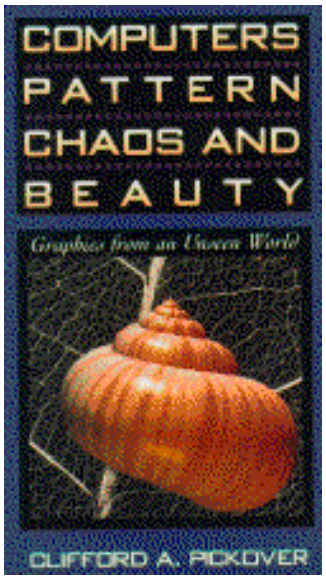
Book Reviews

Review of *Computers, Pattern, Chaos and Beauty* by Clifford A. Pickover

by *Lynellen D. S. Perry*

Computers, Pattern, Chaos and Beauty. 1990. Clifford A. Pickover. St. Martin's Press, New York. 396 pages, $19.95



CPCB is a delightful smorgasbord of various scientific and artistic realms that catalog some of Pickover's research (for more information on his research, see Pickover's home page at http://sprott.physics.wisc.edu/pickover/HOME.HTM). In the preface, Pickover describes the contents of the book as follows,

> "The first part of the book gives background information on computer graphics and the creative use of computers. The second part of the book describes various graphical methods for representing and detecting patterns in complicated data. The third part of the book illustrates simple techniques for visualizing graphically interesting manifestations of chaotic behaviour."

Aimed at students, artists, programmers, and lay-people, this is not a very mathematically-oriented book. Instead, it is an accessible spur to creativity, with something for everyone. Pickover's goals are:

> "1. To present several novel graphical ways of representing complicated data,
> 2. To show the role of aesthetics in mathematics and to suggest how computer graphics gives an appreciation of the complexity and beauty underlying apparently simple processes,
> 3. To show, in general, the beauty, adventure and potential importance of creative thinking using computers,
> 4. To show how the computer can be used as an instrument for simulation and discovery."

Lots of illustrations and even pseudo-code are included to aid the reader in further exploration.

The reader's roller-coaster ride journeys through many topics, including making computers not just speak, but sing; the representation and creation of music with a computer; the study of the "breathing motions" of proteins; and the analysis of genetic sequences in search for a cancer gene. Chapter four introduces several unusual ways to graphically represent or visualize data. Symmetrized dot-pattern snowflakes are used to

visualize speech waveforms, animal vocalizations, and cardiac sounds. Random dot moires display protein molecule rotation while cartoon smiley faces can show the auto-correlation between multiple variables in speech, DNA sequences, and aircraft parameters. All of chapter five examines some image processing techniques as applied to the examination of the Shroud of Turin.

In part two of **CPCB** , Pickover explores how to use mathematical feedback techniques (which produce the fractal images we're so familiar with, such as the Mandelbrot set fractal) to create biological shapes reminiscent of sea life and microscopic life. In part three, more traditional fractal spaces are probed, as are mathematical chaos, dynamical systems, numerical approximation methods and number theory. Several chapters are devoted to synthesizing natural images, artistic spirals, ornamental textures, and tessellations. At the end of the book is a large section of recipes, suggestions for further experimentation, a glossary, and a gigantic list of references.

I highly recommend this book to any student who is trying to find inspiration for understanding a large data set from any domain. If nothing else, **CPCB** will spark your imagination and fire your enthusiasm to try a visualization technique that seems to be completely off the wall. Besides, **CPCB** has a lot of pretty pictures to look at.