a handy primer in biological theory among sometimes heady discussions of the digital universe, Bentley focuses closely on the workings of computers today, projecting what might be true of those machines just a few years from now thanks to the workings of evolution--not strictly Darwinian evolution, to be sure, but evolution all the same. Of interest to a wide range of readers, Bentley’s book raises provocative questions as it prowls around inside the "benign cream-colored boxes" that surround us. --Gregory McNamee --This text refers to an out of print or unavailable edition of this title.

Though books about technology’s effect on nature abound, few titles consider the reverse impact. British research scientist Bentley perhaps recognizing the counterintuitive quality of his argument seems to redouble his efforts to make his point. Sectioned off into chapters with general titles like "Evolution," "Brains" and "Immune Systems," his book is an entertaining look at the ways in which systems of nature are influencing advances in computer research. Bentley contends that "natural and digital biology follow the same processes, just in different universes

This book did not deliver what I was expecting. I thought there would be detailed examples of the use of biological concepts in computing. Unfortunately I was very wrong.There are some examples, however they are very vague with little or no detail. Frequently the author asserts a technique has too many applications to go into in any detail without boring the reader. Next he proceeds to rattle off a dozen vague applications such as scheduling, optimization, etc. without giving enough information about the application to be useful.The center of the book contains a number of pictures that are the result of one technique or another. Unfortunately he does not elaborate on how any of them were created. I enjoyed seeing the coffee table his computer designed. Unfortunately the only explaination he gave on how the program worked was something to the effect that it was complicated. A bit more detail or perhaps even code would have been much better.Beyond my perceived technical shortcomings, the author's style did not appeal to me. For example he wrote a fairly detailed account of what it might be like (as though a virus could think) to be a virus invading a host. Perhaps this was an attempt to engage the readers' imaginations. If so, the effect was wasted on this reader.Two stars seemed right as there are worse books in the world. However I doubt most people would gain much from reading it.

Easy to read explains a lot. Puts many things in perspective.

Verbose and somewhat entertaining.A reasonably but not very technical book for the lay reader.Can live with or without.

I've got to say that I thought this was a wonderful book. An absolutely fascinating overview of a new and developing field of science. Nicely laid out, elegantly written, very "easy style", lots of detailed material is covered for each of the areas the author touches on, so you get depth aswell as the overview. The author presents some very interesting perspectives on existing ideas about biology and machines. Useful notes at the end and the further reading section is good.Rather than be another "here is the future" book by yet another science journalist, this is a book with its feet very much in the present and written by a scientist who is active in the field (rather than a journalist). Do not be alarmed! This guy writes well. I'm not going to say it's a one- sitting read (because that would just make me too much of a techno-nerd), however it's definitely a page-turner.In terms of books available, I think that there is presently only one other non text-book that takes an overview of this field (Moshe Sipper - Machine Nature), though I'm sure there are gonna be a lot more before too

long . If you want 2 books - buy both. If you just want the one - I thought Peter Bentley's had detail aswell as breadth whereas Moshe Sippers, whilst still a very good book, stayed more at an overview level.

The basic premise of "Digital Biology" is that biological systems (brains, plants, insects, etc) were "designed" in a certain way because there was an inherent advantage to this design. Therefore, if we can understand the principles behind the design, we can take these techniques and use them in our software and hardware.Many things in nature seem as if they have no reason behind them - however, as the book illustrates, there are certainly valid, good reasons. An example would be neural networks: since our brain uses this instead of hard coded rules and programming, it is much more flexible. It can learn by trial an error the "best" approach, something traditional algorithms cannot do as efficiently. By taking this mechanism we can create very sophisticated - almost intelligent - programs and robots.There are numerous chapters in "Digital Biology", each dedicated to a specific subject. Each chapter begins by explaining how a specific biology mechanism works (i.e., the chapter on "immune systems" gives a short tutorial on how the body's immune system works). Then, different ways that similar mechanisms are used in artificial applications are demonstrated.Among the most interesting chapters:"Evolution", this chapter elaborates on the principles of Evolution and how they can be used in Computation. What are Evolutionary Algorithms ? What are Genetic Algorithms? What is Genetic Programming? Evolvable Hardware, and more."Brains" - this chapter was FASCINATING. It started with a short introduction of how we believe brains work, and how these principles can be a foundation for AI and ALIFE: by using Neural Networks."Insects"- Insects are interesting because in many ways a group of insects acts as one larger organism. Sometimes many simple organisms can form one fairly intelligent "Creature". There are ways to use these techniques in computation as well, as this chapter shows. (Swarm Intelligence, Boids, etc)Overall this is a very interesting book. It covers a lot of subjects, yet does NOT go too deeply into any of those - I don't think that was the purpose of the author. My main criticism is the way the book was written - some chapters are very raw, the examples chosen could've been better. (I think my favorite one was where the immune system is being compared to the music industry, and antibodies are compared to boy bands. Probably the strangest analogy I have read in my life). I also think that there was too much emphasis on real biology, especially since in many subjects there was no analogy in digital biology. Nonetheless, if the idea of using biological mechanisms in software or hardware appeals to you, this should serve as a fascinating introduction.

Digital Biology: How Nature Is Transforming Our Technology and Our Lives Inheritance: How Our Genes Change Our Lives--and Our Lives Change Our Genes Happy City: Transforming Our Lives Through Urban Design Sacred Rhythms: Arranging Our Lives for Spiritual Transformation (Transforming Resources) Private Government: How Employers Rule Our Lives (and Why We Don't Talk about It): How Employers Rule Our Lives (and Why We Don't Talk about It) (The University Center for Human Values Series) Young Scientists: Learning Basic Biology (Ages 9 and Up): Biology Books for Kids (Children's Biology Books) Bitcoin Basics: Cryptocurrency, Blockchain And The New Digital Economy (Digital currency, Cryptocurrency, Blockchain, Digital Economy) Photography: DSLR Photography Secrets and Tips to Taking Beautiful Digital Pictures (Photography, DSLR, cameras, digital photography, digital pictures, portrait photography, landscape photography) Developmental Biology, Ninth Edition (Developmental Biology Developmental Biology) Digital Storytelling: Capturing Lives, Creating Community (Digital Imaging and Computer Vision) Photography: Complete Guide to Taking Stunning,Beautiful Digital Pictures (photography, stunning digital, great pictures, digital photography, portrait ... landscape photography, good pictures) Digital Proxemics: How Technology Shapes the Ways We Move (Digital Formations) The Complete Guide to Nature Photography: Professional Techniques for Capturing Digital Images of Nature and Wildlife Blockchain: Step By Step Guide To Understanding The Blockchain Revolution And The Technology Behind It (Information Technology, Blockchain For Beginners,Bitcoin, Blockchain Technology) Fintech: Simple and Easy Guide to Financial Technology(Fin Tech, Fintech Bitcoin, financial technology fintech, Fintech Innovation, Fintech Gold, ... technology,equity crowdfunding) (Volume 1) FINTECH: Simple and Easy Guide to Financial Technology(Fin Tech, Fintech Bitcoin, financial technology fintech, Fintech Innovation, Fintech Gold, Financial services technology,equity crowdfunding) Georgia Nature Weekends: 52 Adventures in Nature (Nature Weekend Series) Race Against the Machine: How the Digital Revolution is Accelerating Innovation, Driving Productivity, and Irreversibly Transforming Employment and the Economy The Cyber Effect: An Expert in Cyberpsychology Explains How Technology Is Shaping Our Children, Our Behavior, and Our Values--and What We Can Do About It Photo Craft: Creative Mixed Media and Digital Approaches to Transforming Your Photographs