of GSDAR is to assist those teaching and practicing statistics in promoting graphicacy.

In the preface, Keen suggests how the book can be used as either a text for a course in graphical analysis, a supplementary resource in a statistics program, or a handy reference. A stated prerequisite is that the reader should have at least one introductory course in statistics. However, there is no recommendation regarding the reader's level of R sophistication. Unfortunately, it is unclear what R background the intended audience should have to derive maximum benefit from the book.

The author provides the reader with the needed data in two ways. Larger datasets are made available as R workspaces (.RData files). The majority of the data are made available by executing R scripts (.R files). It is implied that the reader understands the differences between the two, as well as other R functionality. Without prior R knowledge and/or supplemental instruction, readers may not have the sophistication to work through the examples that are included.

Keen's initial presentation of R code demonstrates the level of R sophistication needed to digest and benefit from the text (without supplemental guidance or instruction). To create a *dotchart*, four lines of R code are given—only one of which is instrumental. Furthermore, he utilizes and specifies many of the optional arguments to the *dotchart* function to create a more sophisticated graph. To his credit, Keen does give a detailed and organized exposition of the entire set of code. The companion code available in the well-organized R script is identical to the code in the text.

Another book, *R Graphics* by Paul Murrell (2006), takes a more appealing approach to code exposition. To start, his book includes an appendix which contains a gentle introduction to R. When code is presented in initial sections, it is delivered in smaller, equally well-explained "chunks" which are easier for the reader to digest. As his exposition progresses, he methodically and incrementally adds explained code to develop more sophisticated graphs.

The problematic exposition of R code in GSDAR is not isolated to opening sections. Interestingly, the amount of code presented diminishes as the text progresses. Again to Keen's credit, he gives a thorough, detailed exposition of code used to obtain sophisticated graphics. Code that is not explicitly presented in the text is usually available in the accompanying R scripts. This may create a disconnect between the R code and the exposition in the text which may cause digestion problems for novice R users. Experienced R users who are interested in the code may also find the disconnect frustrating.

The chapter exercises are the highlight of this book, and a valuable resource for teachers. The problems are well conceived, methodical, and reinforce objectives discussed in the chapter. The number "10" must be Keen's lucky and/or favorite number. There are exactly ten problems at the end of each chapter, and the progression of the exercises is comparable in each chapter. The first few exercises typically involve problems designed to reinforce basic chapter concepts. Intermediate exercises are somewhat more sophisticated, and the last several are larger in scope and require a synthesis of concepts and methods. For example, problems 9 and 10 in Chapter 11 ask the reader to reconsider a familiar dataset, do a regression analysis, and produce graphical summaries which can be incorporated into a short summary of model adequacy.

Hadley Wickham and Garret Grolemund gave a thoughtful review of GSDAR (Wickham and Grolemund 2010). They discussed the need for modern graphics, and the book's philosophy, content, and organization. I concur with their assessment, and suggest reading it for further consideration beyond what I offer here. I conclude this review by making suggestions for how to best employ the text. Aspects of the text may be a valuable resource for an introductory statistics course which uses R. The extensive chapter exercises should give students ample practice. The instructor will need to provide guidance and instruction on the R environment, and discuss the included R code. I do not suggest this text for novice R users without supplementary material. For the experienced R user, GSDAR is a handy reference to create sophisticated graphical summaries for one- and two-variable visualization problems.

I thank Professor Emeritus Jay L. Devore for his comments and suggestions in writing this review.

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Graphics for Statistics and Data Analysis With R.

B. V. Balchin describes graphical literacy, or *graphicacy*, as "the communication of relationships that cannot be successfully communicated by words or mathematical notation alone." Kevin Keen thoughtfully and methodically describes this concept in the first somewhat philosophical chapter of his book *Graphics for Statistics and Data Analysis With R* (hereafter GSDAR). Graphical illiteracy has been a systemic problem in many scientific disciplines, which statisticians in academia and industry have recognized and are working to correct. According to Keen, "for most of the educational process, graphical methods are presented haphazardly in a largely unconscious manner … absorbed unconsciously through immersion as in second language instruction." The goal

REFERENCES

Murrell, P. (2006), *R Graphics*, Boca Raton: Chapman & Hall. [204]