Graph Theory. *By Reinhard Diestel.* Springer Verlag, New York, 1997. \$59.95. xiv+286 pp., hardcover. Graduate Texts in Mathematics. Vol 173. ISBN 0-387-98210-8.

This text (a translation of the German edition titled *Graphentheorie*) presents an up-to-date, theoretical treatment of the basic concepts of graph theory at a level that is appropriate for beginning graduate students. The author's purpose is to provide his view of the areas of graph theory that are important areas for current research, either because of recent activity or a perceived potential for more progress. This is stated clearly in the preface,

> ... what are, today, the essential areas, methods and results that should form the centre of an introductory graph theory course aiming to equip its audience for the most likely developments ahead?

The author is the most recent recipient of the Hall Medal, awarded by the Institute of Combinatorics and Its Applications to outstanding researchers in mid-career. Given his active participation in several areas of graph theory, he is qualified to take on this ambitious task. The result is a concise, clear and theoretical presentation of topics that covers all of the principal areas of modern graph theory, while touching on a variety of subsidiary areas.

The reader who is interested in applications or algorithms will be disappointed, for the author is very clear that this is a *pure* mathematics text. However, for those with some previous exposure to graphs, perhaps through their use in computer science or a more intuitive course of study, this text is an excellent vehicle for becoming familiar with a more formal approach to graph theory. The book presumes a level of mathematical maturity that is about that of a beginning graduate student in mathematics, and these students are the book's most natural audience. A thorough study of this text would provide the aspiring graph theorist with both an in-depth survey of the major areas of the discipline and extensive practice with the techniques and methods of arguments that are more formal and structured than those seen at the undergraduate level. But it is not a good choice for the reader that has little or no exposure to graph theory — a full appreciation will require some experience with the subject at a less rigorous level.

The book contains many excellent, detailed figures illustrating the constructions used in proofs. Each chapter begins with a few paragraphs that describe, in non-technical terms, how that chapter's subject fits in with the rest of the book and the discipline. And each chapter concludes with a page's worth of notes that describe how that chapter's theorems fit into the development, and give pointers to articles and monographs for the interested reader to pursue further. Besides the book's overall economical and clear presentation, these introductory and concluding sections for each chapter are its strongest feature. The author credits a course taken from Béla Bollobás with much of his inspiration, since it was notes from this course that evolved into Bollobás' book *Graph Theory — An Introductory Course*. The reader familiar with this earlier book will notice its beneficial influence here. (Coincidentally, Bollobás' book has undergone a major revision and is reviewed elsewhere in this section.)

Each theorem contains a marginal note with a list of the previous theorems it employs, **and** the upcoming theorems that will depend on it. This is an especially nice feature, particularly for an instructor planning to cover only a subset of the book. However, the margins are littered with instances of notation or terms at the locations where they are defined. Often these definitions have a limited lifetime, especially if they are used in a short proof. For example, in one proof four symbols are defined in the space of three lines resulting in each symbol displayed in the margin. The proof runs for three more lines, making references to each of these symbols, and then the proof ends. The utility of such a device is debatable. When a single page contains as many as fourteen such notes, this reader found it very distracting. The defined terms appear in the index, so it is not necessary that they appear in the margin.

Each chapter contains on average about twenty exercises, with the easy and difficult ones tagged as such. For the budget-minded, the book is available in a softcover version.

Chapter titles include: Matching; Connectivity; Planar Graphs; Colouring; Flows; Substructures in Dense Graphs; Substructures in Sparse Graphs; Ramsey Theory for Graphs; Hamilton Cycles; Random Graphs; Minors, Trees and Well-quasi-ordering. While experienced researchers might find some of their favorite topics missing, it would be hard to argue that the choice of topics does not implement the author's statement in the preface.

This text gives the reader a concise, economical discussion of the important areas of current research while also taking care to place the results in context — it is more than a compendium of theorems and proofs. It would be an excellent choice as a textbook for a second course in graph theory for graduate students in mathematics. It will also be welcomed by more advanced readers that wish to quickly obtain an in-depth background in a specific area of research, along with the direction for further reading that is provided by the chapter notes.

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