

Preface

I know not what I appear to the world, but to myself I seem to have been only like a boy playing on the sea-shore, and diverting myself in now and then finding a smoother pebble or a prettier shell, whilst the great ocean of truth lay all undiscovered before me.

— Isaac Newton, *Memoirs*

The heavens are a wonder to us all. So it has been throughout the ages. When we look at the night sky we see what seems a timeless panorama of stars. The slow procession of the planets and an occasional shooting star suggest a sedate motion in an otherwise eternal and unchanging universe.

It isn't so. It has long been known that stars are constantly being born in great gaseous clouds, that they develop in complexity over millions of years and then eventually die. Indeed, in the early years of the last century, the famed British astronomer Sir Arthur Eddington described the Sun as a great furnace that had enough fuel to burn for 12 billion years before it would fade away. His estimate is sound, according to all the developments in the understanding of stellar processes since then. This much is commonly known, if not the details.

What is less well known, which was only recently confirmed by the many different ways in which the heavens can be viewed by modern instruments, many of them based on satellites or carried aloft by balloons, is that from the earliest moments the universe has been a cauldron of fiery activity.

At the beginning, the fire was so intense that nothing in the universe now resembles what it was made of then. The entire *part* of the universe that astronomers can possibly see — limited as it is, not by their instruments alone, but by the distance that light can travel since the beginning — was contained in a very small space. From such a beginning, how did the universe evolve to make stars and the elements out of which planets could be made and from which life could emerge? This is the story I wish to tell. Still more, I include brief stories of some of the men and women who have revealed the cosmos to us. As David Knight wrote in his preface to Rupert Hall's *Isaac Newton*, "Science is a fully human activity; the personalities of

those who practice it are important in its progress and often interesting to us. Looking at the lives of scientists is a way of bringing science to life.”

I write especially with the layman in mind; for the more technically inclined I have placed interesting derivations and calculations in boxes at the end of chapters. In this way I think I have written a story of our universe that will be satisfying to the lay reader as well as to the scientist who would like to become more familiar with a subject — the cosmos — that, beginning in childhood, fills us all with wonder.

The universe we live in is as beautiful as it is awesome — more so to me, having with great pleasure learned enough to write these pages. I hope they will give pleasure to the reader. These are wonderful times in the history of science *on this planet* to be a cosmologist.

Norman K. Glendenning
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November 2001