

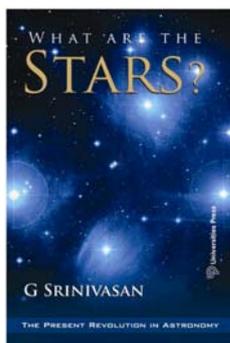
BOOK REVIEWS

culties in conducting ERP studies with rapid succession of stimuli are discussed. Posner and Kar on 'Brain networks of attention and preparing for school subjects' review development of language, phonemic discrimination, reading, numeracy, attention and its neural basis again from the developmental perspective. The concurrent development of reading in a language with transparent orthography such as Hindi and in an opaque language such as English which occurs routinely in India is discussed.

The book gives a glimpse into the rich tapestry that is cognitive science. The chapters offer brief reviews or experimental studies with new and clear insights into specific topics. There is no comprehensive coverage of any one topic of cognitive science, but as the title of the book suggests varied topics are covered in brief. Hence the book would not serve as a textbook or a reference book. The editors have given an introduction prior to each section which summarizes the papers in that section. This together with the brevity and crispness of the chapters makes the book easy to read.

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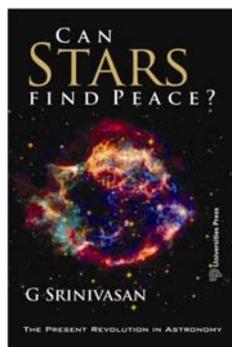


What are the Stars? G. Srinivasan. Universities Press (India) Pvt Ltd, 3-6-747/1/A and 3-6-754/1, Himayatnagar, Hyderabad 500 029. 2011. xiii + 246 pp. Price: Rs 270.

I know of no comparable book in the present-day literature that so successfully conveys the excitement of the development of our knowledge of the physics of

stars, including the newest discoveries, and at the same time is so profound and explains the fundamentals of the science so well. In its style it reminds me of the books of Richard Feynman and George Gamow.

I expect that the book and the series will be appreciated by students as well as teachers. Teachers will find here many examples of beautiful and simple ways to explain complex problems in spectroscopy, radiation physics, nuclear physics, neutrino physics, gas dynamics, etc. Having myself taught the subject of stellar physics for decades, I still found here a number of original and elegant ways to explain complex physical problems which were completely new to me. This made the reading of this book an extra great pleasure.



Can Stars Find Peace? G. Srinivasan. Universities Press (India) Pvt Ltd, 3-6-747/1/A and 3-6-754/1, Himayatnagar, Hyderabad 500 029. 2011. xiii + 254 pp. Price: Rs 270.

This book gives an excellent treatment of the evolution of stars, from their formation until their final stages, in which they 'find peace' as a white dwarf, a neutron star or a black hole. In order to understand how these three types of 'compact stars', which have extreme densities, can exist in nature, Srinivasan gives a clear explanation of all the necessary physics, particularly the quantum-statistical behaviour of the particles that make up matter: atomic nuclei and electrons.

[To have an impression of the extreme densities of matter in these three types of compact stars: white dwarfs have densities of the order one to one hundred million kilograms/litre, and neutron stars hundred trillion kilograms per litre; a volume of a raindrop in a neutron star contains as much matter as all 7 billion people on Earth together.]

It was this quantum-statistical behaviour of matter which led S. Chandrasekhar in 1930 to his discovery that white dwarfs cannot be more massive than about 1.44 times the sun (the so-called Chandrasekhar limit), which in 1934 led to the prediction that more massive stellar remnants collapse to a neutron star. It was 33 years later that these neutron stars were discovered. And their existence then led to the confidence that black holes, predicted by Oppenheimer and Snyder in 1939, must also exist.

The work of Chandrasekhar thus is at the basis of all our knowledge about the final stages of stars, and it is for this work that he was awarded the Physics Nobel Prize in 1983. It is thanks to this work that we know that at the end of life indeed stars 'can find peace'.

This story is the main theme of this book, and this history and its physics background, are told in a clear and fascinating way. I am convinced that the book will be inspiring for university students in physics and other natural sciences, in India and elsewhere.

I know of no other book on the evolution of stars of similar scope and breadth that is accessible for undergraduate students.

I would be delighted to have this book as basic course material for the undergraduate students in physics in my University.

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Annual Review of Astronomy and Astrophysics, 2010. Roger Blandford *et al.* (eds). Annual Reviews, 4139 El Camino Way, P.O. Box 10139, Palo Alto, California 94303-0139, USA. Vol. 48. xiii + 723 pp. Price: US\$ 84.

Reviews of scientific papers are not a new phenomenon, although there has been a spectacular rise in the number of review journals in the recent past. In the old German tradition dating back to the 19th century, there used to be a class of articles called 'Jahresbericht', which were comprehensive records of annual contributions made to a topic of research.

Reviews of this kind are supposed to give a new entrant to a field an idea of what has been achieved and a sense of what lies ahead, and for a practitioner of the field, a pause to take stock of what others have done in that field. Literature reviews are crucial in any field, especially in rapidly growing ones.

The *Annual Review of Astronomy and Astrophysics* (ARAA) has been around for more than half a century and has been the backbone of astrophysical research over these years. It has equally been a place for learning about a topic for students as well as one of summarizing new results and speculating upon new vistas for experienced practitioners. Its reviews are famously non-refereed, a policy that has given the authors the freedom for their reviews not to become mere compilations of all published papers, and to be able to choose wisely. This has set the tone for the reviews for many years, and the readers of ARAA do not turn to its reviews for an exhaustive list of papers, but for thoughtful summaries in a field that is rapidly growing and in which one wishes to look for directions of research and not merely a list.

The ARAA has also had the tradition of including a memoir of a reputed astronomer, which has always been one of the most interesting pieces in the volume, with the personal touches of this feature being in contrast with other academic reviews.

The recent volume is no exception to this tradition. It begins with a tribute to Geoffrey Burbidge who passed away in 2010, and who was at the helm of these reviews for almost 40 years. Burbidge was a stalwart in those spheres of astronomy that exploded in the sixties after the discoveries of quasars and the

cosmic microwave background, namely extragalactic astronomy and cosmology. The memoir this time has been written by Donald Lynden-Bell, a theoretical astrophysicist and a maverick, who transformed many fields of research by his uncanny insight into the relevance of theoretical ideas in the interpretation of observational data.

The articles in this volume range from problems related to the solar system, to the edge of the universe. The review on the birth environment of the solar system discusses the recent ideas concerning star-forming regions and how the environments affect the star and planet formation, in light of the data from meteorites for the abundance of radioactive elements. It is interesting that in spite of the paucity of data and significant uncertainties, working scenarios can be constructed. It appears that the birth environment of the solar system is neither unusual nor rare, although the probability of realizing the particular combination of parameters is quite low. The review on the inner regions of proto-planetary disks focuses on the less understood parts of such objects. The inner regions (within a distance of one astronomical unit of the star) are difficult to observe because of the brightness of the star, and difficult to model theoretically because of the extreme temperature where dust grains begin to evaporate. Recent observations with infrared interferometry have begun to overcome this barrier, and although they have confirmed the existing models, new questions have been raised through these observations.

Young, massive star clusters are the fundamental building blocks of galaxies. A review summarizes the observations of a few such nearby clusters and the attempts to understand their formation and evolution. The variation in the stellar mass function, an important ingredient in the understanding of the process of star formation and evolution, has been discussed in another review.

The advances in the topic of exoplanet atmosphere are dealt with in an engaging article. The prospect of observing planets slightly larger than the Earth orbiting in the habitable zones of M-dwarf stars has received a lot of attention in the recent years. The article describes the direct observations of exoplanet atmospheres and their models.

Another review deals with an important type of cosmic dust grains. Silicates

of different varieties have been detected with infrared observations in a wide range of environments, from proto-planetary disks to distant quasars. Recent space missions with infrared telescopes have enriched this field of study enormously, as well as laboratory studies. Interstellar dust has also been detected by space-probes and is the focus of an interesting review.

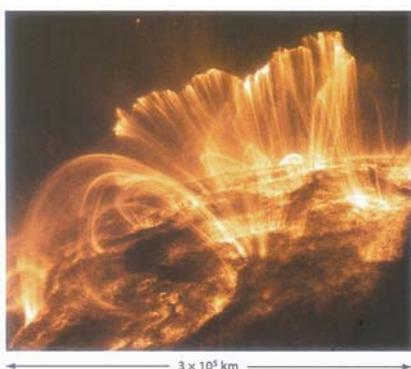
At the scale of galaxies, one of the two reviews in this volume discusses the problem of gravitational lensing by galaxies. Lensing has been used to study a range of topics from the mass distribution inside galaxies to cosmology. Molecular clouds are the nurseries of stars, and observing them outside of our galaxy gives one a clue to understanding the process of star formation in other galaxies. The review of molecular clouds in nearby galaxies shows that several observations point towards the universality of some properties of giant molecular clouds. At a larger length scale, the improvements in the measurement of the Hubble constant are the subject of an important review. The current measurements can boast of having less than 10% error, and the article charts the steps that will be required to bring the errors down to less than 2% level.

The exciting field of detection of dark matter is also covered in an article in this volume. A number of experiments are underway to detect various possible candidates of the elusive dark matter, and if detected, this will change the face of astrophysics. Another interesting review deals with the on-going and future experiments to detect the signs of an important epoch in the history of the universe, that of reionization of the intergalactic medium after the first luminous objects appeared in the universe. This is a challenging experiment and, again, if detected, will change the course of cosmological research. Thus

Thus this volume has yet again come out with a timely and engaging list of articles on topics that have grown in recent years and which will no doubt shape astrophysical research in the near future.

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Transition Region and Coronal Explorer image of solar postflare loops in the Feix EUV line at 171 Å.