Fractals: A Very Short Introduction

By Kenneth Falconer

Questions for Thought and Discussion

- Suggest some further objects or phenomena from nature, science or social science that might be regarded as fractals. How do these fit in with the list of characteristic properties of fractals?
- Why did fractal geometry not really emerge until the 1970-80s even though geometry had been around for thousands of years?
- To what extent has the development of the computer influenced the development of fractals, their applications and popularity?
- How important is visualisation in the study of fractals - for example would the book have been meaningful without any diagrams?
- Mathematical descriptions of real objects or phenomena (fractal or otherwise) are only ever approximate descriptions - how much does this matter?
- To what extent does at least a little knowledge of the underlying mathematics improve one's appreciation of 'the beauty of fractals'?
- Does it really make sense to refer to fractal or box-counting dimension as a 'dimension'?
- Why is the notion of 'iteration' important? Suggest some further examples of iteration from mathematics, science and life in general.
- How might one construct a statistically-self-similar version of the Sierpinski triangle?
- Do complex numbers exist?
- Was the Mandelbrot set invented or discovered?
- A great deal of 'fractal art' has been produced, as an internet search will easily show. Is it really art? If you look at some examples, what emotions does it arouse?
- To what extent is the world we live in random?
- How long is the coast of Britain?
- Can fractal descriptions of share prices (e.g. Brownian motion or more sophisticated models) really help us to understand the behaviour of markets?

Other books by Kenneth Falconer
*The Geometry of Fractal Sets* (Cambridge University Press, 1985; paperback 1986)
*Fractal Geometry: Mathematical Foundations and Applications* 3rd Edition (John Wiley, 2013) [A gateway to the mathematics of fractals and their applications.]
*Techniques in Fractal Geometry* (John Wiley, 1997)
(With H.T. Croft and R.K. Guy) *Unsolved Problems in Geometry* (Springer-Verlag, 1991)

Further Reading
Benoit Mandelbrot, *The Fractal Geometry of Nature* (W.H. Freeman, 1982) [This is the book that brought fractals into the public eye, giving a broad scientific and philosophical overview of fractals, with many illustrations and little technical mathematics]
Nigel Lesmoir-Gordon and Will Rood, illustrated by Ralph Edney, *Introducing Fractals: A Graphic Guide* (Icon Books, 2009) [A short, entertaining overview of fractals with insightful cartoons on every page.]
Ian Stewart, *Does God Play Dice?* (Penguin, 1997) [A very readable account of chaos and fractals avoiding any mathematics.]
Heinz-Otto Peitgen, Hartmut Jürgens and Dietmar Saupe, *Chaos and Fractals* 2nd ed (Springer, 2004) [Presents the basic mathematics of fractals and chaos with many illustrations and examples.]

Benoit Mandelbrot, *The Fractalist: Memoir of a Scientific Maverick* (Pantheon Books, 2012) [Mandelbrot's autobiography published soon after his death.]

MacTutor History of Mathematics Archive, http://www-history.mcs.st-and.ac.uk [This web archive, maintained at the University of St Andrews, contains a vast amount of historical information about the mathematicians mentioned in the VSI.]

Please note the extended Further Reading section at the end of *Fractals: A Very Short Introduction*.