

Preface

This volume is the proceedings of IAU Symposium 201, 'New Cosmological Data and the Values of the Fundamental Parameters', held in Manchester, U.K. during August 2000. It will be evident even to someone reading this preface during the year of publication (2005) that August 2000 is a long time ago. For this, the chief organiser of the meeting, and main editor of this volume, Anthony Lasenby, has to apologise unreservedly. It is entirely his fault that such an extraordinary delay has occurred with publication, and he apologises to all the contributors to this volume who would have liked to see their work appear in print very much earlier, and also to the staff at ASP and the IAU who have had to suffer under all the delays, and wait for so long for the volume to appear. He also apologises to his co-editor, Althea Wilkinson, who has been entirely blameless in all respects with regard to the delays.

However, despite the usual dictum that conference proceedings in a fast moving subject have to appear more or less immediately if they are to have any value, we would like to suggest that in the present case an exception is possible. The year 2000 can be thought of as a turning point in modern cosmology. This is the time at which the indications there had been in the preceding two or three years for a non-zero cosmological constant, began to solidify into a new picture of the universe. This new model, currently known as the 'concordance model', is dominated by an energy density which causes acceleration rather than retardation of the universe's expansion. This energy density is known as dark energy, and in its simplest form can be modelled as a non-zero cosmological constant. The next most dominant component is dark matter, and this too began to be 'nailed down' in a quantitative way around the year 2000. In the few years before then, the total density of matter (both ordinary and dark) had been uncertain by factors of a few. By the time of this Symposium, this uncertainty had largely vanished, and estimates had converged on 0.2–0.35 of the energy density of the universe being made up of matter, with 0.65 to 0.8 as coming from the dark energy. A third strand, was the status of measurements of the Hubble Constant. The big advances brought about by the Hubble Space Telescope, and its concordance with other indications from the Cosmic Microwave Background and Large Scale Structure, meant that previous big disputes over the value of H_0 by factors approaching 2, were finally being brought down to arguments at the 10% percent level.

What had caused these major shifts was the sheer quality and quantity of the data that was now flowing into cosmology. This in turn had come about via huge advances in techniques and capabilities in all areas. For the first time, cosmology was now thoroughly 'data-driven', leading to the extraordinary situation of knowing, to an accuracy unheard of just a few years before, the values of

all the main parameters of the universe — age, density in various components, degree of curvature, expansion rate and so on — whilst simultaneously encountering more and more mystery about what the major components actually were, and why they existed in the proportions they did.

All these same facts exist in the same form today, five years on, whereas virtually none of them existed just one or two years before the meeting took place. Thus the meeting in Manchester, in August 2000, was a very appropriate point at which to lay down a ‘time capsule’ in cosmology. It is hoped that the present volume achieves this, and shows in a vivid way, just what the state of cosmology was at that time. It is also probable that the reader will agree that we are still, five years on, living with more or less exactly the same, fairly uncomfortable, world picture.

Aiding the ability of this volume to provide an exciting snapshot of a critical time in cosmology, is the presence at the meeting of many of the most significant figures in modern cosmology. We would like to thank all of those who took the time to write up their excellent talks, thus providing the material for this volume. In addition, we have included a large proportion of the poster material which was presented, and think that this also contributes to the ‘snapshot’ nature of this volume, in highlighting in a short span a great deal of the technical work going on at the time.

Finally, we should like to thank many people at Jodrell Bank, at Manchester and in the IAU who contributed to the organisation of the meeting, and who made it possible to bring together such a large proportion of the world’s cosmologists in one place. In particular, we would like to thank Prof. Rodney D. Davies, whose inspiration, and very direct help, led directly to the meeting itself, and contributed much to its success.

Anthony Lasenby and Althea Wilkinson.