BOOK REVIEWS

Edited by ANDY LIU

From Erdős to Kiev: Problems of Olympiad Caliber, by Ross Honsberger,
published by the Mathematical Association of America, 1996,
ISBN# 0-88385-324-8, softcover, 257+ pages, $31.00.
Reviewed by ***Bill Sands****, University of Calgary, Calgary, Alberta.*

This book is number 17 in the Dolciani Mathematical Expositions series of the MAA, and is the seventh in this series by Ross Honsberger. His previous book in this series, *More Mathematical Morsels* (reviewed in ***Crux*** on [1991: 235–236] by Andy Liu), contained mostly problems from ***Crux***. The same is true of *From Erdös to Kiev* — and this time, all problems taken from ***Crux*** are accompanied by references (year and page number) to where in ***Crux*** the problem (and sometimes solution) appeared. Most of the ***Crux*** problems used here are from Rob Woodrow's Olympiad Corner columns from 1987 and 1988; thus they are mostly contest problems, some easy to find elsewhere, like the AIME and IMO contests, others quite obscure. The author has sometimes used solutions taken from ***Crux***, duly crediting the original solvers, and other times has come up with his own, but in all cases he has written (or rewritten) the problems and solutions as he liked: a privilege not usually available to ***Crux*** editors! The result is a readable and enjoyable book, that every ***Crux*** fan will want to own.

Altogether the book has 89 problems collected into 46 unnumbered "chapters", with no discernible reason for the order they are put in. Instead of a traditional index, at the end the problems are classified under three subjects (roughly: combinatorics, algebra/number theory, and geometry) with a one–line description of each problem. This reviewer can't single out many of the problems in this book for special mention — as the general editor of ***Crux***, I was not as close to the material in the Olympiad Corners as I was to the regular Problems and Solutions columns. But Honsberger includes a few items from here too, and I recognized with pleasure one of Hidetosi Fukagawa's *Sangaku* problems on page 223 — one of several he submitted to ***Crux*** (and not the most striking one in my opinion) before publication of his book *Japanese Temple Geometry Problems* with Dan Pedoe in 1989.

Of course, none of you need to be sold on the virtues of ***Crux***! One hopes, though, that other readers of this book would thus be drawn to subscribe to ***Crux***, and maybe some of them will, but wouldn't it have been appropriate, given the book's debt to ***Crux***, if the words "***Crux Mathematicorum***" had been more visible? Yes, ***Crux*** is acknowledged, and praised, in the Preface, and the book is even dedicated to ***Crux***'s late founders Léo Sauvé and Fred Maskell, which is a thoughtful touch and is appreciated. But why couldn't ***Crux*** get some mention in the title or at least somewhere on the cover? And the MAA's advertising for this book, as far as I have seen, does not mention ***Crux*** either. Come on, MAA — fair's fair!

As for other criticisms — well, we could start with the accent on the "o" of Erdős, which is wrong (I've used the incorrect umlaut till now in this review!), in the title and elsewhere in the book too. (As an aside, I might note that the title, though catchy, isn't especially appropriate, in that the book neither begins nor ends with a problem involving Erdős or Kiev; however, there are Erdős problems, and a problem from the Kiev Olympiad, in the book. Picky, picky ... .)

I didn't notice many misprints or weaknesses of exposition liable to slow readers down. On the bottom of page 242 and the top of page 243, there are two displayed equations in which most of the terms have been left out, but the reader can probably reconstruct these with little trouble. On pages 116–117, to show that c_n is not a multiple root of the polynomial $P_n(x) = 0$, it is much simpler just to differentiate the polynomial $Q_n(x)$, which is a factor of $P_n(x)$; we get

$$(n+1)x^n + nx^{n-1} + \cdots + 1$$

which is obviously positive for $x = c_n > 0$. Thus c_n is a single root of $Q_n(x)$ and so also of $P_n(x)$.

On page 107, Daniel Ropp's university should be Washington University, not Washington State University (the correct name is given in ***Crux***). In oddly similar typos, the zeds in Bruce Reznick's last name and Zvi Margaliot's first name are replaced by s's, on pages 179 and 187 respectively.

In the second half of the book there is a rash of minor errors involving ***Crux*** references; for the benefit of readers rather than as criticism, I'll list them here. On page 153, the reference given [1987: 120] is to the original publication of the problem; the solution actually appeared on [1988: 182]. On page 159, the year for this reference should be 1988, not 1987. Also, the solution for this problem appeared on [1994: 191–193] with a further comment on [1995: 82] (both probably too recent to be picked up by Honsberger's searches). On page 167, the solution for this problem appeared on [1988: 199]. On page 177, again the year of publication of the original ***Crux*** problem should be 1988 not 1987, and the solution appeared on page 267 of the 1989 volume, not page 269. And by the way, these references all refer to problem 1 of this chapter, which contains two problems. On page 239, the page reference given as 491 should be just 49.

Having a whole chapter on Olympiad Corner solutions by George Evagelopoulos, the first chapter in fact, was, I think, a mistake. Some of these solutions were equally due to other readers, as reported in ***Crux*** at the time. In fact, problem 1 of this chapter is listed as coming from the 1983 Australian Olympiad, which indeed it does, but the ***Crux*** reference given [1985: 71] is to the same problem as proposed by Brazil (but not used) at some IMO. The correct reference for the Australian problem is [1983: 173], with the *official* solution as supplied by Peter O'Halloran published on [1986: 22]. This is the same solution that Honsberger gives in his book and attributes to Evagelopoulos. Only on [1987: 43] is the Brazil version of the problem wrapped up, and here no solution is published, only the solvers are listed. (And, as Honsberger mentions, these include two others as well as Evagelopoulos.) Strangely, in two other cases Honsberger fails to mention solvers given equal credit in ***Crux*** for solutions he uses and ascribes to Evagelopoulos alone. The solution to problem 4 was credited (on [1989: 230]) also to Zun Shan and Ed Wang; what Honsberger calls a "brilliant observation" could just as well be attributed to them. And for problem 7, in the published solution in *Crux* [1990: 105] Duane Broline is also listed as a solver. There are also remarkable similarities between some of Evagelopoulos's solutions and earlier solutions published elsewhere. For example, for problem 3, a problem from the Russian journal *Kvant* and first published in ***Crux*** in 1988, Evagelopoulos's original solution in ***Crux*** [1990: 104] contained the same square diagram, complete with the same cells labelled "A" and "B", as is present in the *Kvant* solution (see page 24 of issue 12 of the 1987 *Kvant*); no doubt the *Kvant* solution is a "beautiful gem", as Honsberger calls Evagelopoulos's solution on page 5. And for problem 6, also from *Kvant*, Evagelopoulos's solution in ***Crux*** [1990: 102] contained the same terminology ("representative", translated from the Russian) and the same notation ("$\sim$") as in the solution published on page 25 of issue 9 of the 1987 *Kvant*, to mention only two of the amazing resemblances between these two solutions.

The last chapter contains an exposition with proof of the power mean inequality, and so is of a different character from the rest of the book. While this is a useful inequality to know, it's a bit jarring to have it suddenly appear here, especially when there is only one small, brief, unattributed example given of a problem that can be solved with it. There must be lots of problems from ***Crux*** that could have been used. However, let none of the above reservations prevent anyone from buying this book.