perception sheds light on the physical cues that inspire rhythmic patterns in the mind of the listener. These cues help distinguish features of the sound that are properties of the signal from those that are properties of the perceiving mind. The beat is not in the signal, it is in your mind."

In this quotation, both the first and last sentences are fundamental, and especially the last. It is the reason there is such a great range of musical appreciation and understanding in the general community.

Because of their central role in the subsequent deliberations, auditory boundaries, event successions, feature vectors, and feature vector detection are examined in considerable detail in this chapter.

Transforms are the focus of Chapter 5. Its role is the formulation of the mathematical framework within which the subsequent deliberations about statistical methods, automated rhythm analysis, beat detection, musical recomposition, and feature vector musical analysis are defined and analyzed. The Fourier and wavelet transforms are discussed, along with a detailed exposition about the periodicity transform, which subsequently plays a key role in the detection of beat patterns. Statistically, it can be viewed as a functional data analysis methodology.

At this stage, at the end of Chapter 5, Sethares comments that "A transform must ultimately be judged by the insight it provides and not solely by the elegance of its mathematics." The subsequent deliberations in the book strongly respect this tenant. Consequently, the introduction, discussion, and application of adaptive oscillators in Chapter 6 focus on their relevance and role, via entrainment and synchronization, as beat analysis and tracking techniques.

Some aspects of the application and comparison of the utility of these techniques involves statistical considerations for which appropriate models are required. The articulation of models where there is a periodicity in the underlying statistical distribution is the role of Chapter 7.

Chapters 8–11 is where all preceding material is brought together to solve the problem of designing a foot-tapping mechanism. As alluded to in different ways in the earlier discussions, the central issue and challenge are the detection, in real time, of the current rhythm in the audio input being processed. Consequently, a detailed discussion about the applicability of the earlier introduced methodologies is the focus of Chapters 8 and 9, where automated rhythm analysis and beat-based signal processing is examined. The purpose of Chapters 10 and 11 is a discussion and analysis of the opportunity that successful rhythm detection represents. The detailed discussions in the text are synchronized with a variety of informative musical illustrations on the CD.

The philosophical and speculative aspects of the subject are kept for Chapter 12. As Sethares notes, most of the book before Chapter 12 stays fairly close to the "facts."

No book is perfect. Some explanations are not as clear as they should be, etc. However, to list the things that this book could have contained or could have done better would lack an appreciation and respect for what the author has aimed to achieve and has achieved with considerable success.

Independently, this book contains good material to motivate the interests of students about the "importance of mathematics in applications."

For many potential readers, the first five chapters might be all they read. Though the intellectual content of successive chapters is steadily increasing, it is a gentle pedagogical process.

Our neuronal interpretations of regular successions are performed by synchronized regular succession of electrical impulses. Your brain will enjoy the entrainment such synchronization performs between electrical impulses and the words in this book.

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Graph Theory. *By J. A. Bondy and U. S. R. Murty.* Springer, New York, 2008. $69.95. x+651 pp., hardcover. ISBN 978-1-84628-969-9.

This book is a follow-on to the authors' 1976 text, *Graph Theory with Applications.* What began as a revision has evolved into a modern, first-class, graduate-level textbook reflecting changes in the discipline over the past thirty years. What has changed in that time? Graph theory has escaped the "slums of topology" and become an important discipline in its own right, first because of its applications to computer science, communications networks, and combinatorial optimization through the design of efficient algorithms or the study of desirable properties of networks. Second, it has seen increasing interactions with other areas of mathematics: probability sees increased use in the probabilistic method, while geometry and topology play a greater role, and tools from analysis, algebra, and number theory have been brought to bear. Conversely, results such as Szemerédi's Regularity Lemma have seen application in areas such as number theory. With major problems, such as the Four Color Problem and the Strong Perfect Graph Conjecture, now settled, the emphasis of research efforts has shifted. Clearly, a major overhaul was needed.

The book is supported by a Wordpress blog (http://blogs.springer.com/bondyandmurty/), where the table of contents may be downloaded. Each chapter begins with a mini-table of contents listing the subsections, and the titles of further subdivisions. These initial pages of each chapter are also available for download. So the interested reader can obtain a very accurate impression of the topics and organization, and we will not repeat that information here. However, broadly speaking, the topics covered by the twenty-one chapters are consistent with the authors' introductory remarks about the current state of the discipline and feature colorings, connectedness, planarity, matchings, algorithms, networks, and coverings. The only major advance escaping coverage (appropriately) is the theory of graph minors initiated by Robertson and Seymour.

This text hits the mark by appearing in Springer's Graduate Texts in Mathematics series, as it is a very rigorous treatment, compactly presented, with an assumption of a very complete undergraduate preparation in all of the standard topics. While the book could ably serve as a reference for many of the most important topics in graph theory, it fulfills the promise of being an effective textbook. The plentiful exercises in each subsection are divided into two groups, with the second group deemed "more challenging." Any exercises necessary for a complete understanding of the text have also been marked as such. There is plenty here to keep a graduate student busy, and any student would learn much in tackling a selection of the exercises. Each chapter contains several "proof techniques": short insets describing techniques employed in proofs, either more general in nature (e.g., proof by contradiction) or more specific to combinatorics (e.g., Möbius inversion). Definitions, theorems, examples, and especially algorithms are amply illustrated with excellent illustrations of nontrivial graphs. Reasonably detailed pseudocode presents algorithms unambiguously.

Each chapter is organized to begin with more routine aspects and then move into more advanced aspects of the relevant topic. So an instructor can vary the breadth and depth of a course, along with the difficulty, by adjusting just how far to penetrate each chapter. The blog contains suggested course outlines, including introductory courses for students in mathematics, computer science, or operations research, along with eight "ideas" for more specific courses. These latter courses suggest in-depth analysis of topics such as colorings, or more general courses focusing on open problems or proof techniques.

A goal stated in the preface is for the book to serve as an introduction to research in graph theory. This is to great measure accomplished by the more advanced material at the end of the chapters and the more challenging homework exercises. However, there are open problems frequently inserted into the narrative and highlighted by a double-edged box. An appendix at the end collects exactly one hundred of these problems. Even for the student who may not tackle any one of these problems, it is instructive to see that the material of the text could carry one forward to the forefront of current research. Perhaps the book's blog, and associated RSS feed, will be used to track and announce progress on these conjectures.

Not only is the content of this book exceptional, so too is its production. The high quality of its manufacture, the crisp and detailed illustrations, and the uncluttered design complement the attention to the typography and layout. Even in simple black and white with line art, it is a beautiful book. The authors' 1976 predecessor is out of print, but can be freely downloaded for noncommercial use as scanned images from Bondy's website, and for this new edition the authors have retained the copyright. Hopefully their intent to make the previous version available, along with their control of the copyright on this version, will translate to an effort to keep the text available for many years to come. Additionally, considering the quality of the content and presentation, plus the necessary effort and cost to write and produce a comprehensive 650-page hardback, the authors and publisher should be commended for the very fair pricing.

This book could serve several purposes for a graduate student's education. Introductory courses, a variety of advanced topics courses, and individual preparation for thesis research could all be supported. Talented undergraduates with the right preparation might also find the text useful. While any one course could only cover a fraction of the book, it is a book worth keeping for a student's personal library. Libraries supporting research and professionals in discrete mathematics will want to add a copy to their collections.

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The Strength of Nonstandard Analysis. *Edited by Imme van den Berg and Vítor Neves.* Springer-Verlag, Vienna, 2007. $129.00. xx+ 401 pp., hardcover, ISBN 978-3-211-49904-7.

"Nonstandard" was in the 1930s a term used in some theory in mathematical logic. However, "infinitesimal" was a utopia for mathematicians following Newton, Leibniz, etc. The eminent mathematician A. Robinson had a profound idea to connect the two concepts in the 1960s. He was the first to apply the nonstandard logic theory to define infinitesimal real numbers. After him, progress was done to simplify or/and improve the theory. Different axiomatics were written to allow rich reasoning (see, for example, [1]). Many domains of mathematics take advantage of these nonstandard formalizations.

The Strength of Nonstandard Mathematics reflects the progress made in the forty years since Robinson's book. It is the state of the art for the mathematical community of nonstandard analysis, after others older books (see, for example, [2]). It contains twenty-five articles, all from eminent experts.

The 400 pages are divided into three unequal major parts: in the first one (115 pages), called "Foundations," the reader can understand the benefit one can draw from the different presentations or axiomatics of nonstandard analysis. Some consequences on general classical mathematical objects are presented: real functions, order of magnitude, set of nonstandard real numbers, etc.

In the second part (230 pages), many applications are presented in combinatorial number theory, statistics, probability theory, measure theory, mathematical finance, differential calculus, and differential equations (ordinary, partial, stochastic, and functional). The results are new and interesting, even for non-"nonstandardist" mathematicians.

In the third part (40 pages), a pedagogical point of view is studied. The best definition of a mathematical concept is not obvious: we have to choose among the classical standard and all the different nonstandard possibilities. The discussion is difficult because we are polluted by the classical definition and have to build the "simplest" presentation of mathematics. For example, the definition of the derivative of a function is discussed.

This book is not a survey course on nonstandard analysis. For each article a basic knowledge is necessary (in nonstandard analysis and/or in the domain of application). Due to the diversity of the applications, few people can read all the articles with complete benefit. But any mathematician with a small baggage in nonstandard analysis will read the "Foundations" with pleasure and benefit. He will learn very interesting results in his own area of expertise