Chatting fractals and New Math

Thomas Banchoff

Mathematical People: Profiles and Interviews. Edited by Donald J. Albers and G.L. Alexanderson. *Birkhäuser: 1985. Pp.372. $24.95.*

GEORGE Pólya died recently at the age of 97. Here was a legendary teacher whose book *How to Solve It* and famous film *Let Us Teach Guessing* inspired generations of students and teachers of mathematics. Would it not have been instructive to have had the opportunity to ask him questions about his career? In recent years, Benoit Mandlebrot's filigreed fractal patterns have burst out of the pages of journal after journal, intriguing scientist and designer alike. How would it be to interview him and get some insight into the process of creating a new kind of mathematics?

In *Mathematical People* we can enjoy conversations with these figures and two dozen more. This collection of interviews and profiles comes primarily from a very successful series of articles over the past six years in *The College Mathematics Journal* (formerly *The Two-Year College Mathematics Journal*). The project began auspiciously with an interview with Pólya on the occasion of his ninetieth birthday celebration at Stanford and continued to include some of the most interesting mathematical people of our day.

Here are stories about Persi Diaconis, who left school at 14 to travel with a professional magician, Martin Gardner who explains the origin of his hugely popular *Scientific American* column, and the immensely prolific, champion collaborator Paul Erdös. We can follow the controversial views of Morris Kline about the New Math, and compare them with the counter-suggestions of Peter Hilton and Paul Halmos. We can contrast the impressions of Richard Courant given by his co-author Herbert Robbins and by the biographer Constance Reid. And we can keep track of dozens of comments about the sometimes opposing relationships between pure and applied mathematics.

What we do not find are answers to the question: "What good is mathematics anyway?". The interviewers are for the most part mathematicians themselves and everyone takes for granted the fact that the creation and communication of mathematics is a worthwhile occupation. Moreover the primary readership for the original articles was teachers of mathematics, so questions tend to centre on different aspects of teaching as opposed to research.

There is wide variation in the depth and the nature of the interviews and profiles, and occasionally a general reader will be left behind when the discussion takes a technical turn. There are also a few other places where one looks in vain for a follow-up to a remark in an interview. For example, what was the subject of Donald Knuth's first published article, in *MAD Magazine*? Could Albert Tucker please explain why his mentor Solomon Lefschetz had artificial hands? And if David Blackman was not conscious of discrimination all through his schooling, why was it that he only applied to black institutions when he sought his first job?

By and large, however, the interview format is quite successful. By contrast the set pieces taken from popular scientific journals, on Shiing–Shen Chern and Ron Graham for example, may be better organized and generally more informative but they lack the spontaneity of the transcribed interviews. The detailed and technical autobiographical reminiscence of Olga Taussky-Todd, originally written as part of a Caltech oral history project, seems out of place in this volume.

Still, one must expect such vagaries in a collection such as this. Many people will find illumination and entertainment in the book, and will be happy to learn that a second volume is in preparation. □

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In physical context

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Mathematics and the Search for Knowledge. By Morris Kline. *Oxford University Press:1985. Pp.257. $19.95, £21.*

OVER several decades, Morris Kline has built up an enviable reputation as the author of a series of popular books on mathematics which include a substantial element of historical material. The first book, *Mathematics in Western Culture* (Oxford University Press, 1953), remains perhaps the best: the last one, *Mathematics: The Loss of Certainty* (Oxford University Press, 1980), was probably the worst, with numerous infelicities and errors over the foundations of mathematics and its history. This latest volume lies somewhere between the two.

Here, Kline has returned to applied mathematics, in order to explain how mathematics helps us to understand the physical world. After a "Historical Overview" dealing with various philosophers' positions on the possible existence of an external world, and a discussion of the fallibility of sense perception, he proceeds to a chronological account of episodes in the history of astronomy and mechanics: the Greeks, Copernicus and Kepler, Descartes and Newton. Then electromagnetism is introduced, chiefly as background to relativity and quantum mechanics. The final trio of chapters contains discussions of aspects of the philosophical questions which underpin the book as a whole.

The level of success achieved by Kline in answering these questions may be appraised at first by looking at his use of history. The treatment is more detailed than in his *Mathematics and the Physical World* (Crowell, 1959), but not much; in particular, there is not actually a great deal of mathematics in the book, the chapters on general relativity and quantum mechanics including hardly any at all. Further, the range of applications is curiously incomplete: there is little or nothing on optics, heat diffusion (the paragraph on p. 202 about Fourier misrepresents his philosophy, overrates his mathematics and underrates his physics), hydrodynamics, elasticity theory or engineering mathematics (friction studies, machines of all kinds, cartography and topography, and so on). Probability and statistics earn the falsehood that "the theory of probability . . . entered into mathematics quite by chance in connection with games of chance" (p. 189): the virtual absence of these two topics is an especial pity, since work on them greatly extended the range of application of mathematics and raised important questions about knowledge and ignorance, and the epistemological status of approximative theories.

The result of these omissions is not only