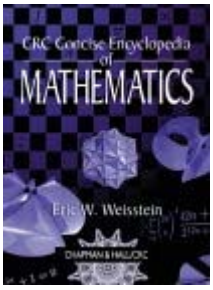
Of Making Compilations There Is No End

Book Review

Philip J. Davis



CRC Concise Encyclopedia of Mathematics
Eric W. Weisstein
Chapman and Hall/CRC, Boca Raton, Florida, 1999, 1969 pages
CD-ROM version available.
(Errata can be found on the author's Web site.)

How on earth does one review an encyclopedia? Especially in today's market, which has been drowning us in databases, interactive info centers, . . . , you name it. Every individual, every group has become an un-turn-off-able gusher of everything they think you have ever wanted to know.

Far in advance of delivery, I laid out what would be my first step in dealing with this 1969-page, 10-pound, one-man job, which contains 110,000 cross-references. (Allow me to refer to this production hereafter as the CEM.) I would begin by checking out the CEM to see whether it mentioned a couple of things I'd stressed over the years and thought of as peculiarly my own. Following that, I had no plans.

I drew two blanks. Grave disappointment set in. But as I surfed the pages, a bit of cheerfulness ultimately broke through. I found several references to a couple of papers I'd written. More than that, I noticed that one of the most frequent references in the CEM was to the famous National Bureau of Standards Handbook of Mathematical Functions, called familiarly "Abramowitz and Stegun," in which, years ago, I'd had a small finger. On this basis, I decided the CEM couldn't be all bad and I was infused with zest for more surfing.

"Concise" is hardly a fit description for this heavy tome. Yet compared with the great Enzyklopedie der Mathematischen Wißenschaften of a century ago, compared with G.-C. Rota's "Encyclopedia of Mathematics and Its Applications" series, now containing more than 70 volumes and still growing, the CEM is concise. The word "encyclopedia" seems to embody a very expandable concept. I have no doubt that someone, somewhere, has put out an Encyclopedia of Window Washing. And shall we now consider the Web to be a nanopedia or a picopedia?

Reader: Come and surf along the CEM with me and we will all its pleasures prove. Do you know what the Rigby points of a triangle are? Do you know what the realizer of a poset is? Do you know what an extra-strong Lucas pseudoprime is? Is Laspeyres' index

on the tip of your tongue? The boustrophedon transform? A Staeckel determinant? Would you recognize the Golomb-Dickman constant if you saw its first four digits? Does the Monica set turn you on? Or two isospectral manifolds, if you saw them holding hands? Could you tell whether a piece of modern architecture has a built-in medial deltoidal hexecontahedron? No? Then the CEM will inform you.

I didn't have even a nodding acquaintance with any of these topics. Today, I know something about them, but will I be able to reproduce any of this knowledge tomorrow? Well, that's what encyclopedias are for: for information, for memory expansion, or, if you're anything like me, for simple browsing when you can't find anything better to read. One thing you might do initially with the CEM: Use sampling to estimate the fraction of the entries you know. I took a "random" sample of 100 entries and came up with 61 entries whose topics I am familiar with. Too high, I thought.

There are six separate entries under "sampling," but I doubt that a tyro could use any of them to figure out with what confidence I might assert, on the basis of my sample, that I know between 60 and 70% of the entries. And what assumptions lie behind such an assertion? Well, an encyclopedia is not a how-to-do-it book. Or could it be? Should it be? Encyclopedias seem to be anything that the author and publisher agree to call by that name.

I learned another lesson from this exercise: In counting 61 terms out of a hundred that I "knew," did I really have a clear and consistent idea of what I meant by "knowing"? Knowing enough that, with a bit of memory jogging, I could give a lecture on the topic? Or merely having seen the entry somewhere out of the corner of my eye? And then, how should I count those entries for which I was familiar with the content but not with the term used to name the topic? A fig for statistical assertions that depend on subjective answers! But when do they not? I just read that countries have now been rated on a newly devised "Index of Corruption." A new entry for an updated Encyclopedia of Sociometrics.

Enough rambling. Let me now get back to the content of the CEM. Every encyclopedia, every dictionary, every anthology that is produced reflects in some measure the interests, the values, the sense of importance, the goals, commercial as well as intellectual, of the compiler(s). It reflects their endurance (11 years in the present case). In reviewing such a work, there is no point in carping about what is missing or about the total inadequacy of such and such an entry. If there is a formula that's wrong or a reference that is misspelled, I'm not the person to call up the author at 2:00 A.M. and complain. I'd rather enjoy what's there. And in the CEM there is much to enjoy.

There may be as many English- and foreign-language mathematical compilations as there are makes of car; if a Chevy sedan doesn't suit your taste or pocketbook, buy another make or model. I have a good dozen mathematical compilations, dictionaries, formularies on my shelves, including one in French, 1324 pages long and pitched at the (French, of course) high school level. There is a significant non-overlap between any two of them.

Eric Weisstein, who is an astronomer by training, and a compiler extra-ordinaire (check out his "Treasure Trove" on the Web), has combed through many books, papers, and Web sites. He seems particularly fond of number theory, synthetic and polyhedral geometry, abstract algebra, combinatorial arithmetic and geometry, formulas of all kinds, integer sequences (N.J.A. Sloane's The Encyclopedia of Integer Sequences is a favorite source here). Special functions are all over the place. A sufficiency of

recreational material of the Martin Gardner variety is incorporated into the text to amuse the casual reader or stimulate math buffs into buffistic creativity.

The CEM can serve as a mathematical "Guinness Book of Records." Example: As of 1952, the largest known Mersenne prime had 687 digits.

Illustrations? There are more than 2000. There is much up-to-date material. Some entries are given long treatments. There are 14 pages under the heading "trigonometry." "Pi" is given 11 pages; "finite groups," eight pages; "Johnson solids," eight pages. As balance, or as a show of indifference, many entries get short shrift with a rapidly sung nunc dimittis. The pages teem with references. The layout is attractive, and the figures are clear.

The CEM's treatment of logic is weak, and the same is true for applied mathematics and the history and philosophy of the mathematics. (Did I say I wouldn't carp?) These topics are obviously ripe for additional encyclopedias. The CEM is not an encyclopedia for specialists. Other authors have made the topics of individual entries in the CEM into whole books (e.g., the newly published 650-page Special Functions in the Rota series). Nonetheless, a specialist could serendipitously stumble on an item of great interest. While you can go to the MathSoft Web site and download for free a long essay on the Golomb-Dickman constant, together with 46 references, you may have read about it first in the CEM.

The CEM makes a lovely bed book, but watch it! Without care, its sheer bulk might end you up in an orthopedic ward. Become addicted to its CD-ROM version and you could be inviting carpal problems. The life of a mathematician has its pleasures but is not without its risks.

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