Introduction

For my eightieth birthday a friend who is a retired physicist gave me quite unexpectedly a copy of Alan Lightman's *Great Ideas in Physics*. Lightman, who holds appointments in both Humanities and Physics at MIT, is internationally known for several works of both nonfiction and fiction as well as numerous articles in a variety of publications. The two aims of the book were "to provide a grasp of the nature of science, and to explore the connection between science and the humanities". The great ideas of physics according to Lightman are the conservation of energy, the second law of thermodynamics, the theory of relativity, and quantum mechanics. Using only elementary mathematics not including any calculus he explores each of these ideas and introduces excerpts from the writings of such scientific giants as Newton, Kelvin and Einstein as well as many other scientists, poets, novelists and philosophers. Appendices give a brief review of the necessary elementary algebra and geometry, and provide additional problems and discussion topics.

I read the book with great interest and pleasure and finished it feeling envious of the students, most of whom were in their first year, who had taken the course from which the book developed. However what remained foremost in my mind was the first page of the Introduction which began with a brief account of a visit which Lightman had made to the Font-de-Gaume prehistoric cave where the walls are covered with 15,000-year-old Cro-Magnon paintings. After describing one painting of two reindeer, Lightman continues:

> ... The light was dim, and the colors had faded, but I was spellbound.
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> Likewise, I am spellbound by the plays of Shakespeare. And I am spellbound by the second law of thermodynamics. The great ideas in science, like the Cro-Magnon paintings and the plays of Shakespeare, are part of our cultural heritage.

Unfortunately most university science courses regardless of the discipline spend little time on the historical aspects of the subject or its relation to the humanities. Most are intended for students majoring or intending to major in the subject or who wish to use the subject as a tool in their own discipline. There are relatively few courses which in the words of one British scientist and educator treat "science as a humanity" intended as part of a liberal education. With the emphasis in the modern university on research, publication and research grants few faculty, quite understandably, are willing or able to take the considerable time away from their own specialities to become involved in the preparation and presentation of courses for a general audience. The situation was very well stated over forty years ago at the opening of one of the junior colleges in Alberta by Walter H. Johns who was then the President of the University of Alberta:

> The universities today are havens for free inquiry - and so they should remain - but they

> should also be centres of teaching as well as of learning. There is a way of academic life epitomized in the phrase "publish or perish" for the academic world which requires that each person in the modern college must perforce add his own share of the contributions to the mountains of information that already reach the height of Mount Everest and are growing larger every minute. Is there to be no place for the scholar or the scientist who might wish to study this vast pile of ore to find the precious metal in it? Is there to be no place for the person who considers it is his task to pass on to the students in his classroom the results of this enormous activity for their use and comfort?

It is most unfortunate that Dr. Johns's very sound counsel appears to have gone largely unheeded.

In the chapters which follow we shall present for the general reader what we consider some of the more important ideas in computing. As with Lightman's book there will be little mathematics and it will be introduced as necessary. However, in addition to conventional mathematical notation we shall use when considered helpful the executable notation **J** developed by Kenneth Iverson and considered by him to be a "modern dialect" of his well-known and widely used language APL. As **J** will undoubtedly be new to many, if not most, readers, the first chapter will give a very brief introduction to Kenneth Iverson and the APL and **J** languages. Further aspects of **J** will be introduced in subsequent chapters as they are needed and in an unobtrusive manner as possible.

In addition to Lightman's book another book which influenced the form of the presentation of the material in these chapters was *Business Japanese. A Complete Course for Beginners*, an unpretentious and inexpensive little book in the well-known British "Teach Yourself" series. It has been my favourite reference in my continuing not very successful but nevertheless very enjoyable attempts to learn Japanese. The twenty chapters in the book tell the story of a Mr. Richard Lloyd, or "Roido-san" as he is called, the marketing manager for the British company Dando Sports who visits the Wajima Trading Company in Japan. The story of the two companies and Mr. Lloyd's business and social activities are told in twenty chapters, each one opening with a dialogue in Japanese of about one page in length between Mr. Lloyd and his Japanese associates. Each chapter then continues with a discussion of new Japanese vocabulary and grammar that is introduced and a number of reinforcing exercises. The result is that the reader is learning Japanese language and culture by reading a realistic if fictional narrative where the language is introduced as necessary in support of the story. Similarly in the following chapters the **J** language is introduced to support the factual narrative giving an account of the development of computing.