social aspects are currently in press.

All in all this is an important book. It should be read, analyzed, discussed, debated and enjoyed. It is not, nor should it be, the final word on Heisenberg, his science and his times. Many important issues remain to be settled, in particular Heisenberg's relation to Pauli (treated rather cursorily in this biography); the social scientific changes in German and European physics during and after the war; Heisenberg's relations to a new postwar generation of European and US physicists; and the increasing doubt about the inevitability of the Copenhagen interpretation. These studies should be undertaken, but it is Cassidy's fundamental work that makes such studies possible.

Computational Nuclear Physics 1: Nuclear Structure

Edited by K. Langanke, J. A. Maruhn and S. E. Koonin
Springer-Verlag, New York, 1991. 209 pp. $55.00 hc
ISBN 0-387-53571-3

Two graduate students were in my office when this book arrived, so I showed it to them. The book, which presents bits of theory together with working computer programs, described in detail, greatly appealed to them. It is obvious that such a text could benefit graduate students.

This compilation covers a rather wide range of subjects in a relatively small number of pages. It is organized into 10 chapters to which 19 experts have contributed; each chapter is devoted to a single topic. The book comes with a PC-compatible floppy disk containing the programs described in the text. The contents of the book reflect the approaches used nowadays to study the properties of atomic nuclei. Important topics include shell model theory, effective mean-field approaches, linear response theory, geometric collective models, the interacting boson approximation, the variational Monte Carlo method for light nuclei, Faddeev equations for three-nucleon systems, the relativistic impulse approximation and electron scattering.

In spirit *Computational Nuclear Physics* is reminiscent of the articles one finds in the journal *Computer Physics Communications*. All the chapters are organized in more or less the same manner, each incorporating a relatively concise theoretical introduction to the topic with a sufficient number of references; a description of the program and the numerical methods used in it; a flowchart and description of most of the program's subroutines; and the input and output.

The programs themselves represent approximation schemes that are now extensively studied. Because the programs are often simplified, one could hardly use them to carry out original research. On average, the programs are rather long (2000–3000 lines), but the rather frequent comments and the explanations provided in the text should ease the journey through any of them.

Inherent in such a compilation is a certain lack of unity. The programs have mostly been written for specific purposes, and I would not advise someone to try to use them in a library of general-use software or for situations that are obviously different from those described in the book without additional input and effort. For example, if one were to use transition densities obtained from a linear response approximation or a variational Monte Carlo calculation and test them in an electron scattering calculation or a relativistic impulse approximation, besides having a mismatch between the physical assumptions used in the different approaches, one would run into unpleasant programming problems. I believe the best approach might be to run one program first, store the results and maybe work on them by changing the format of, interpolating, smoothing or fitting the data. Only afterwards would I try to use the data in a subsequent calculation.

In fact, I prefer to write my own programs from scratch, rather than to use bits and pieces from disparate programs or to rewrite existing ones to suit my own needs. This is because, in general, physics programs are not canned programs meant to produce results under a wide range of initial input conditions. However, a diligent student will find, after a careful study of the programs described in the book, lots of tricks and methods that may help him or her feel more confident in writing programs.

I am a purist when it comes to using different numerical methods. I found it disturbing that often in the same program numerical approximations having different degrees of accuracy were used. For example, in this book one author suggests computing parts of a wavefunction using higher-order finite difference formulas, only to spoil everything later on with a lower-accuracy formula, often within the same subroutine. Physicists are goal-oriented people, and for us the ends often justify the means. However cheap solutions do not always lead to reliable results, and a serious student has to complement his or her physics knowledge with a reasonable study of the wide range of numerical techniques from more specialized sources. I would also like to have seen some discussions of why the authors chose one solution method over another (even though this additional material might have resulted in an excessively long text).

It would have been useful, I think, to provide the authors' electronic-mail addresses in addition to their postal addresses, so that readers could get additional information or more sophisticated versions of the programs directly from the authors. In addition, because some of the subroutines described in the book could be used as canned programs, a subroutine–program index might have been a useful addition to the subject index.

In spite of the fact that my comments sound critical, on the whole I warmly recommend this book as a useful complement to a graduate course in nuclear structure physics. This compendium should help students to get a better feel for what they are studying, and teachers can use the programs to formulate a range of exercises for their classes. At the same time, the book might even help professional physicists who need to get a quick and simple result but don't want to go through the pain of writing a program themselves.

Aurel Bulgac
Michigan State University

Evaluation and Control of Measurements

John Mandel
Marcel Dekker, New York, 1991. 249 pp. $89.75 hc
ISBN 0-8247-8531-2

Physics is, above all else, an experimental science. Measurements determine the acceptance of physical theories. It is puzzling, therefore, that so little of a physicist's education deals with the design, evaluation and control of measurements. Most physicists are unfamiliar with such issues as the statistical design of experiments, statistical process control and exploratory data analysis. Names such as Deming, Tukey and Shewhart and terms such as factorial design, control chart, analysis of variance and boxplot are seldom in a physicist's vocabulary. Reading John Mandel's *Evaluation and Control of Measurements* can correct some, though not all, of these deficiencies in our collective educations.

Mandel is a guest researcher at the National Institute of Standards and Technology and a well-known figure in statistics and the control of measurements. His thesis is stated at the start of the book: "Manufactured products are the end product of a process called a manufacturing process. Similarly, measurements are the end product of a process that we call a measuring process.... From the analogy ... it follows that there is a need for quality control of measurements."

An entire branch of science and engineering has evolved to address the need for statistical control of manufacturing processes to provide quality control of manufactured products. W. E. Deming brought these ideas to the attention of the Japanese in the 1950s; they applied the ideas broadly, with results that are evident today in Japanese manufactured