Dear Physics Student,

We hope you will find the study of this book interesting and rewarding. We believe that physics is an essential subject for everyone to study. This belief is not based solely upon the enjoyment we have gotten from physics. The mental processes used in physics are used in many other areas of human life. These processes include using concrete experiences as a basis for understanding the present and predicting the future; inventing definitions, developing concepts, or constructing models to impose order on these experiences; and testing these models, or mental constructs, by the accumulation of additional experiences. We see these processes as universal human activities. A wide variety of human activities have been justified by reliance upon such abstract models as justice, national security, democracy, communism, capitalism, and Christianity. These models are considerably more complex than those you will study in this physics book. However, the same mental skills are required in all of these cases. We hope your attention to these physics materials will include your awareness of a development of your own reasoning skills. We believe that such cognitive development is a prerequisite for effective living in our modern world.

In addition to our belief in the universality of reasoning skills used in physics, we discover physics everywhere, in the kitchen as well as in the laboratory. For us, the physics problems encountered in the repair of a faulty electric frying pan are as challenging as those met in solving a complex physics research problem. We are sympathetic to your desire to have physics materials that are relevant. After all, since physics is everywhere, why should physics books not contain more everyday examples and applications? We have tried to illustrate the physics principles with examples drawn from the applications of physics to human systems. We have developed these materials to meet the need for a textbook flexible enough to be used in the physics courses required for students preparing for careers in bioscience, medicine, or allied health.

A definite learning sequence which begins with concrete experiences and progresses to abstract ideas is appropriate for a general physics course. Each new topic is introduced with an exploration of concrete experiences of nature common to most people, then the necessary definitions, concepts, or models are invented to help you impose order on your common experiences of nature, and finally applications of these concepts, or models, are provided in the examples, the exercises, and the problems.

This book has been designed to encourage you to be actively involved with its contents. Each chapter begins with a list of the chapter’s goals so you will know where the chapter is headed. Each chapter includes a list of prerequisites so you know if you are adequately prepared for it. The early chapters that require some specific mathematics skills offer a short mathematics self-check for you to use to assess your skills. If you need an additional mathematics background, you will find it in the back of the book in the section entitled Mathematics Background for Physics. Throughout the book many questions are asked to encourage you to reflect upon what you are reading and studying. At the end of each chapter is a chapter summary in the form of a number of short answer questions keyed to the chapter goals. You will find it helpful to review the contents of the chapter by working through these chapter summary questions. The answers to these questions and a reference to the related section of the chapter are provided to help you achieve the chapter goals you may have missed.

A reasoning skill you need to develop is the ability to translate a written problem, or
question, into an experimental situation, or perhaps into a quantitative relationship. At
the end of each chapter you will find a series of algorithmic problems. These problems
are grouped together with all the quantitative relationships you need to solve them.
This activity will enable you to become familiar with the translation of a word question
into a quantitative question, the selection of the proper algebraic relationship to answer
the question, and the mathematics manipulation required to obtain the correct
numerical answer.

At the end of each chapter a series of exercises have been organized according to the
section of the textbook to which they are related. Each exercise can be answered using
the material of only one section of the book. The exercises will help you consolidate
your understanding of each individual section of the book.

Finally, each chapter concludes with a number of problems that may require you to
use more than one concept to answer them. These problems will help you bring
together the concepts from many different parts of the book. As you work on these
problems, we hope you will be putting it all together so that it makes sense for you.

Learning is a do-it-yourself activity. No one else can learn physics for you. You are
the ultimate test of this book. What happens to you as you interact with these materials
and think anew about your experiences of nature? Do you develop your reasoning
skills as you study these materials? Do you feel good about yourself and about physics?
Do you have a feeling that you understand nature better?

Best wishes for success in physics!

The Fullers  (1978)