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Jamal N. Islam

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JAMAL N. ISLAM

Reader in Mathematics, The City University, London

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Preface

In 1977 I wrote a short technical paper entitled ‘Possible ultimate fate of the universe’ which was published in the *Quarterly Journal of the Royal Astronomical Society*. A number of colleagues found this paper amusing. Just then, Weinberg’s excellent book *The first three minutes* appeared and it occurred to me that it would be interesting to have a book about the end of the universe. Soon I was requested by the astronomical magazine *Sky and Telescope* to write a popular version of my paper for them. This appeared in January 1979 under the title ‘The ultimate fate of the universe’. The response to this article convinced me that a popular book on the subject would not be inappropriate. The result is this present book.

I have written the book with the person who has no special scientific knowledge in mind. All the technical terms mentioned and all the physical processes described are explained in as simple language as I have been able to use. However, I have avoided oversimplification. This means that some parts of the book will require close attention by the reader who does not have any scientific background, but I hope that everyone who cares to read the book will be able to follow the main ideas without much difficulty.

I have made free use of some of the books and articles mentioned in the bibliography for the more standard parts of this book. As this material is very standard, I feel it unnecessary to acknowledge the sources individually. However, I have tried, wherever possible, to mention the names of the people who have been responsible for originating new ideas or making new observations. I have usually given full names and year of

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birth and death of past scientists who are reasonably well known. With some exceptions this information has been taken from the 1970 edition of the *Encyclopaedia Britannica*. I have found the latter useful for some other pieces of information. For contemporary scientists I have used initials instead of first names.

I am deeply grateful to F.J. Dyson for encouraging me to write this book in the first place and for the fact that many of the new ideas in this book are his. My thanks are also due to S.J. Aarseth, S.W. Hawking, S. Mitton, J.V. Narlikar, M.J. Rees and J.C. Taylor for useful comments on various aspects of this book, and to the staff of Cambridge University Press, in particular Marion Jowett, for their cooperation. I am deeply indebted to Mrs Mary Wraith for her efficient typing of the manuscript. Lastly, I would like to thank my wife Suraiya and my daughters Sadaf and Nargis for constant support and encouragement during the period in which this book was written.

November 1982

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*To the memory of my parents.
Also, to the memory of my brother
Tareque Muinul Islam (1930–1979)
and to the memory of my nephew
Nadeem Omar (1955–1979)*

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Note on some conventions

In this book the term ‘billion’ is used in the American sense to mean a thousand million. The number represented by 1 followed by n zeros is often written as 10^n . Thus a billion is 10^9 and a billion billion is 10^{18} . The reciprocal of 10^n , that is, 1 divided by 10^n , is written as 10^{-n} . Thus a billionth is 10^{-9} and a billion billionth is 10^{-18} . Also, 10^{10^n} is the number represented by 1 followed by 10^n zeros.