

# Preface

I began to write this book in the year 2009, the 200th anniversary of the birth of Charles Darwin and the sesquicentenary of the publication of *The Origin of Species*. The BBC has commemorated this double anniversary with two splendid series of television programmes, one highlighting the experimental side of Darwin's work and the other the impact made by his theory of natural selection on both the scientific and religious establishments of his time and on political philosophies until quite recently. Come to think of it, the impact can be felt even today. There are still many who believe that the world and all it contains was made some 6,000 years ago by an act of divine creation and that, in particular, mankind was created in its present form. Such fundamentalist views are quite common in the United States but perhaps less so in most European countries.

Stimulated by the BBC programmes, I looked again at my copy of *The Origin of Species*, the sixth edition published in 1888. Included on the title page is the line 'THIRTY-THIRD THOUSAND', the total number of copies printed by John Murray, the publisher, up to that date. This is quite a modest print run for a work of such importance and I find it surprising that so few copies of the book could have made such a great impact. Probably the newspaper cartoons depicting Darwin's head on the bodies of apes made more of an impression on the public than the book itself, a lengthy scholarly presentation that few laymen would have regarded as attractive reading. Browsing through it, I am struck by the detail in the presentation of the arguments in favour of natural selection. Darwin was worried about the consequences of presenting his theory, fearing adverse reactions from both the clergy and scientists. To defend himself against potential criticism he laid out his ideas in meticulous detail, building his case step by step in a logical progression. Even so, it took the

intervention of Alfred Russel Wallace, a young English anthropologist living in the East Indies at the time, to push Darwin into publication. In 1858 Darwin received from Wallace a draft paper which described ideas on evolution and natural selection very similar to his own. To his credit, Darwin helped in the publication of this paper but covered his own proprietary rights on the theory by arranging for a presentation of both his and Wallace's ideas to the Linnean Society of London, the world's leading society devoted to natural history, in July 1858. One is left wondering when, and if, *The Origin of Species* would have appeared without Wallace's influence on events.

A striking aspect of Darwin's style is that it is written in the first person, so the reader feels as if the narrative is related to him personally — at least this is the impression I have. The kinship I feel with Darwin is a particular one. Much of my scientific work has been in a field where the word 'origin' has relevance; in my case it is the origin of planets. Darwin took 20 years to develop his ideas while I have taken 47 years to develop my own. Darwin's ideas on evolution were themselves evolving as he uncovered more and more evidence to support the basic concept of natural selection. My own ideas have evolved as observational evidence has revealed more and more facts about the presence of planets in our galaxy and the locations in which stars, and presumably planets, are formed. Let it not be thought that I am claiming equal importance for the topic of planet formation as that of natural selection. The Universe is full of material and finding out how this is assembled by physical processes to form planets is mundane and humdrum compared with how new species of both animate and inanimate life evolved from simple forms through to creatures as complex as ourselves. However, there are problems even more fundamental than those addressed by Darwin; natural selection describes how new types of life develop from previous forms but does not deal with the origin of life in the simplest forms of single-celled bacteria and archaea. The origin of life and the origin of the Universe — these are the really important, fundamental problems to which, as yet, we have no solutions.

Humdrum or not, the problem of how planets originated is regarded to be of sufficient importance for space agencies worldwide to assign considerable resources to support projects that make

observations that might help to solve this problem. Even if it is not one of the great fundamental problems of our age, looking for the mechanisms by which planets may have formed is of interest and has exercised, and still exercises, the minds of many scientists, especially during the last 200 years.

Looking at Darwin's great opus, I am inspired to take it as a model and, to the best of my ability, to emulate his thoroughness in describing my own ideas in *The Origin of Planets*. There must, of course, be important differences between the general form of presentation of *The Origin of Species* and the one I shall be using. A treatise on natural history can be cast in everyday language and *The Origin of Species* deals with the problems of the general reader by providing a glossary of scientific terms at the end of the book. By contrast, astronomy, dealt with in a formal way, must be expressed in terms of physics and mathematics — foreign languages to the majority of non-specialist readers. Many of the physical relationships that describe astrophysical processes are most clearly expressed in the form of equations and would be impossibly difficult to describe in words, except in a most handwaving way. Another difference is that, whereas Darwin made do with a single simple figure illustrating an evolutionary tree, modern printing technology allows for the prolific use of pictures and diagrams to assist the reader. I shall try to walk the tightrope of giving a proper formal presentation of the science while also expressing ideas in words that should convey the essence of the science to a non-specialist. In place of Darwin's glossary is a series of appendices. Some of these are designed to help the non-specialist reader to understand the physical concepts and terminology; others will derive physical relationships and will be of more interest to the specialist reader.

I shall begin this book in much the style that Darwin did in *The Origin of Species*, with an historical review of the important theories and ideas that have gone before. Thereafter I shall revert to a more modern format, although I shall try to maintain the detailed and rigorous reasoning that Darwin employed. Will I succeed in spanning the divide between the professional scientist and the non-specialist? We shall see.