Not only computing — also art

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Figure 1

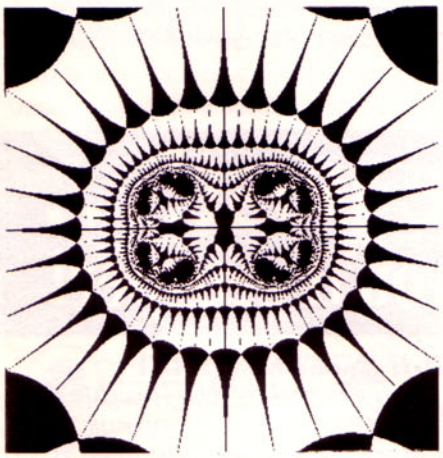


Figure 2

Figure 3

The great current interest in chaos theory and fractals continues to grow among scientists and mathematicians (and, rather more surprisingly among artists and designers, too). In fact, so extensive is this interest that keeping up with the literature it generates is rapidly becoming a full-time task.

Hardly a week goes by without its new quota of notes, articles and books on the subject, either technical or popular. An incredible number of these seem to emanate from the pen of US researcher, Clifford Pickover — I wish I was even just half as prolific as he. In a new book, *Computers, Pattern, Chaos and Beauty* (published by Alan Sutton, Stroud, Glos 1990), Pickover has put together an extremely valuable collection of his previously published contributions as well as much new work. The book is full of fine illustrations (Figures 1, 2 and 3) as well as practical recipes for generating similar images. It should be near the computer of everyone with any interest whatever in this burgeoning field.

When you casually glance at the volume in the bookshops, however, two things might put you off purchasing it (that is, if you share my prejudices). First, the flyleaf says that 'Pickover writes in the spirit of Hofstadter's *Gödel, Escher, Bach* … ' — true. Indeed, this seems to be the avowed aim of every post-1980 American popular text which deals with mathematics with some 'art' thrown in. I heartily wish authors would try and use some other model for their inspiration. Second, right up front in his introduction, Pickover recommends us to Pirsig's *Zen and the Art* of *Motorcycle Maintenance*. Normally, a favourable reference to either of these two pretentious — but, I confess, extraordinarily popular — works would lead me to replace the volume on the bookshop shelves without further ado. Two such references right at the start are almost enough to induce apoplexy. It says much for the quality of Pickover's book that I was able to overcome these terrors and find the work so recommendable.

Another practical and extremely useful book on chaos and fractals (which makes only one oblique reference to *Gödel, Escher, Bach*) was published last year by Cambridge University Press. This is *Dynamical Systems and Fractals* by Karl-Heinz Becker and Michael Dörfler of the Bremen University dynamical systems research group, under Professors Peitgen and Richter (who, since the early 1980s, have done most to foster an interest in the visual aspects of fractals and chaos theory). Originally published in German in 1986, Becker and Dörfler's book doesn't cover all the ground that Pickover's does (four years is an eternity in chaos theory) but, to my mind, is rather more insightful. In addition, as all its many algorithms are in Pascal — and full versions of programs are given in various versions of that language — the work makes an excellent introductory text for those students wishing to make a start either on Pascal programming or on computer graphics. Interesting, too, is the way in which the authors have used spreadsheets to compute and display the numbers that dynamical systems produce. The book is, however, marred by a number of misprints, but I think it is essential reading.

One little piece of information hitherto unknown to me arises in a translator's note at the bottom of page 138 of the paperback edition. The Bremen group call the well-known Mandelbrot set, 'Apfelmännchen' (literally the 'little apple man'). This, as can be seen from Figure 4, is quite an evocative name for it, although it may not be immediately apparent as we don't normally display the image this way up. In English we would probably call it the 'gingerbread man' and this is the term the book uses. The translator, Ian Stewart — himself a significant contributor to chaos theory — points out that this is also a pun-like reference to 'Mandelbrot' which translates as 'almond bread'.

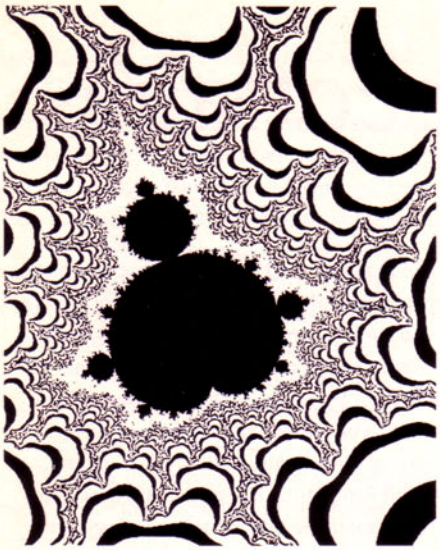


Figure 4

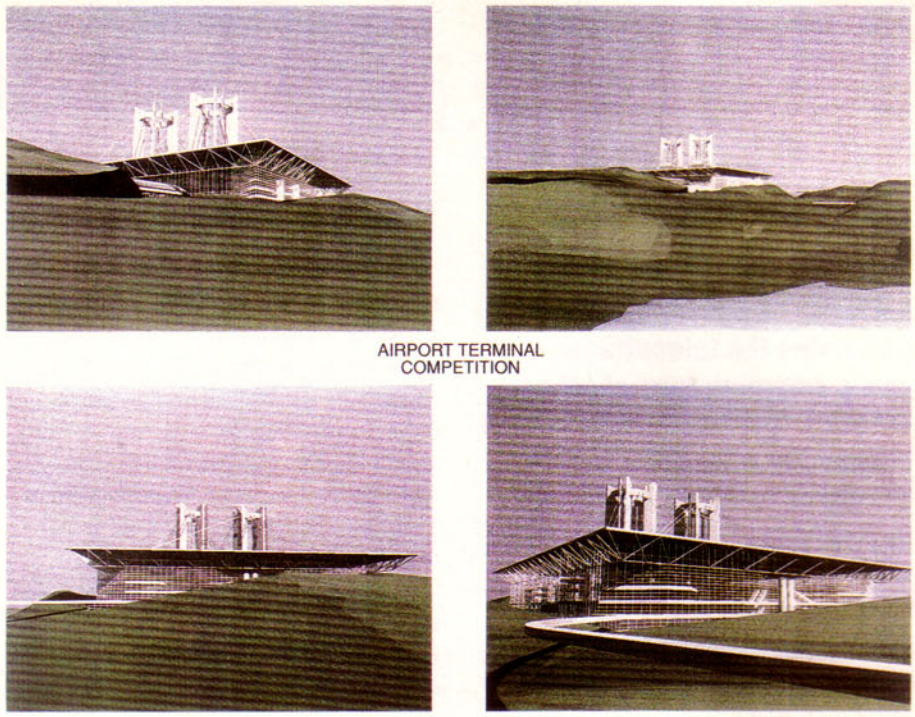
Going down to the sea again

One application of chaos theory which particularly caught my eye this year was in the *New Scientist*, 9 June 1990. Allan McRobie and Michael Thompson of University College, London, are using it to look at the dynamic behaviour of ships. With the aid of some stunning computer graphics they can illustrate the way in which certain conditions of ship and wave motion give rise to instability and ultimate capsize. The main insight they give us is to encourage thinking of the normal engineering 'factor of safety' in terms of distance from the boundaries of different 'safe' areas of colour on a chaos theory attractor plot (resembling the ones shown in Figures 1, 2 and 3).

To be stable, a ship should be at a fair distance from a boundary — indeed capsize will probably occur if it crosses from one area to another. But, as time progresses, particular combinations of movement and wave impact gradually erode the safe areas splitting these up and bringing the boundaries closer together. It is clear that the study of the fractal shapes arising from these sorts of plots will give engineers new understanding of the forces that their structures have to withstand and of the circumstances that give rise to collapse.

Prizes on offer

For the past couple of years, the Computing Industry Computing Association (CICA) which is an Associate Group of the BCS, has been running a computer-drawing competition in conjunction with CalComp Ltd. In addition to their normal 3-D modelling and visualisation and 2-D draughting awards, they are also introducing a student CAD drawing award for the 1991 competition. This will be in the form of a £500 prize for the student and CalComp equipment to the value of about £4500 for the student's college. As so many colleges and schools of architecture now encourage their students to use CAD systems, I look forward to seeing some stimulating images coming under this category. The closing date for entries is mid-December, so get those submissions in immediately. Figures 5 and 6 shows the standard of the professional entries. Figure 5 shows the 1990 winner in the 3D modelling and visualisation category. It is by Roger Matthews of architects, Scott Brownrigg and Turner. Figure 6 shows the 1990 winner of the landscaping and mapping category (a special category for 1990). It is by Hugh Whitehead of the YRM Partnership — a long-established architectural practice which has helped pioneer the uses of computing in architecture.



AIRPORT TERMINAL
COMPETITION

Figure 5

Figure 6