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Aspects of topology, by Charles O. Christenson and William L. Voxman, Pure and Applied Mathematics, Vol. 39, Marcel Dekker, Inc., New York and Basel, 1977, xi + 517 pp., $ 19.75.

Set-theoretic topology: With emphasis on problems from the theory of coverings, zero dimensionality and cardinal invariants, by Gregory L. Naber, University Microfilms International, 1977, xv + 706 pp., $ 37.25.

General topology is a subject which graduate students are usually expected to absorb an adequate amount of somewhere between calculus and graduate school. A working mathematician needs some intuitive feeling for at least its vocabulary: what open, closed, compact, and connected mean, what a metric is, what Tietze's extension theorem says. But the common denominator is quite small and one can take this minimal knowledge which ignores the forest of pathologies found in more abstract spaces and march right into a graduate course in algebraic topology and hardly feel a twinge of desire for a more thorough background. Special topics in general topology can perhaps be studied more easily at a time when one wishes to know more. Both set theory and general topology are vast subjects which have seen tremendous expansion in recent years. Mathematicians who frequently deal with uncountable sets, with families of sets of integers, with combinatorics of any kind, with nonseparable Banach spaces, with topological spaces which do not have a countable base, . . . , these mathematicians would do well to know of the recent development in set theory and perhaps general topology too! But the growth is so diverse and the really useful parts so technically set theoretic, that it is hard to keep the community aware, especially via general textbooks.

Recently we have seen large numbers of new beginning graduate texts in general topology. I'm not sure why. It is true that the available ones were out of date. But for the most part, these new texts have few recent theorems and little or no set theoretic technique. Still they concentrate on the abstract; there is minimal introduction to manifold theory.

The book of Christenson and Voxman is *not* one of these. It *is* a new beginning topology text; but the aim is to get you into geometric topology as fast as possible. The interest in abstract spaces, as opposed to subsets of the plane, is almost zero. To illustrate: the definitions of *Hausdorff* and *regular* are found on p. 117 immediately preceded by a rather thorough treatment of absolute neighborhood retracts and immediately followed by a gory-details-with-pictures proof of the Jordan curve and Schönflies theorems. I agree that nonnormal spaces are irrelevant here. On the other hand Moore spaces are discussed! The authors do not wish to slight a topic which is part of the traditional heritage of many geometric topologists. The book covers essentially those topics which might have been found in a course taught by R. H. Bing at Wisconsin ten years ago: the simplicial approximation theorem, the dunce's cap, the pictures of everything, ...

A basic principle of the book is: the best introduction to higher dimensional geometric topology is to really get one's hands dirty in dimension two. The proof of the Jordan curve theorem could only be called primitive; the discussion and pictures of indecomposable continua (the pseudo arc in particular) are something to see. Covering spaces, Van Kampen's theorem, and a good discussion of simplicial complexes are there; but two dimensional topology is *stressed*. I can't say I agree with this principle; but I enjoyed reading the book; it is graphic and different.

The book of Naber is *not* a beginning graduate text. It *is* a book about general topology; one intended as a reference for the experts or as a text for a special advanced topics course. Naber sets out to give a unified treatment to the vast quantities of general topology published in the last thirty years. But, as he says, he gives instead a "potpourri of miscellaneous results". He presents tons of material (700 + pp.). After a couple of introductory chapters in which he discusses some basic ideas and tools of special interest to him, each of the remaining four chapters is devoted to the solution of one or two related well-known problems along with structural material.

Naber's taste is for topology as opposed to set theory. By its very nature, general topology is everywhere dense with ultrafilters and cardinals and transfinite induction proofs. But Naber's basic assumption that the reader knows only some naive set theory forces him into a somewhat amateur position and away from the deeper set theoretic results. He is at his best when the set theory is minimal and the traditional topology maximal.

Some readers will complain about the choice of topics. Some will complain that their favorite proof isn't used: I prefer the Pol-Šapirovskiĭ proof of the Arhangel'skiĭ theorem to the traditional one which is given just because the former is so much simpler and applicable to other cardinal function problems. Naber's choice of proof is usually the traditional rather than the latest, an attitude that has virtue. Beware of the "open questions". Some aren't. Some are the traditional, intractible, very hard ones. Leafing through, looking for one I didn't recognize, I found the question of whether a Σ-product of copies of the rationals must be normal. I had never heard of the problem but a couple of hours later I had a proof that a Σ-product of metric spaces must be normal. As I know from experience, it is dangerous to list open problems in a book: people keep solving them and it is difficult to judge the difficulty when it is a little away from your specialty.

I feel Naber's book is well worth while for it puts between two covers a tremendous number of definitions, historic techniques and theorems; diverse information that is hard to find. Because of its size and the magnitude of the job attempted and the current rate of change in the field, it is more of a first attempt than a definitive answer. But I shall find the book a valuable reference on my shelf.

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