in this section are selective excitation and slice selection, frequency and phase encoding, and data acquisition techniques. An overview of raw data storage/manipulation and various aspects of the digital image also is provided. The k-space treatment in this section, supplemented with a set of figures, is one of the simplest and most accurate tutorials I have read. Chapters 7 through 10 deal with the basics of MRI and MRA techniques, artifacts and motion-artifact reduction techniques. Topics, such as enhancing contrast between tissues and ensuring fidelity of the detected signals, are carefully covered. Chapter 8 is well complemented with sample MR images showing the various artifacts discussed. Poor print quality, however, makes it is rather difficult to visualize the artifacts on the MR images.

MRI instrumentation, including data acquisition systems, is covered in Chapter 11. This chapter concludes with a short summary of the components of the MRI system. Discussion of the magnetic component of the imaging systems is organized on field strength, rather than the conventional classifications of permanent, resistive and superconducting. Although the discussion includes a comparative review of these magnet systems, the authors do not address the specific advantages and disadvantages of each magnet type. Chapters 12 and 13 provide a brief overview of magnetopharmaceuticals in clinical use and sample MRI clinical practices. The chapter on contrast agents does not address safety issues nor clinical utility. Interestingly, the final chapter, dealing with clinical applications, does not include any MR images.

Throughout the text, the authors achieve their objective of introducing complex subject matter by presenting the topics in a reader-friendly fashion. *MRI Basic Principles and Applications* is well presented with ample illustrations. The only limitation of this book is its lack of MRI safety and patient care coverage. A brief chapter addressing these issues would complement the book nicely. Nonetheless, this book will serve as a useful introduction to MRI for nuclear medicine technologists and students.

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NUMERICAL RECIPES IN FORTRAN 90: THE ART OF PARALLEL SCIENTIFIC COMPUTING, 2nd ed., vol. 2 of FORTRAN NUMERICAL RECIPES

William H. Press, Saul A. Teukolsky, William T. Vetterling and Brian P. Flannery. New York, NY: Cambridge University Press; 1996; 551 pages; $44.95 US; ISBN 0-521-57439-0.

This book is the second volume of the popular computational math methods and analysis text *Numerical Recipes in Fortran 90: The Art of Parallel Scientific Computing*. The original text, retroactively labeled Volume 1, is noted for its breadth of topics and informative introductory discussions of the background and theoretical underpinnings of the algorithms presented. Although specialists in particular subfields often are aware of superior algorithms for their specific applications, the algorithms described in *Numerical Recipes in Fortran 90* are remarkably robust, effective and generally easily adapted to a broad range of problems. Topics of interest to the nuclear medicine imaging community include linear algebra, interpolation, numerical integration, random number generators, function minimization, Fourier and spectral analysis, data modeling and inverse methods.

In this new book, the authors have recast all of the algorithms in Volume 1 to take advantage of the extended capability of Fortran 90, particularly the new and powerful array intrinsic functions that lay the groundwork for highly-accelerated performance in parallel-computing environments. They make a convincing case that parallel-processing capability, previously limited exclusively to the most advanced mainframes and supercomputers, is heading for the desktop. Indeed, they predict that a typical desktop computer will have four to eight CPUs within just a few years, and that the number of CPUs per computer will increase rapidly thereafter. They argue that it is time for us to develop software and programming techniques that can take advantage of the great potential increase in computational speed that these systems will offer. *Numerical Recipes in Fortran 90* is an excellent step in this direction.

In addition to increased performance on parallel computers, there are many other advantages of programming in Fortran 90. The array intrinsics alone provide for substantially more compact and readable code. These functions obviate the need for many inelegant, bulky do-loops, and they more naturally reflect the way scientists think about the problems they are solving. Even single-processor computers likely will exhibit improved performance, because optimizing compilers for most architectures can take advantage of the array structure inherent in many operations. Fortran 90 also offers several other modern programming features that encourage better style and generally improve code structure, readability and maintainability, including but not nearly limited to: derived data types, or structures; modules that provide for explicit procedure interfaces and global variables; pointers; and dynamic memory allocation and management. Although Fortran 77 is considered a subset of Fortran 90 (F90 is completely backward compatible with F77), many of the problematic features of Fortran 77 are deprecated in Fortran 90 and declared obsolete. Common blocks, for example, which have led to more than a few recalcitrant programming bugs, are now unnecessary and will likely be declared obsolete in the next standard revision of the language, Fortran 2000.

Missing from this book are the theoretical background and other text that accompany and so nicely describe the algorithms in Volume 1. After two introductory chapters and one describing a host of Fortran 90 utility functions devised for the algorithms presented later, each chapter parallels one of the chapters in Volume 1. Most of the text in these chapters is composed of the algorithms

themselves, coded in Fortran 90. Although these are well documented, descriptive text is generally reserved for highlighting the use of specific Fortran 90 features and pointing out particular subtleties of the parallel implementation. Therefore, unlike its predecessor, most of this book is more useful as a reference than as a textbook.

This book is highly recommended to those who already own Volume 1, the original *Numerical Recipes in Fortran 90*, and who are interested in learning Fortran 90 or the principles of parallel programming. For this group, *Numerical Recipes in Fortran 90* provides a clear, compact introduction to the new features of Fortran 90 and myriad examples of these features applied to the problems addressed in Volume 1. An electronic version of the source code also is available on compact disk in HTML format (ISBN 0-521-57608-3 for Macintosh/DOS version, $89.95; a UNIX version is available for $149.95), in Fortran 90 (this is the only language with parallel implementations), Fortran 77, C, Pascal, Basic, Modula 2 and Lisp, along with numerous numerical tools and examples. See http://www.nr.com for more information.

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