BOOK REVIEWS

The variational theory of geodesics by M. M. Postnikov. Translated from the Russian by Scripta Technica, Inc. Edited by Bernard R. Gelbaum. Saunders, Philadelphia, Pa., 1967. 200 pp. $6.00.

Publishers have an understandable tendency to suggest that their products are suitable for large audiences. It is claimed on the cover of the volume reviewed here that it "can be effectively studied outside the discipline of the classroom" and that it "is readily understandable to those with a solid grounding in calculus." The publisher's optimism is probably based on Postnikov's tendency to include details that many writers for mature audiences would omit. It is indeed possible that a bright student who knows calculus well would be able to follow most of the proofs; but following individual proofs is not the same thing as reading a book like this one. The internal evidence suggests that Postnikov had a much more knowledgeable reader in mind since he includes almost no exercises, examples, motivation, historical orientation, or indication of how his subject is related to the rest of mathematics. A more plausible choice for a suitable reader would be someone (most likely a budding topologist) who already knows why he wants to study the Morse theory of geodesics and what it is good for, but who knows no differential geometry.

The book falls into two parts, the first of which consists of Chapters I, II, and III and is devoted to more or less standard topics in differential geometry. It begins with the definition of a manifold, develops most of the usual facts about tensor fields, connections, geodesics, curvature, and Riemannian geometry and ends with the Hopf-Rinow-Myers theorem which is (typically) not identified by name.

Except for a few minor twists everything covered in these chapters is well known and can be found in many other places. One would therefore expect that they were written with a stack of other sources close at hand. Unless there have been incredibly many coincidences, *Differential geometry and symmetric spaces* by S. Helgason must have been on the top of the pile most of the time. The basic approach is like Helgason's in its emphasis on tensor fields as modules over the C^∞ functions rather than as sections of vector bundles. Moreover, many of the sections appear to be mere translations of Helgason's rather precise and formal exposition into Postnikov's much more casual style. The similarities become quite evident with the C^∞ Urysohn lemma (Helgason p. 6, Postnikov p. 7). From there on, almost everything in Postnikov except for a few digressions, has a counterpart in