BOOK REVIEWS

LOVING + HATING MATHEMATICS
Challenging the Myths of Mathematical Life

by Reuben Hersh and Vera John-Steiner
Princeton University Press, 2011. ISBN 978-0-691-14247-0. $29.95

Reviewed by Anthony G. O'Farrell

This is an entertaining, useful, and provocative book. It is about mathematicians, rather than mathematics. Its aim is missionary: to rehabilitate mathematicians in the opinion of the general public (GP).

The majority of the GP are more-or-less indifferent to mathematics. A large minority love it, and a larger minority hate it — a hate usually born of schoolday fear. Recently, a number of films and documentaries on mathematicians have attracted wider attention, and these upset professionals because they reinforce the myths. There have been calls for mathematicians to redress the balance, and this book is one attempt in that direction. Professor Hersh has already published an outstanding book about the mathematical experience [1].

The myths of the subtitle are four:

(1) Mathematicians are different from other people, lacking emotional complexity.
(2) Mathematics is a solitary pursuit.
(3) Mathematics is a young man's game.
(4) Mathematics is an effective filter for higher education.

The book is structured as a systematic attempt to debunk these myths. The evidence adduced consists in the main of anecdotes drawn from the increasingly voluminous literature of writing about the lives and foibles of mathematicians, supplemented by some informal survey work by the authors and by reasoned argument.

Professionals will recognise many of the anecdotes, but the authors have trawled well, and I encountered many new gems here.

One of the useful features of the book is its excellent bibliography of sources on writing about mathematicians. However, professionals are not the target readership. The book is written to be accessible to the general public. There is essentially no mathematical content. The remarks about the substance of various mathematical achievements will not enlighten anyone who does not already understand them. There are just three equations: the quadratic equation and its standard solution, and a Rogers-Ramanujan identity (p.92). The latter seems to be there just for show, and has a misprint. No doubt the misprint will be corrected in future printings, but it might be a better idea to drop all three. The solution to the quadratic is typeset in an odd way, using (+ or −) instead of ±, (as though a reader who can understand $\sqrt{}$ will not understand ±), and the comment about the solution — "not beautiful" — is debatable. *De gustibus non disputandum est,* but I distinctly recall being bowled over when I was eleven by the trick of completing the square, when Br. Kevin Skehan showed it to us. Besides, according to a well-known publishing principle, the elimination of three equations should have the effect of multiplying the prospective sales figure by eight!

Myth (1) is challenged in the first four chapters, which examine anecdotally how people grow up to become mathematicians, how mathematical culture operates, the role of mathematics as a solace in terrible times, and mathematics as addiction and obsession. Included are the touching stories of J.-V. Poncelet and José Luis Massera, and the more troubling tales of Grothendieck, Gödel, and the murderers Bloch and Kaczynski — the Unabomber (Irish readers, familiar with the events of 1649, will be interested in the authors' idea that some words of Cromwell — of all people — might be used to urge Kaczynski to reconsider his murderous conclusions).

Taken together, these stories support the view that competent mathematicians come in various personality types, and many exhibit emotional complexity, but in the reviewer's opinion they also support the case that mathematicians are different. The story of how J.H. Conway re-invented the filing cabinet is typical. Mind you, the book would be far less entertaining if they were the same as everyone else.

There is proven interest among the GP in anecdotes and biographies of highly eccentric mathematical geniuses. Whether there will

ever be much interest in the lives of the many perfectly sane mathematicians who obtain wonderful but generally-incomprehensible results is open to question. This is the problem about divorcing the account of the people from their work. We may just have to face the reality that the GP will never understand us. The brutal truth is that even most of our scientific colleagues don't understand what we do, or why it should matter.

By the way, the illustrations, consisting of mediocre-quality black-and-white photographs of mathematicians, will do little to dispel any stereotypes. Quite a few are of women, but that's about it.

Myth (2) is successfully demolished in two chapters, one on friendships and partnerships, including marriages, and one on famous mathematical communities, ranging from Göttingen in the 1890's to the Association of Women in Mathematics and the online community built by Gowers and flourishing today. The pocket accounts here will stimulate readers to pursue the original sources for fuller accounts. The reviewer was particularly taken by the accounts of mathematical friendships and community life in the former Soviet Union. Of course, his interest in these stories is coloured by his knowledge of the technical achievements of the participants, and it is hard to judge how the same stories will strike a reader to whom their names are just names of men and women, as opposed to the names of demigods. That Kolmogoroff and Alexandroff spent many a sunny March day skiing across country in their underpants gains an interest it might not otherwise have, if you know something of what these men created.

Myth (3) is perhaps not a myth of the GP, but rather of mathematical enthusiasts. It is challenged on two grounds.

First, cases of successful women are given, starting with the usual Germain-Kovalevskaya-Noether trio. More interesting is some witness on the somewhat improved contemporary scene. A reasonable summary would be that mathematics is a man's game, but it doesn't have to be.

Second, an impressive list is given of mathematicians who maintained or even began productivity in old age, and this is supplemented by an account of responses to a survey conducted by Hersh. The results are interesting, but hardly altogether encouraging. A reasonable summary would be productivity can be maintained, but

only if appropriate steps are taken to compensate for declining energy, memory and computational ability, and that the most reliable recipe is the combine your accumulated technique and cunning with the energy of a younger collaborator.

Myth (4) is about the rôle of mathematics in education. The related questions are: what mathematics should a given person learn, and what people are capable of learning a given area of mathematics?

Chapter 9 contrasts two extreme approaches to teaching mathematics at university: that of R.L. Moore, and the *Potsdam model* invented by C.F. Stephens of SUNY Potsdam. This chapter is very interesting, but a bit frustrating. Most readers of this Bulletin will be familiar with Moore's method, designed for elite students, rarely used, but it was fascinating to read of Moore's implacable bigotry. Stephen's method, spectacularly successful, is based on the idea that *by lovingly and patiently nurturing students* one can teach mathematics to *any student who wishes to learn*. The frustrating part is the absence of any real detail on how this striking idea is actually carried into practice.

The last chapter addresses the problem of fear and loathing of mathematics among school-children, and advocates as part of a solution that we eliminate "abstract" mathematics (including algebra) as a universal component in secondary education. The point is made that children are not born hating mathematics; they *learn* to hate it in school. There would be no reason to fear it if it could be avoided easily. It is also pointed out that many professional people, such as doctors, make no use of algebra and trigonometry in their work. These facts are not in dispute, but many will dispute the wisdom of the proposed solution. In particular, the authors may underrate the rôle of mathematical studies in developing reasoning skills, which, once developed, may be transferred to other domains. There is also evidence [2] that patients would be better served if many doctors had more, rather than less exposure to mathematics.

Apart from the usual indices and notes, the book includes a useful appendix giving thumbnail biographies of hundreds of mathematicians.

No-one who hates mathematics will pick up this book. Realistically, the most likely reader already belongs to the minority who are positively-disposed. Younger readers of this kind will find support

for the view that a reasonable person might find happiness and fulfilment in the pursuit of mathematics, and will be stimulated to pursue further the lives, achievements, and problems mentioned. I recommend this book for school and university libraries, and for prizes. It is priced to be affordable by the public, and worth owning.

References

[1] Davis, P.J. and Hersh, R.: *The Mathematical Experience.* Birkhäuser. Cambridge, Mass. 1980.
[2] Gigerenzer, G.: *Reckoning with Risk.* Penguin. London. 2002.

Anthony G. O'Farrell
Department of Mathematics and Statistics
NUI, Maynooth
Co. Kildare
Email: anthonyg.ofarrell@gmail.com

Anthony G. O'Farrell was educated at UCD and Brown University. He is Professor of Mathematics at NUI, Maynooth. His research interests centre on Analysis.

Received 8-7-2011.

THE BEST WRITING ON MATHEMATICS 2010

Mircea Pitici, Editor
Princeton University Press, 2011. ISBN 978-0691148410. $19.95

Reviewed by Stephen Buckley

Compiling a good anthology is no easy task, but here Mircea Pitici has succeeded in putting together a wonderful and varied bouquet of texts related to mathematics.

The editor says that in putting together this book, he aimed *to make accessible to a wide audience texts originally printed in publications that are often not available outside the scientific community or have limited distribution even inside it.* He also aimed *contribute to the dispersion of thinking on mathematics*, to *illustrate the growing*

presence of mathematical subjects in the mass media, and to *encourage even more and better writing of a similar sort.* All selected texts were published in 2009, and all are texts about mathematics rather than mathematical texts: in particular, there are no formal proofs and very few mathematical formulae.

A successful anthology requires a clear set of aims and selection criteria such as the above, but it also requires that the editor pores over a large number of candidate texts and chooses wisely. Pitici's considerable efforts have certainly succeeded: the chosen 35 texts are mostly of a very high standard and consistent with the selection criteria. Some are broad surveys of certain areas of mathematics, while others are discussions of mathematical culture, philosophy, or history. Of course it is in the nature of anthologies that the reader will find some selections much more appealing than others.

The book is divided into six sections, although there are no clear delineations between several of these sections. The Section *Mathematicians and the Practice of Mathematics* includes an interesting report by Timothy Gowers and Michael Nielson on massively collaborative mathematics, and the essay *Birds and Frogs* by Freeman Dyson, a written version of Dyson's AMS Einstein Lecture. Here he discusses two types of mathematicians: *birds fly high in the air and survey broad vistas of mathematics*, while *frogs live in the mud...[and] delight in the details of particular objects.* Dyson maintains that Mathematics needs both frogs and birds. The wonderful set of anecdotes about a variety of famous mathematicians, each of whom Dyson classifies as a bird or a frog, is reason enough to recommend this book to all professional mathematicians.

The Section *History and Philosophy of Mathematics* also contains several articles likely to be of considerable interest to the professional mathematician, including a discussion of why Lagrange attempted to prove the Parallel Postulate, and a discussion of Kronecker and constructive mathematics.

In this same section, there is an interesting survey by Philip Bowers on circle packing. He contrasts two branches of circle packing. The first, focusing on the relationship between circle packing and classical complex analysis, is guided by a grand vision given by major conjectures and "revered texts". The second, relating circle packing to the discretization of geometry, gets its impetus from a variety of applications, from minimal surfaces to computer vision, medical

imaging, and manufacturing design. This contrast ties in nicely with Dyson's birds and frogs essay.

Other survey texts in this book deal with financial mathematics, models of the Internet, a discussion on how to represent numbers in a computer (including the *level-index system* which curiously is arithmetically closed despite containing only a strictly bounded subset of the real line), and a discussion of certain games of chance. Surveys such as these are likely to be of particular interest to prospective mathematicians.

There are several texts on the nature of truth and proofs in mathematics in the first section of the book. These are particularly suitable for the non-mathematical reader to get a sense of what mathematics is all about, although the survey *An enduring error* by Branko Grünbaum is also likely to be of interest to many mathematicians. This survey examines the various treatments of Archimedean polyhedra and in particular traces a certain error in their enumeration that has been reproduced in many texts.

Other texts of interest include separate articles on the attitude of Einstein and Darwin to mathematics, a report on the Kervaire invariant problem, and newspaper articles on the mathematics of love and on mathematics in the movies (including discussions of zombie movies, a Batman movie, and "Reservoir Dogs").

Overall, I highly recommend this book to everyone with an interest in mathematics, whether they are professional mathematician, graduate or undergraduate students, teachers, or enthusiastic amateurs.

Stephen Buckley
Department of Mathematics and Statistics
NUI, Maynooth
Co. Kildare
Email: stephen.buckley@maths.nuim.ie

Stephen M. Buckley was educated at UCC and the University of Chicago. He is Professor of Mathematics at NUI, Maynooth. His main research interests are in Geometric Analysis.

Received 6-7-2011.