THE *OXFORD USERS' GUIDE TO MATHEMATICS SIAM REVIEW*

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1. Dictionaries, Handbooks, Encyclopedias and Tables

For thousands of years, dictionaries, encyclopedias, handbooks, manuals, outlines, primers, problem books, review journals, synopses, tables, and users guides, have played a central role in Mathematics–from the *Rhind* or *Ahmes* papyruses (see [3]) of the Egyptians (C 3400 BCE), through Leonardo (Fibonacci) Pisano's *Liber Abaci* (1202-1228) to the *Jahrbuch* and later *Zentralblatt*, *Math Reviews/SciMathNet* even *Wikipedia* and *MathWorld*.

In his preface to Fibonacci, L. E. Sigler, the translator writes *"Liber Abaci is an encyclopedic work treating most of the known mathematics of the thirteenth century on arithmetic, algebra, and problem solving. ... Liber Abaci was good mathematics when it was written and it is good mathematics today."* What a model to emulate!

Let me continue with a discursive discussion of reference material and of the issues any author of such has to deal with, before turning to the *(Oxford) Guide*[1] in question. Given my own twenty years as book editor, book author, and as an 'accidental lexicographer'—as described below—I feel reasonably comfortable to do this. There is a community of compilers and collators and I write as one of this generally supportive fraternity.

This is in part because as a compiler one largely asserts facts without substantiation. Thus, there is much need for judgement and great room for error—as there is indeed in a textbook, particularly in exercises:

> *" "[T]he proof is left as an exercise" occurred in* De Triangulis Omnimodis *by Regiomontanus, written 1464 and published 1533. He is quoted as saying "This is seen to be the converse of the preceding. Moreover, it has a*

> *straightforward proof, as did the preceding. Whereupon*
> *I leave it to you for homework."*[2]

Unlike a paper in one's specialty or even a book in one's favourite topic, where one can aspire to mastery of the subject, a compiler is constantly skating on thin ice. Replacement of an 'a' by a 'the' can show how thin the veneer of knowledge is. A reversed inequality might well not be invidious, but mistranscription of a superscript may well leave an expression mangled as, for example, in equation (2.1) below. Above all, placing material in ones own deft words is a recipe for original sin.

1.1. **The Collins Dictionary: a disclaimer and my own experiences.** I feel somewhat in at least and apparent conflict of interest. I am a coauthor with Ephraim Borowski[3] of the *Collins Dictionary of Mathematics* [1]. It is now in its 15th printing and about to be re-launched in an updated Smithsonian edition late in 2005. Since I write a less than glowing review it may well seem self-interested and disingenuous. But a conflict-of-interest announced is one at least half-resolved.

We started writing the Collins Dictionary in 1985 after a reader of the general Collins dictionary complained justifiably about certain of the mathematical and logical entries therein. Borowski[4] and I were asked to revise the thousand or so mathematical terms and such we did. At the end we had a stack of handwritten filecards and a mild addiction which grew into the dictionary. This was typed on four Macintoshes (one a repentant Lisa), using the chalkboard as a database manager, with frequent airmailing of floppy disks across the Atlantic. We ended up having written a 9,000-or-so-term[5] book which became the first text set from disk in Europe—an interesting if not a pretty process. Through ignorance on Collins' part, we had been left the *"electronic and musical rights."* By the mid-nineties this had resulted in an interactive CD version, the *MathResource* which embeds student *Maple* (see `www.mathresouces.com`). Ten years later the dictionary is symmetrically sitting inside *Maple*.

After 'finishing' the first edition of our dictionary in 1988, I found I could not enjoy a single colloquium or seminar for more than three years. I would constantly ask myself *"Did I define that term correctly, should I have included their result?"* I felt like a giant hamster on a

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[2]Quoted in a book review in *Science*, 1994.

[3]With the assistance of many others. We met for lexicographic reasons—our names were listed next to each on Oxford class lists.

[4]Who was already engaged in revising philosophy, religion and other entries.

[5]Counting dictionary entries is not an exact science.

never-ending lexical treadwheel. Such is the life of a lexicographer or a compiler.

1.2. **Dictionaries in General.** Neglecting entirely Denis Diderot and his *Encyclopédie*[6] (1745–1772), some of the central events in English are worth revisiting. *Roget's Thesaurus*, published in 1852 as "Treasury of Words" by the remarkable Peter Mark Roget (1779–1869), had rapid and enormous success; even as a fashion accessory for the cultured; for a period it was good social style to consult it openly in drawing room conversation. Roget never expected it to be used except by the well educated! It is now on line free at

`http://thesaurus.reference.com.`

Samuel Johnson's Dictionary (written between `1747-1755`) is generally viewed as the first English dictionary. Since only Scotland educated the middle-class in those days, five out of six paid assistants were Scots, and definitions like **oats**, as a food that sustains for horses in England but people in Scotland, must be read with this knowledge. As with *Fowler's Modern English Usage*, it had some effect in standardizing usage and spelling. While most authors aim to be descriptive not prescriptive, readers often take prescriptions. Over the last two centuries, Canada has veered between 'math' and 'maths', 'analyse' and 'analyze' 'cancelled' and 'canceled', '-metre' and '-meter'; never quite finding the 'centre/center'.[7]

Johnson (1709–1784), immortalized by Boswell's marvellous 1791 *Life of Samuel Johnson*, had all our modern troubles with funding his projects[8] and these are reflected in the dictionary. The entry for

> **patron, n.,** *one who countenances, supports or protects.*
> *Commonly a wretch who supports with insolence, and is*
> *paid with flattery.*

was aimed at the Earl of Chesterton who offered patronage only at the end of the day–when success was assured. The dictionary was far from error-free, about which Johnson was refreshingly honest. When challenged as to why he had defined a **pastern** to be a horse's kneecap he replied "*ignorance, madam, pure ignorance.*"

Johnson's American competitor Noah Webster (1758–1843) had a dramatic impact on English through his 1840 dictionary.[9] The Webster

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[6]Diderot's original co-editor was the mathematician d'Alembert.

[7]All *MathResources* software has to have a bilingual 'units toggle'.

[8]Paid by the Chapter for a book on *The Snakes of Europe*, one chapter *in extenso* reads "There are no snakes in Ireland."

[9]After his death and having eschewed copyright protection was acquired by the Meriamms in 1847 whence the *Merriam-Webster Dictionary*.

dictionary standardized spellings such as 'colour' and 'favour' and led to their acceptance in the UK and largely in Canada, but by early in the last century had lost out in the US save for the occasional faux-Victorian "Icecream Parlour". Together Webster and Johnson had spawned the modern dictionary while the *Oxford English Dictionary* of 1928 (OED) inarguably nursed it to term.

As charmingly described in Simon Winchester's best seller *The Professor and the Madman*, the OED was and remains a monumental project that took the better part of forty years to see the light of day. The OED was perhaps the first clearly open source project. Readers everywhere sent paper slips recording what became the *earliest usages* one finds today in the OED. The slips arrived from such as W.C. Minor (the Madman), who contributed thousands of entries from Broadmoor prison, at the Scriptorium in Oxford where they were inserted in pigeon-holes before being compared, contrasted and digested under the direction after 1879 of (the Professor) James Augustus Henry Murray (1837-1915). What a worthy ancestor to the open-source *wikipedia*[10] and shared computations like those at *www.mersenne.org.*[11]

1.3. **Some 'Recent' Mathematical Dictionaries.** Mathematics is an ancient subject and so for me "recent" means roughly since World War Two. This is consonant with my student days in Oxford when "modern literature" ended with Ulysses.

When Borowski and I began our work there had been no new one-volume college-mathematics dictionary for a generation, since the Van Nostrand *Mathematics Dictionary* by Glen and Robert C. James (1942–1959). In this case a distinguished mathematician son assisted an older lexicographer father.[12] Unlike our predecessors we opted for a full lexical structure rather than Britannica-like topic entries. I think in this we were far sighted, certainly in light of internet reading habits.

News of our impending Collins volume immediately triggered a similar slimmer dictionary from Penguin (1989) and Chris Clapham's *Concise Oxford Dictionary Of Mathematics* (1990). Volumes have followed from Barrons (1995) and McGraw-Hill (1997) among others. A more modern entrant was Eric Weisstein's *Concise Encyclopedia of Mathematics* (CRC, 1998) which has a CD version and has developed—after an intellectual property tussle between Wolfram and CRC—into a

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[10]Derived from the Hawaiian 'wiki wiki' meaning "quick" or "informal", a **wiki** is "The simplest online database that works." (see `http://en.wikipedia.org`).

[11]The most recent Mersenne prime was found by an opthamologist.

[12]So also did George assist Tobias Danzig.

lovely and comprehensive set of well-maintained[13] and much-visited resources on the *Mathematica* website `http://mathworld.wolfram.com`. It now has over 12,000 entries. A more specialized but highly rewarding volume is Stephen Finch's *Mathematical Constants* (Cambridge University Press, 2003).

At the other end of the spectrum is the more advanced two-volume topic-based *Encyclopedic Dictionary of Mathematics* (1993) from the Mathematical Society of Japan, which I find unwieldy: too big to use easily and with less information about more topics than a row of subject books. By contrast, I found the *VNR Concise Encyclopedia of Mathematics* (1977) which is aimed at a high-shool/early college market as is very nicely illustrated and proved very useful in my own lexical work. Unlike all the others mentioned, it lamentably does not seems to have a recent edition.

1.4. **The Issues for Authors.** These are enormous in ambit. They include the desired depth and breadth of coverage. Is it fair to suppose that a user consulting **affine variety** has no need to be told much about **affine**? What *x-refs* are needed? Achieving balanced coverage is also a huge headache. When I would show our manuscript to an analyst she would tell me the algebra coverage was excellent but the analysis was wanting ... . Especially with multiple authors one should add uniformity of style and convention.

Originality (authorship) and accuracy (authority) are often in conflict. Collins used "*eight words in sequela*" as a definition of plagiarism in trade books. In the interests of correctness, precise science and engineering are typically excluded from this impossible constraint—try defining an **abelian group**; you are appropriately apt to give the same definition as I did.

Determining which of competing definitions and theorems to trust is problematic: is a **topology** implicitly assumed **Hausdorff**, does a **field** in the given context always have **characteristic zero**, is a **partial order** taken to be **antisymmetric**, may a **Banach space** be complex; and on? Book authors notoriously make running assumptions that frequent readers become aware of but not so the innocent compiler or assistant. Even the best older sources such as Whittacker and Watson's *Modern Analysis*, are terribly prone to this. Of course the ideal future includes complete semantics and wonderful metadata.

In our 2002 edition we added an *Appendix* on the *Millennium Problems* to accompany the one on the *Hilbert problems*. My coauthor

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[13]Maintaining a web site is in some ways easier (ease of correction and user input) and in others much harder (pressure to correct) than with print.

wanted to write his own descriptions, I wished to copy those on the *Clay Institute* web site. We compromised. The definition of **plagiarism** was plagiarized (from Tom Lehrer and the New York Times) and I hope it is the only case of plagiarism in the volume. Incidentally, Noah Webster is accused of great gobs of plagiarism but he also gets deserved credit for uniformizing spelling and much else in American English.

Plagiarism is only one of many copyright issues.[14]

Wikipedia writes:

"Copyrights currently last for seventy years after the death of an author, or seventy-five to ninety-five years in the case of works of corporate authorship and works first published before January 1, 1978. All works from before 1923 are in the public domain. Some material from as recently as 1963 has entered the public domain but some as old as 1923 remains copyrighted if renewals were filed. No additional material will enter the public domain until 2019 due to changes in the applicable laws.

Such is the 'Mickey Mouse' Act introduced in Congress by the late Sonny Bono. By contrast:

" "The U.S. Congress first exercised its power to enact copyright legislation with the Copyright Act of 1790. The Act secured an author the exclusive right to publish and vend "maps, charts and books" for a term of 14 years, with the right of renewal for one additional 14 year term if the author was still alive. The act did not regulate other kinds of writings, such as musical compositions or newspapers and specifically noted that it did not prohibit copying the works of foreign authors. The vast majority of writings were never copyrighted - between 1790 and 1799, of 13,000 titles published in the United States, only 556 were copyrighted."

The 1790 law's '`14+14`' formula was very much akin the 1710 British *Act of Anne*. Many of us would like to see a return to the spirit of Anne.

Both clearing or asserting copyright[15] itself can be excruciating. It took three years to get all permissions needed[16] for *Pi a Sourcebook* [3]. The laws differ over many jurisdictions. While the USA has First Amendment Rights and notions of fair use, the EU has Moral Rights,

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[14]See `http://en.wikipedia.org/wiki/United_States_copyright_law` and `www.ceic.math.ca`.

[15]Charles Dickens was among the foreign (and US) authors who railed at the exclusion of foreign authors but it was only in 1891 that this law was changed.

[16]Even though Springer-Verlag would settle for three active attempts.

I live in the British Commonwealth, China has not signed the Berne Convention, and nothing is entirely clear on the World Wide Web. It is not always certain who owns the rights or even sometimes who the author is. Illustrations are worse, we had to get permission from the British Museum to place a picture of the Rhind papyrus in [3].[17] Our publisher asked us not even to try to put a picture of Winnie-the-Pooh doing math in [6]—it meant asking *Disney*©. We were refused permission by *Fox "for reasons we are not at liberty to share with you."* to print the Bart Fax (Figure 1) sent to my coauthor. This despite the *Simpsons* having used the answer in an episode.

Figure 1. **A Bart Fax from the Simpsons**.

Maintenance and enhancement is a terrible problem. Errors arise in may ways—from Johnson's 'pasterns' to discontinuity of authorship and changing formats over the years (in our case from MacWord to HyperCards, PageMaker, TeX, VisualBasic, MathML and beyond). Especially without the use of relational databases and other IT tools (we now benefit from having the dictionary full hyper-linked so missing or stray x-refs are much easier to find) it is a nightmare to update computations of **Pi** or **Mersenne primes**, solutions to once open problems (true and false) such as **Fermat's last theorem** or recent work on the **Poincaré conjecture**, deaths of living mathematicians such as **Paul Erdős** or Claude Shannon, and the like. For each major revision this process has entailed hiring assistants (printers devils), often at our own expense. Keeping prices down for authors is frequently used by

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[17]Thereby setting a mathematical record perhaps, since we needed permissions over a five millennium span.

book publishers as a reason for resisting enhancements such as color or paying for more copy-editing and fact checking.

A more vexing problem is to capture past lacunae (or is it lacunas?) and to chart the changing boundary of the relevant collection. For example, between 1985 and 2000 the following entries (which were arguably not needed in our dictionary in 1985) were among those that had migrated into many undergraduate curricula and were added or dramatically revamped in the 2002 edition.

> **MATHEMATICAL NEOLOGIA. Erdős graph**, **fractal dimension**, **genetic algorithm**, **interior point methods**, **monster group**, **q-bit**, **quantum computer**, **RSA code** and **Andrew Wiles.**

Terms such as **Groebner basis**, **integer relation**, **internet graph**, **neural network** and the new **polynomial primality algorithm (AKS)** of Aggarwal Kayal and Saxenna [7, pp.300–303] are on the list be added in the next edition.

A compendium is also the easiest of books for a reviewer to tear apart— you just look for a few maladroit terms in your speciality and build your review around them. When we were fixing the Collins Dictionary, I would read other, say medical, entries, as I waited for my colleague to move to the next math term. I always trusted the medical terms and rarely the math ones. I did have the pleasure of replacing an erroneous anglo-centric definition of a **home run** with the compact *"A four base hit."*

2. The Pleasures and Perils of Compendia

Samuel Johnson observed that dictionaries are like watches in that *"the best do not run true, and the worst are better than none."* The same is true of handbooks, tables and databases. That is in part why we all need many!

> *" ... Several years ago I was invited to contemplate being marooned on the proverbial desert island. What book would I most wish to have there, in addition to the Bible and the complete works of Shakespeare? My immediate answer was:* Abramowitz and Stegun's Handbook of Mathematical Functions. *If I could substitute for the Bible, I would choose* Gradsteyn and Ryzhik's *Table of* Integrals, Series and Products. *Compounding the impiety, I would give up Shakespeare in favor of* Prudnikov,

Brychkov And Marichev's *Tables of* Integrals and Series.

. . .

On the island, there would be much time to think about waves on the water that carve ridges on the sand beneath and focus sunlight there; shapes of clouds; subtle tints in the sky... With the arrogance that keeps us theorists going, I harbor the delusion that it would be not too difficult to guess the underlying physics and formulate the governing equations. It is when contemplating how to solve these equations - to convert formulations into explanations - that humility sets in. Then, compendia of formulas become indispensable."[18]

Prudnikov, Brychkov and Marichev's excellent three volume compendium is printed in a mediocre Soviet format. It contains as Entry 9 on page 750 of Volume 1:

$$(2.1) \qquad \sum_{k=1}^{\infty} \sum_{l=1}^{\infty} \frac{1}{k^2 \left(k^2 - kl + l^2\right)} = \frac{\pi^? \sqrt{3}}{30},$$

where the "?" is *probably* "4". Integer relation methods, see [6, §6.3], strongly suggest that no *reasonable* value of "?" works. I still do not know what is intended in equation (2.1).[19] There are many such examples in the literature from Lewin's attempt to understand an enticing polylogarithmic assertion of Landen (see [7, p. 210]) to Ramanujan and of course Fermat's Last Theorem. We would benefit from a well-developed set of *Forensic Mathematics* tools—such as would certainly exist for CSI-Oberwolfach?

Three quarters of a century ago G.H. Hardy, in his retirement lecture as *London Mathematical Society* Secretary, commented (see [8, p. 474]) that:

Harald Bohr is reported to have remarked "Most analysts spend half their time hunting through the literature for inequalities they want to use, but cannot prove."

They still do and so have to choose between consulting good, bad and indifferent compendia on inequalities.

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[18]Michael Berry,"Why are special functions special?" *Physics Today,* April 2001.

[19]I have intentionally not asked the authors directly, but return to the challenge from time to time.

2.1. **When Good Things Come from Bad Sources.** Ramanujan's sources of inspiration may be a rather more common story in the presence of the WWW and the cost of commercial material, especially in the developing world.

The Indian genius Srinivasa Ramanujan (1887–1920), growing up in Kumbakonam about 250 km from Madras[20], read what was available in his local library. He learned what he learned largely from two books: S.L. Loney's *Plane Trigonometry* standard trigonometry of the time and *A Synopsis of Elementary Results in Pure Mathematics* written by Carr who was a "crammer" in Cambridge. This is a compilation of many thousands of results that "might be on exams". This source apparently contained no complex variables and so Ramanujan famously knew none when he arrived in Cambridge in 1914. He had however worked out marvellous new mathematics based on what he had gleaned from these unexceptional sources.

Today these sources might be replaced by *Schaum's Outlines*[21] and Sloane's wonderful online *Encyclopedia of Sequences*[22]

$$\texttt{www.research.att.com/\~njas/sequences}$$

or the soon-to-be-released *Digital Library of Mathematical Functions* (DLMF) being completed at NIST, originally the National Bureau of Standards, see `http://dlmf.nist.gov`. The DLMF is a massive print-CD-and-Web revision of Abramowitz and Stegun's *Handbook of Mathematical Functions*, partially funded by NSF. The web version will be freely available and will have quite sophisticated 'math-aware' search capabilities.[23]

The original has sold perhaps 750,000 copies between its NIST and Dover editions— making it the best selling mathematics reference book ever. The new book is still over 1,000 pages long but the 500 pages of numerical Tables in the original have almost disappeared (*Maple*, *Mathematica* and *MatLab* being broadly accessible) and been replaced by more and newer mathematics—with formula-level metadata and with the old gray-scale illustrations replaced by fine colored graphics which have some dynamic functionality in the digital edition.

One hopes any new Ramanujan would also be able to call upon *JS-TOR* (`www.jstor.org`) and *MathSciNet* (`e-math.ams.org/mathscinet`) but this will depend on whether he has directly or indirectly paid for

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[20]He moved to Madras in 1910.

[21]Or by more dubious variants.

[22]Based on a 1985 *Academic Press* book with 5,000 entries, this immaculate database now has over 110,000 entries.

[23]And so if Michael Berry's island has wifi, he could keep Shakespeare in book form ... .

access. He would certainly have access to many of the resources in the emerging *World Digital Mathematics Library* (`www.wdml.org`).

Very recently David Bailey and I have been working on parallel quadrature implementations of **Euler-Maclaurin Summation** [2]. We found that `planetmath.org/encyclopedia/`
`ProofOfEulerMaclaurinSummationFormula.html`
had correct and useful but nonstandard information while other sites were less satisfactory. This was equally true though of books as of websites.

3. THE OXFORD USER'S GUIDE

The **Editorial Review From Book News, Inc** of the *Guide* contains:

"Recognizing the importance of mathematics in research and commerce, the many instances in which different aspects of mathematics are coming to inform each other, and the prevalence of the personal computer, Zeidler (Max Planck Institute for Mathematics in the Sciences) and contributors offer a basic overview of mathematics for students, practitioners, and teachers."

This is fairly accurate as to the actual ambit of the *Guide*, save for the odd reference to the prevalence of the personal computer. The Oxford University Press **Book Description** is less on target:

The Oxford User's Guide to Mathematics in Science and Engineering represents a comprehensive handbook on mathematics. It covers a broad spectrum of mathematics . . . . The book offers a broad modern picture of mathematics starting from basic material up to more advanced topics. . . . . The book addresses students in engineering, mathematics, computer science, natural sciences, high-school teachers, as well as a broad spectrum of practitioners in industry and professional researchers. . . . The bibliography represents a comprehensive collection of the contemporary standard literature in the main fields of mathematics.

Having made these expansive claims, a Publisher has some obligation to ensure they have been met. Expectation management is an issue in all walks of life from academic publications to national elections.

3.1. **Something of the Oxford Users' Guide.** The claims made by OUP may have been close to true in 1958 but are not today. My quarrel is more with what is left out than with what is said. Many students view their texts as exo-skeletons—what is not there does not exist. As the case of Ramanujan shows, even mediocre coverage is often better than complete omission. Zeidler is an excellent researcher, a fine

scholar and broadly knowledgable; but as I have already indicated even modest dictionaries need sizeable and continuing teams.

Let me divide the *Guide* in four. My notional *Part I* contains roughly 225 pages of **Elementary Mathematics** and Tabular Information alluded to earlier. My *Part II* follows with 375 pages on **Analysis** (of which less than 10 cover harmonic analysis), 125 pages on **Algebra and Number Theory**, 150 pages on **Geometry** (elementary, algebraic and differential). This core material is followed by *Part III* with 30 pages on Foundations, 60 pages on **Calculus of Variations and Optimization** (linear and nonlinear) and 70 pages on **Probability and Statistics**. *Part IV* comprises 125 pages on **Scientific Computation**: numerical methods for linear algebra, interpolation, nonlinear equations, ordinary and partial differential equations. The book is the completed by a 25 page **History** of mathematics, a 27 page **Bibliography**, and various indices.

The topics covered are thus somewhat staid. They are I imagine quite faithful to a thirty year old undergraduate German curriculum, but even undergraduate mathematics has moved on. Moreover, one uses a compendium especially to look up material with which one is not familiar–often in subjects not taken in college.

For example, point-set topology (other than metric), algebraic topology, combinatorics, dynamical systems and chaos, financial mathematics, game theory, graph theory,are among the missing or get only the most cursory mention. Thus, on page 833 a footnote refers to another book by Zeidler[24] for the definition of **topology** which is need to make sense of the **Zariski topology**! Likewise, **Complexity Theory** rates a paragraph on page 1050. So it is puzzling that Oxford recommends the book to groups such as '*students... in computer science*" or "*practitioners in industry.*"

Moreover, even the entries on topics like **Scientific Computation** and **Optimization**, whose coverage is touted, are somewhat limited and do not include interior point methods or anything discovered much since the **simplex method** or the **singular value decomposition**. A few references to computational science have been sprinkled in rather at random. For instance, the totality of practical numeric guidance appears to be on the bottom of page 1049:

> **Numerical mathematics with Mathematica**: *With this software package you are able to perform many of the numerical standard procedures on your home PC.*
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> . . . . . .

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[24]1995 in German with a still only promised English version.

> *For every imaginable numerical procedure, no matter how elegant it appears, there are* counterexamples *for which the method does not work at all.*

The Chinese remainder theorem? Newton's method for the square root? The AKS primality algorithm? This is false or at best true but somewhat fatuous. I suppose this is the sort of thing that justifies OUP saying that the *Guide "offers a broad modern picture of mathematics"*.

To be fair my serious criticisms are directed largely at OUP—and Teubner before it—and the process by which both had the *Guide* refereed and produced. Additionally, the translation while largely very good is a trifle Teutonic and seemingly done without adequate *mathematical* copy editing. On page 239 one reads about the irrationality of $\sqrt{2}$ that

> *This discovery destroyed the harmonic picture of the universe by the Pythagoreans and triggered a deep shock.*

On page 878 we learn that the method of **indirect proof** "then leads this assumption to a contradiction." Such stiltedness is sometimes to the point of obscuring the meaning: on page 823, I have no idea what—in the context of **Pythagorean triples**—an **accord** is despite of it being in the index.

Typographically, the *Guide* has masses of white space and gratuitous boxes of a kind that probably looked fine at one time. They now only adds needless heft to an already weighty book with too small margins. Unlike the DLMF's decision that Tables were obsolete, the *Guide* still has roughly 150 pages of material much better found online or on a personal computer. Even the binding is dubious, my cover tore in the first week of very mild use!

A more thorough review and production process would surely have adequately addressed this last set of issues. I can no better make this point than to quote Simkin and Fiske quoting the late Stephen J. Gould in a review of Simon Winchester's *Krakatoa*.[25]

> "In his review of Winchester's previous book, *The Map That Changed the World,* Stephen Jay Gould wrote: *I don't mean to sound like an academic sourpuss, but I just don't understand the priorities of publishers who spare no expense to produce an elegantly illustrated and*

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[25]Tom Simkin and Richard S. Fiske, "Clouded Picture of a Big Bang," *Science*, July 4 (2003), 50–51. These reviews do make me question the reliability of the *Professor and the Madman.*

> *beautifully designed book and then permit the text to wallow in simple, straight-out factual errors, all easily corrected for the minimal cost of one scrutiny of the galleys by a reader with professional expertise ...*
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> "With *Krakatoa*, the publisher clearly spared considerable expense, and this new book also wallows in errors. Perhaps, given our popular culture's appetite for sensationalized disasters, a modern publisher would rather not see all those pesky details corrected."

It seems this is a somewhat under-consider 'economy' English adaptation of a ten-year old Teubner book which was itself already somewhat dated having had its first of eighteen German editions in 1958. As I have said, I have great respect for Zeidler, and his colleagues. But like a University Department's set of teaching notes this *Guide* has decayed over time. Will current and future generations have a taste for information served up as it is in the *Guide*? Would contestants in the recent *SIAM 100-Digit challenge* [4, 5] have found the *Guide* helpful? I suspect not. I decided to sample *Google*, *MathWorld*, and the *Guide* on the terms in the **NEOLOGIA** above. I did better on the Web.

4. Conclusion

There are many positive things to be said about the book under review. The price is good. What it covers it usually covers well and seems largely error-free. It contains several attractive extra features such as a useful biography[26] of books on the subjects it does covers and a amusing brief History of Mathematics[27] [28].

On balance, I am happy to have the *Users' Guide* added to my reference shelf—right next to the computer and its online resources. I'll look in it for topics where it is strong such as analysis and classical applied physical mathematics and avoid its advice on topics like numerics.

References

[1] E.J Borowski and J.M. Borwein, *The Collins Dcitionary of Mathematics*, with the assistance of J.F. Bowers, A. Robertson and M. McQuillan, Collins, 1998–2005.

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[26] I had trouble discerning the rationale used for a book being included in this large, but in no sense comprehensive, un-annotated list.

[27] Which for some reason includes Mary Queen of Scott's execution in 1587 and Shakespeare's dates, and a lot more Nobel Prize winners than Fields medalists.

[28] Again, here one sees the difficult of the task attempted: **Claude Shannon (1916-2001)** is listed among the living.

[2] David H. Bailey and Jonathan M. Borwein, "Effective Error Bounds for Euler-Maclaurin-Based Quadrature Schemes," submitted *Math of Computation*, June 2005. [D-drive Preprint 297].

[3] L. Berggren, J.M. Borwein and P.B. Borwein, *Pi: a Source Book,* Springer-Verlag, 1997. Third Edition, incorporating *A Pamphlet on Pi* [CECM Preprint 2003:210], June 200).

[4] Folkmar Bornemann, Dirk Laurie and Stan Wagon, Jörg Waldvogel, *The Siam 100-Digit Challenge: A Study In High-accuracy Numerical Computing*, SIAM 2004.

[5] J.M. Borwein, "The SIAM 100 Digits Challenge," an Extended Review *Mathematical Intelligencer*, **27** (4) (2005), xx–xx. [D-drive preprint 285].

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