FACTS AND SPECULATIONS IN COSMOLOGY

The theory of the origin of the universe has advanced over time through observational evidence as well as through a lot of speculation. In this historical approach to cosmology, the authors review our present ideas on the origin and large-scale structure of the universe against the backdrop of our astronomical knowledge. They argue that the speculative element has become a dominant part of modern cosmology, showing how assumptions have been made and portrayed as confirmed facts.

This unique book gives not only a critical assessment of the big-bang theory, but presents a host of anomalous observations, and puts forward an alternative, controversial theory on the origin of the universe. A non-mathematical account, it contains analogies from everyday life so that readers can understand the concepts easily and follow the arguments presented. A thought-provoking insight into the evolution of cosmology for undergraduate students and general readers, this book shows that the mystery of the origin of the universe is far from being solved.

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CAMBRIDGE
UNIVERSITY PRESS

CAMBRIDGE UNIVERSITY PRESS
Cambridge, New York, Melbourne, Madrid, Cape Town, Singapore, São Paulo, Delhi

Cambridge University Press
The Edinburgh Building, Cambridge CB2 8RU, UK

Published in the United States of America by Cambridge University Press, New York

www.cambridge.org
Information on this title: www.cambridge.org/9780521865043

First published 2008

Printed in the United Kingdom at the University Press, Cambridge

A catalogue record for this publication is available from the British Library

ISBN 978-0-521-86504-3 hardback

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Preface

If you ask a well-read person what is his or her understanding about the origin of the universe, the reply is invariably: 'It originated in the big bang.' This is also the view of most professional scientists, that cosmologists are very close to their much sought after holy grail, namely the understanding of the origin and large-scale structure of the universe.

Major reasons for this view have come with the serendipitous discovery of the cosmic microwave background by Arno Penzias and Robert Wilson in 1964, and the discovery of the very small fluctuations in this by the teams led by George Smoot and John Mather in 1992. Both of these discoveries well deserved the Nobel prizes which have been awarded. The theory and observations, all based on the view that there must have been a big bang, have convinced all of the observers and most theorists that this model must be correct. However, this interpretation is in large part based on theory which has not been independently tested. In short, speculations are confused with facts.

Our purpose in writing this book is to share with the general reader our unease at the definitiveness that is often attached by professional cosmologists to their interpretations, when they are really based on speculations rather than facts. To underscore the circumstance that this is not the first such episode in the history of astronomy, we go through a historical sequence of the evolution of man's understanding of the universe. Time and again we find that there were majority views asserted with a great deal of firmness, views that had to be subsequently discarded when contradicted by facts. It is because of such examples, that distinguished physicists have expressed their derision of cosmologists in no uncertain terms. We cite two:

Lev Landau: 'Cosmologists are often wrong but never in doubt'

Max Born: '... modern cosmology has strayed from the sound empirical road into a wilderness where statements can be made without fear of observational check ...'

Many of our cosmologist colleagues would like to argue that all of the earlier examples in history belong to times when the observational support for cosmology was nowhere near as strong as it is today, so that they are on firmer ground in their assertions than their predecessors of bygone days. The fact is that those predecessors made exactly the same defence of their assertions.

The present theoretical structure of the standard big-bang cosmology rests on extrapolations of known physics to domains far beyond what is experimentally tested. Also the assertions about what happened in the very early universe do not rest on direct astronomical observations but on large extrapolations of what is actually observed. Given this speculative base of the present ideas, we feel that scope exists for alternative ideas that depart considerably from the big-bang paradigm. We have developed one such alternative model, the quasi-steady-state model. This predicts a cyclic universe with no beginning. We do not claim it to be perfect, but it is certainly good enough to be compared with the standard model. At present it is only rarely mentioned because of the hype associated with the big bang.

In this book we also draw attention to observations involving expansion and ejection in individual galaxies and clusters that are almost invariably ignored or disbelieved since they do not fit into the standard paradigm of the expanding universe. In the past the anomalous phenomena have played a useful role in shaping directions of physics and astronomy: they indicate that nature is holding out the hope of unravelling one more secret. Ignoring such data because 'it has to be wrong' is like throwing the proverbial baby out with the bath water.

We were coauthors with the late Fred Hoyle in a technical account of the present cosmology, entitled *A Different Approach to Cosmology*, published by Cambridge University Press in 2000. The book was quite well received by astronomers and physicists (but of course, not standard cosmologists!). This has encouraged us to write the present account so that the ideas may be shared with a wider group. We thank the Cambridge University Press for providing us with this opportunity.

We thank Peggy McCoy, and Vyankatesh Samak for help in preparing the manuscript. For line drawings we are glad to acknowledge help from Prem Kumar and for images and photographs, from Arvind Paranjpye.