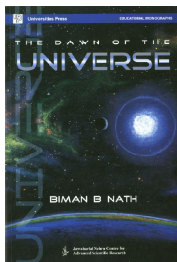


The Dawn of the Universe

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Biman B Nath
 Universities Press, Hyderabad
 p.172, Price:Rs.125/-, 2005.

Cosmology has always been a branch of science whose appeal readily transcends the scientific community. The very audacity of science to grapple with the understanding of the origin and evolution of the entire cosmos does explain why popular books on cosmology rapidly disappear from the shelves of bookstores. However, many of these books lure readers by portraying speculative aspects at the front-line of research as ‘sort-of-established’ science. Here is a book that doesn’t do so! Consequently, it is probably not a popular science book that the casual, mildly curious public would pick up from book store chains and enjoy reading. It is a package essentially meant for young minds that want to have an understanding of cosmology, rather than simply goggle wide-eyed at fascinating, mysterious ideas. While books that dwell on speculative research frontiers certainly have their own role, it is also important that we attract young minds to the thrills of cosmology with a contemporary perspective and a clear conscience.

And, what a book this is! Rarely does a popular book hold the attention of an active researcher in the field and compel him to read it carefully from cover to cover (leading to inordinate delays in writing a book review, much to the annoyance of the editors). This book is a must-read for all high school and under-graduate students fascinated by and curious about the cosmos. The simple style of writing makes it easy to read. It is almost as if someone is talking to you through the pages and giving you a balanced picture of contemporary cosmology. The book is concise and the chapters are short, and yet the magic is that you cover immense ground and learn a lot. The text refers to notes that outline simple mathematical calculations which provide fodder to the more enthusiastic student to delve further into some of the topics.

The reader is led gently into the realm of the cosmos in the first chapter. While most of the readers would have read about the Solar system before, the excellent section on the local stellar neighborhood of the Solar system (section 1.4) is a treat even for seasoned astronomers. Then the ‘horizon’ gradually opens up in steps, up to a current view of the distribution of galaxies on cosmological scales available from the recent surveys in the past decade. All this happens so smoothly, that you are taken aback at the long journey made in the few pages.

Cosmology is arguably the most spectacular application of the modern theory of gravitation. Einstein’s theory of general relativity

(GR) led to an intellectual revision of a space-time from a mute background to the natural world to a dynamical entity that participates equally in the motion of matter. The expanding (or contracting) universe emerges from the simplest of applications of GR to the observed homogeneity of distribution of matter and radiation in the universe. While most popular texts on cosmology prefer to skirt around a description of relativity and introduce cosmology using Newtonian gravitation, this text takes the bull by its horns and starts with a concise, yet lucid, introduction to special relativity and then its extension to general theory of relativity. That this could be achieved so successfully in a single chapter of the short book is simply amazing! I recommend this section to any high school or undergraduate student as a first brief exposition to relativity. Perhaps it will not be out of place to recommend this also to others, like me, who dream of reaching out so easily to young minds on advanced topics. The sections of this chapter are quite a masterpiece of pedagogy. In particular, the section on the Olber's paradox is again a treat. The author has carefully hand picked the most effective analogies from other introductory texts to explain concepts in terms of day to day experiences. For recent observations he has even constructed very original analogies, such as that of deducing the accelerated expansion of the universe from supernova data with inferring the economic history of a civilization using the archaeological study of coins.

The entire description of the early universe is again masterfully packed into a concise chapter.

The chapter covers a lot of ground with a well-balanced emphasis on aspects based on established physics and that which is more speculative. This is a refreshing departure from attempts to jazz up cosmology with sensational ideas based on speculative early universe of higher dimensions, yet unknown interactions and high-brow 'fundamental' physics. In this era of immense improvement in observations, cosmology is now rich and exciting enough with the observationally well-established perspective of the early universe. Exquisite measurements of the fluctuations in the Cosmic microwave temperature, surveys of galaxies reaching to the vast expanses on the observable universe, etc., discussed in the book, have shifted the emphasis in cosmology to more concrete endeavors and away from traditional theoretical speculation.

In modern cosmology, the remarkable progress in the past few decades has come from the intense interplay of theory and observations of the large scale structures in the distribution of matter traced by galaxies and its encryption in the relic fluctuations of the cosmic microwave background radiation. Here again, the author has not shirked from the difficult task of introducing important concepts that underlie the tools of the trade. The reader is introduced to concepts such as the power spectrum of fluctuations using clear analogy to day-to-day experiences. In the final few chapters, the reader is transported to the front-line of our understanding of structure formation and evolu-



tion and formation of its tracers, the galaxies. The book also familiarizes the reader with the major observational facilities that have been developed in India.

It is not easy to suggest improvements in this wonderful book. A more elaborate text book for undergraduates that builds upon this book by including the material in the notes, into the text would be a valuable resource. Books in regional languages can potentially reach a much wider audience. It is heartening that the book (an earlier version of it) first appeared in a regional language, Bengali. I sure hope that the author will make the effort to update the Bengali version based on this new version. The quality of the figures has a lot of room for improvement and something that should be given consideration in the future editions. Price permitting, the inclusion of color figures would make it attractive and allow pack-

ing more information into some of them. A section in the text, or, notes on the ongoing research in these areas in India will be a welcome resource for the Indian students.

In summary, this is an excellent book for the young, curious minds in our high schools and undergraduate colleges providing an up-to-date, no nonsense introduction to contemporary cosmology. The book should certainly be made available in the libraries of every school and college. This is also a perfect resource material to distribute in the many introductory workshops for promising students and refresher courses for school/college teachers. The modest price would also allow many students to make a well-justified investment in a personal copy.

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