Chapter 1

INTRODUCTION

Most people know, at least in some vague way, that the sophisticated technology that drives our society has been driven in turn by fundamental discoveries of physics. But, just what is physics? It derives its present name from the Greek word for nature; it was previously called natural philosophy. Physics can be defined as the science that deals with matter, energy, motion and force. It studies the fundamental building blocks of the universe and how they interact. It seeks answers to such fundamental questions as: What kind of world do we live in? How does it work? What are the fundamental laws of nature? Thus, physics is the basic science from which all others have derived.

Transistors, microchips, lasers, computers, telecommunications, nuclear power and space travel are among the many applications of physics that are so pervasive in our times. In our daily newspaper or weekly magazine, we often find articles that attempt to explain to a lay public a variety of topics related to physics. These might be sophisticated experiments on fundamental particles of matter; space probes and their missions; discoveries of astronomy in very remote regions of space; exotic new theories on the nature of matter, or the universe as a whole.

The relevance of physics is all around us. Although not as palpable as in the days of the Cold War with the Soviet Union, the terrifying threat of nuclear holocaust still hangs over all mankind. With so many programs competing for federal funds, government support of very expensive scientific ventures has become an issue of public interest. Except for fundamentalist groups, few, if any, religious leaders dare challenge the experimental findings of physics. No metaphysical speculation about the nature of reality[1], whether by lay people or professional philosophers, can ignore these findings. We clearly live in times that require at least some modest level of literacy in physics, one of the most profound achievements of the human mind. Unfortunately, physics is the least known and the most intimidating of all sciences. This is true even for many who are literate at some level about other human endeavors.

Among the factors that make physics appear so alien to so many people are the difficulty of many of its concepts, its pervasive use of advanced mathematics and cryptic symbolism, and the sophistication of its instruments, whose complexity goes far beyond the telescope first used by Galileo in 1609.

Although strongly intimidated by physics, much of the lay public has

[1] In this book, the terms world, universe and reality will be used interchangeably. The term "reality" derives from the Latin word "res" meaning thing. Thus, reality refers to the totality of all things.