BOOK REVIEWS

ALAN LAW

Confronting the Core Curriculum, by John A. Dossey, published by the Mathematical Association of America, 1998,
ISBN 0-88385-155-5, softcover, 136+ pages, $38.50 (U.S.).
Reviewed by ***Ron Scoins****, University of Waterloo, Waterloo, Ontario.*

Subtitled *Considering Change in the Undergraduate Mathematics Major*, this book is a summary of the proceedings of a 1994 conference held at West Point. The conference was organized as a response to the need for changes to core curriculum in view of the four-fold increase in the number of students studying mathematics and the realization that core mathematics must serve the needs of all students, not just math majors.

The book starts by reviewing the efforts over the past 40 years of the MAA Committee on the Undergraduate Program in Mathematics to address the goals and content of core curriculum. In spite of many excellent recommendations on ways to modify core to serve the needs of all students in the mathematical sciences, it is disappointing to realize that not many math departments have made an effort to meet this challenge. The point is also made that content and pedagogical practices should be considered simultaneously. Suggestions are given on how to establish a student growth model to ensure a successful program.

The next section describes a bold and innovative curriculum coupled with student and faculty growth models that have been in place since 1990. The "7 into 4" core curriculum is an integrated program that includes topics from discrete, continuous, linear, non-linear, deterministic, and stochastic mathematics. It has gone through several iterations since its introduction. For departments considering core curriculum reform, it is a good framework from which to start.

Section II of the book reports on the central agenda of the conference. It outlines a core curriculum designed as if most students will not take the next course in that branch but without cramming "everything" into it. Proposals are put forward for the inclusion of Discrete Mathematics, Calculus, Linear Algebra, Differential Equations, and Probability and Statistics to be the basis of a core mathematics program. The rationale for inclusion, along with suggested topics, and pedagogical practices to enhance learning for each of these five areas, was presented by a prominent mathematician from that discipline. Responses to these proposals are also reported. The responses are very supportive of the ideas put forth by the presenters.

I was disappointed that the inclusion of Computer Science was not considered to be an essential part of core mathematics. (This may have something to do with the culture at Waterloo.)

As a response to the recommendations made at the 1994 conference, a follow-up workshop was held in 1995 at which four universities reported on revisions to their core curriculum. A summary of this workshop is also included in the book.

Most educational jurisdictions in North America (including Canada) have revised the mathematics curriculum for elementary and secondary schools within the past five years. This, along with the challenge of educating a broader base of university students for participation in a technological society, suggests that university mathematics departments need to review and possibly revise their core mathematics curricula. I strongly recommend reading this book as a first step in that process.

Magic Tricks, Card Shuffling and Dynamic Computer Memories,
by S. Brent Morris,
published by the Mathematical Association of America, 1998,
ISBN 0-88385-527-5, softcover, xviii + 148 pages, $28.95 (U.S.).
Reviewed by **Paul J. Schellenberg**, *University of Waterloo, Waterloo, Ontario.*

This book may appeal to readers on several different levels — the mystery and delight of a well-performed magic trick, the magic explained, mastering the perfect shuffle, and the mathematics of perfect shuffles.

The perfect shuffle requires the dealer to divide a deck of $2n$ cards precisely in half, and then perfectly interlace the cards of the two halves. This perfect shuffle can be performed in two ways, an *out-shuffle* which leaves the top and bottom cards on top and bottom, respectively, and an *in-shuffle* which does not. For example, a deck consisting of the cards 1, 2, 3, 4, 5, 6, 7, 8, in that order, will have the order 1, 5, 2, 6, 3, 7, 4, 8 after an out-shuffle and the order 5, 1, 6, 2, 7, 3, 8, 4 after an in-shuffle. The definition of a perfect shuffle is generalized to decks with an odd number of cards. These perfect shuffles permute the cards of a deck in such a precise fashion that one can mathematically determine the location of any card after one or a series of such shuffles. For example, after only 8 out-shuffles of a deck of 52 cards, the deck is restored to its original order!

The author describes how the properties of the perfect shuffle are exploited to accomplish some delightful magic tricks. The book has five chapters, each beginning with a spectator's description of a magic trick using a deck of cards. Morris then explains some mathematical properties of perfect shuffles and finally concludes the chapter by revealing how to perform the trick. In the fifth chapter, Morris applies the mathematics of perfect shuffles to describe how data can be retrieved efficiently from a volatile dynamic computer memory — an application which is primarily of theoretical interest, as developments in computer memory design have eliminated the need for dynamic memories.

The author has included a substantial bibliography to the literature of perfect shuffles, and describes some of their history. There are also four appendices. The fourth one, entitled "A Lagniappe," describes three further magic tricks, two of which rely on special properties described in this book.

The combinatorial mathematics of perfect shuffles begins at a fairly elementary level and becomes increasingly technical as it proceeds to its ultimate application to dynamic computer memories. The reader can enter into these mathematical developments as deeply as he or she chooses. The description of the magic tricks is not impeded by the complexities of the mathematics.

Among the general population, there are those who have a natural bent toward entertaining and performing. Many of you will find this book a treasure trove of material to delight and astonish your listeners.

Correction

In Walther Janous' letter [2000 : 467], there was a confusion in the dates of the references. Here is a corrected version:

References.

[1] G.H. Hardy and E.M. Wright, *An Introduction to the Theory of Numbers*, Oxford, New York 1965.

[2] A. Makowski, Problem 3932, *Mathesis* 69 (1960), 65.

[3] D.S. Mitrinović, J. Sándor and B. Crstici, *Handbook of Number Theory*, Dordrecht, Boston, London, 1996.