Preface

Computer simulations are now an integral part of contemporary basic and applied physics, and computation has become as important as theory and experiment. The ability to compute is now part of the essential repertoire of research scientists.

Since writing the first two editions of our text, more courses devoted to the study of physics using computers have been introduced into the physics curriculum, and many more traditional courses are incorporating numerical examples. We are gratified to see that our text has helped shape these innovations. The purpose of our book includes the following:

1. To provide a means for students to *do* physics.
2. To give students an opportunity to gain a deeper understanding of the physics they have learned in other courses.
3. To encourage students to "discover" physics in a way similar to how physicists learn in the context of research.
4. To introduce numerical methods and new areas of physics that can be studied with these methods.
5. To give examples of how physics can be applied in a much broader context than what is discussed in the traditional physics undergraduate curriculum.
6. To teach object-oriented programming in the context of doing science.

Our overall goal is to encourage students to learn about science through experience and by asking questions. Our objective always is understanding, not the generation of numbers.

The major change in this edition is the use of the Java programming language instead of True Basic, which was used in the first two editions. We chose Java for some of the same reasons we originally chose True Basic. Java is available for all popular operating systems, is platform independent, contains built-in graphics capabilities, is freely available, and has all the features needed to write powerful computer simulations. There is an abundance of free open source tools available for Java programmers, including the *Eclipse* integrated development environment. Because Java is popular, it continues to evolve, and its speed is now comparable to other languages used in scientific programming. In addition, Java is object oriented, which has become the dominant paradigm in computer science and software engineering, and therefore learning Java is excellent preparation for students with interests in physics and computer science. Java programs can be easily adapted for delivery over the Web. Finally, as for True Basic, the nongraphical parts of our programs can easily be converted to other languages such as C/C++, whose syntax is similar to Java.

When we chose True Basic for our first edition, introductory computer science courses were teaching Pascal. When we continued with True Basic in the second edition, computer