A Journey through the Universe

Providing an in-depth understanding for both general readers and astronomy enthusiasts, this highly comprehensive book provides an up-to-date survey of our knowledge of the Universe.

The book explores our Solar System, its planets and other bodies; examines the Sun and how it and other stars evolve through their lifetimes; discusses the search for planets beyond our Solar System and how we might detect life on them; and highlights interesting objects found within our Galaxy, the Milky Way. It also looks at our current understanding of the origin and evolution of the Universe, as well as many other intriguing topics, such as time, black holes and Einstein's theories, dark matter, dark energy and the Cosmic Microwave Background.

The book is uniquely supported by video lectures given by the author, available online. It also includes the very latest astronomical observations, such as those made by the Planck and Kepler spacecraft.

IAN MORISON spent his professional career as a radio astronomer at the Jodrell Bank Observatory, and he has had an asteroid named in his honour in recognition of his work. In 2007 he was appointed Professor of Astronomy at Gresham College, the oldest chair of astronomy in the world. He writes a monthly online sky guide and audio podcast for the Jodrell Bank Observatory and is the author of numerous articles for the astronomical press and of a university astronomy textbook. His most recent book is *An Amateur's Guide to Observing and Imaging the Heavens* (Cambridge University Press, 2014).

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Gresham Lectures on Astronomy

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This book is dedicated to my friends and colleagues at Gresham College, the Mercers' Company and the City of London Corporation, who have made my years associated with the College the most rewarding of my life.

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The colour plates can be found between pages 212 and 213.

Preface

Although I have been a radio astronomer all my working life I have also greatly enjoyed observing the heavens. At the age of 12, I first observed the craters on the Moon and the moons of Jupiter with a simple telescope made from cardboard tubes and lenses given to me by my optician. As I write, I have my father's thin, red bound, copy of Fred Hoyle's book *The Nature of the Universe* on the desk beside me. It was this book that inspired me to become an astronomer.

I was able to study a little astronomy as an undergraduate at Oxford University and was also in the 'signals' section of the University Officers' Training Corps. As I was revising for my finals I spotted an advertisement for a new course in radio astronomy at the Jodrell Bank Observatory. Being interested in both astronomy and radios this seemed a good idea and I began to study there in 1965, initially studying the surface of the Moon by radar.

My supervisor as a PhD student had been giving evening classes in astronomy at a local college and due to illness asked me if I would take them over from him. Giving such evening classes over the majority of my career gave me much experience in trying to explain astronomical concepts to members of the general public, as did the giving of a general course on astronomy to the first year physics students at the University of Manchester.

It was, perhaps, this experience that helped me to be appointed to the post of Gresham Professor of Astronomy in 2007. This is the oldest chair of astronomy in the world, dating from 1597 and once held by Christopher Wren. In this role, over four years, I gave over 25 lectures on astronomy in the City of London. For each of these lectures I was required to write a transcript, and almost all chapters of this book are based on these transcripts but have been, of course, brought totally up to date. In fact, one reason why I did not put this book together sooner was that I wanted to include the results of two major space telescopes that were only released in 2013: Planck, studying the Cosmic Microwave Background, and Kepler, searching for extra-solar planets in the Galaxy.

Each of my lectures was videoed and can be found on the Gresham College website (just search for 'Gresham College lectures by Ian Morison'). These have the same titles as the chapters of this book so, should you wish, you could watch and listen to the lectures to complement the book's text. In this, this book might well be unique. Chapters 3 and 10, on aspects of the Solar System and the properties of stars, though not based on specific lectures, have been added to provide some additional information to make the book complete.

Should you like to explore some of the calculations that lie behind the results given in the book, then you might like to read my textbook *Introduction to Astronomy and Cosmology*, published by John Wiley, and if, perhaps, this book inspires you to observe the wonder of the Universe yourself, then you might like to read my book *An Amateur's Guide to Observing and Imaging the Heavens*, published Cambridge University Press.

I most sincerely hope that this book will help you to increase your knowledge and understanding of the Universe in which we are privileged to live.

Acknowledgements

As the dedication of this book implies, my first acknowledgement goes to Gresham College and its sponsors, the Mercers' Company and the City of London Corporation, who gave me the opportunity to become Gresham Professor of Astronomy.

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I would also like to thank Vince Higgs, Lindsay Stewart and Jonathan Ratcliffe at Cambridge University Press who have steered this book through to publication. I must thank too Margaret Patterson, who copy-edited my text, and Kanimozhi Ramamurthy and her team who have prepared the book for printing.

Finally, but not least, I must thank my wife for supporting me as I spent far too many hours at the computer and too few in carrying out domestic chores.