Mathematics: A Simple Tool for Geologists

by D. Waltham, 2000; Blackwell Science, Inc., 238 Main Street, Cambridge, Massachusetts 02142; 208 pages, softbound; $26.50 (£16.50); ISBN 0-63205-345-3.

David Waltham advertises his book on the back cover by stating that is "for students who did not follow mathematics through to the end of their school careers and for (those) whose mathematics have become rusty...". As such, the mathematically rusty target audience should be amply satisfied by Waltham's delivery in this handy paperback, which concentrates on traditional and useful concepts for the working geologist. The introduction and summary of the book both emphasize the focus on the utility of each concept in deference to the classical development of the mathematics.

Mercifully lacking in theorems and rigorous theoretical development, this book sticks faithfully to its promise of pitching mathematics at the right level. The primary aim of providing a solid geometric interpretation and practical applications of the various subjects is clearly met in each chapter, with even a smattering of historical development.

The nine chapters are organized in a logical progression from simplest to more difficult subjects. Each chapter contains a manageable number of exercises that reinforce the presented concepts and are really worth doing because of their continuing focus on practical geologic applications. A pleasantly unique feature is that 21 supplemental example spreadsheets are available for downloading and use from the web via an active site I was able to access easily.

Each chapter is independent of the others, and sections can be skipped without overall loss of continuity. The reader is lead through the book at a gentle pace that is neither tedious or laborious, nor condescending. The main concepts and objectives of each chapter are clearly introduced, while the summary paragraphs tend to recapitulate key learning points and emphasize their linkage to the 'big picture'.

Chapter 1 is a review of mathematical symbols, subscripts, superscripts, and scientific notation. A whole host of definitions are included. Linear regression, quadratic, higher-order polynomial and exponential functions, and logarithms are well explored in Chapter 2. Algebraic manipulation and factoring are in Chapter 3. These concepts are further developed in Chapter 4 for the cases of exponential and logarithmic expressions. Solving simultaneous linear equations is introduced for the first time. Chapter 5 is a rather long and extremely useful treatment of trigonometry, with good examples and illustrations. Chapter 6 is also lengthy, with a good and in-depth discussion of graphs and projections; it should be of particular interest to structural geologists. I believe Chapter 7, on statistics, is the best chapter in the book. The definitions of statistical terms are concise and clear. The link to regression, and error analysis is nicely established at this point. Chapters 8 and 9 complete the formal development of the text with differential and integral calculus. The two appendices capture a host of useful equations and the answers to all the chapters' problem exercises.

Relevant concepts for the geologist, such as functional relationships between time and depth, age and depth, and sedimentation rates, are addressed. The book delves deeper into more complicated, if not overly difficult, matters such as pressure, gravity, heat flow, radioactive decay, polynomial, and simultaneous equations. The exercises, both in the book and on the spreadsheets, focus on applications to problems such as these. The graphics are rather plain and simple, but are generally clear and effective as they are. Like the subject matter progression, the graphics are better and more illustrative later in the book. Additionally, more frequent changes in text size, font style, offset, or boldness of the equations could further enhance readability.

This book is highly recommended for its overall readability and usefulness as a quick reference tool for the target audience that Waltham seeks to address. The later chapters, after Chapter 5, are very well done and should be of interest to more than just the mathematically rusty. The consistent application of the mathematical concepts to geologic scenarios is most helpful, while the spreadsheet exercises are a novel and interesting technique. This book is a real opportunity to shake off some of the mathematical rust.

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