Digital Biology

by Peter Bentley. Published by Headline, 2001, £18.99 HB

As anyone who is familiar with computer games will know, computers can create universes that simulate reality to create a world to play in. Given some instructions, the computer can simulate alien attacks, flying airplanes or busy life in a city. When the rules of the computer universes are based on physics, we see more-or-less what we expect. When, however, the rules are based on biology we get something surprising. Things look alive. We get digital biology.

A wide range of biological effects arise out of running very simple rules. In particular, just as evolution helps nature find solutions to surviving effectively, computer simulation of evolution allows us to find solutions to survival in imaginary worlds, which we can design to represent useful problems. Just as one might imagine a bacterium evolved to suit some special habitat, we can write programs that evolve to fit financial habitats, finding out as they do so how best to work the markets.

Peter Bentley is well known for his work in evolutionary computing, applying insights from biology to computer-based applications. The gist of *Digital Biology*, which is his first popular science book, is that biology follows rules and computers can be programmed to follow the same sorts of rules. By copying biological rules, we can harness “nature’s creativity” to solve our problems, provided they are suitably expressed in universes created inside computers.

Imagine an ant nest. The ants as individuals may not be very clever, but by working together the ants forage and find optimal routes to supplies of food. Likewise, although a computer isn’t very clever it can be programmed to simulate what ants do, and then it can solve hard problems such as finding the best way to visit customers to keep a company in business. Similar nest-inspired digital biology methods have been used to schedule processes, route automatic vehicles, and to design electronic circuits.

It is very hard to write popular science, especially when combining two such contrasting subjects. I’m afraid critics will find the explanations in their own speciality simplistic, yet won’t get enough from the book about the other field to go deeper. The writing has a lot of imaginative story-telling, but it isn’t obvious how to go from inspiration to involvement. You can admire the creativity of researchers and be fascinated by the applications, but it is hard to see how to do any digital biology for yourself. Fortunately there is plenty of digital biology on the web you can explore, although the book doesn’t point this out.

Apart from a few asides, *Digital Biology* does not get into exploring vision or robotics, which are the main ways computers sense and interact with the real world. Perhaps because his digital biology is stuck inside computers, Bentley is keen to make sure we realise it is supposed to be real biology rather than mere simulation. I happen to disagree, but there’s no doubt that harnessing digital biology to real-world problems, being inspired by evolution, neurons, insect swarms, immune systems and embryology, is going to change our lives — probably more dramatically than robots will.

Reviewed by Harold Thimbleby