Book Review:

What are the STARS? xiii + 246 Can STARS find peace? Xiii + 254

both by **G. Srinivasan**, University Press, Hyderabad (2011)

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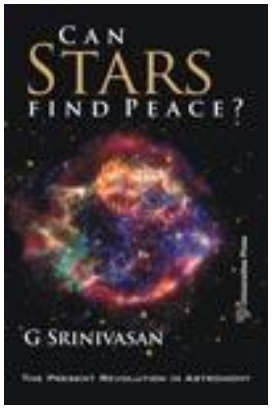

Stars, their origin, structure, evolution and end, today constitute the most successful part of astrophysics. The media, however, tell us that glamour lies elsewhere, in cosmology, with dark matter, dark energy, God's particle, etc. the main actors. It is a pity that stellar physics, the really solid part of modern astrophysics gets neglected in the presence of the physics of the origin and evolution of the universe. Against this background the two books listed above are most welcome, especially so as they come from an author with excellent teaching experience. For, someone like **G. Srinivasan** who has taught the subject to graduate students can very well express the textual information in a format that the student reader will appreciate. The reader will also find the encouraging words of Lord Martin Rees who has written a foreword in the beginning of each volume.

The two books together are meant to cover the different aspects and stages of a star's life. The **first text** deals with Sun-like (main sequence) stars whereas the second one deals with red giants and the more dramatic aspects like exploding stars, pulsars, black holes,etc. The chapters and coverage of the first book are as follows.

Against the backdrop of the International Year of Astronomy, the year 2009 AD, the author gives a brief description of the present revolution in astronomy. It is a broad brush picture of what one talks of today in astronomical research literature. This account of course includes cosmology and the belief that the universe started with a big bang. The author's glorification of spacetime singularity as an exact result, however, reminds this reviewer of the Aesop's fable of the fox who lost his tail and sought to glorify this defect.

Indeed, it might have been more relevant to stick to the stars and start with the Chapter 1. Here the physics behind spectra of stars is very well explained. On this observed evidence the astronomer bases any theory of the stars. It is surprising that in this discussion the Hertzsprung Russell diagram has been bypassed! Although the HR diagram is referred to in the second volume, with the accolade "Perhaps the most important diagram in stellar astronomy is what is known as the Hertzsprung Russell diagram (H-R diagram)"

the question arises as to why its arrival on the scene is delayed to the second volume. This is like delaying the stage entry of the Prince of Denmark in the Shakespearean play *Hamlet.* Chapters 2 and 3 are devoted to Eddington's classic work modeling the typical main sequence star. The author has explained the temperature drop as one move from the core to the outer surface of the star and the role of opacity. It is good to see a derivation of the Eddington limit representing the tussle between the forces of gravitation and radiation pressure. First considered in the context of stars this result has been applied also in high energy astrophysics.

Chapter 5 deals with the crucial question of solar energy and here the author's teaching ability is obvious. Having spent a good bit of time explaining the nuclear fusion process which led to Bethe's work on the solar model, he asks the desired question: the model works well but how do we test its validity? And he goes on to give a lucid outline of the solar neutrino experiments. This is followed by a chapter on *Sounds of the Sun* which show how the surface phenomena observed for the Sun can be linked to interior features of the solar model. Helioseismology is thus briefly described as well as the *GONG* programme that links solar observatories round the globe into a programme of uninterrupted observation of the Sun. The Solar and Heliospheric Observatory (*SOHO*) with its multiple uses is also described. The standard model of particle physics is finally discussed and the phenomena of neutrino oscillations are identified in the solar neutrino detectors.

The **second book** appears to allocate a disproportionately large share to white dwarfs and neutron stars. This is presumably because the author may have wanted to emphasize the pioneering work of S. Chandrasekhar in the area of stars containing degenerate matter. There are 157 pages devoted to such stars whereas the rest including red giants and supernovae get only 88 pages. The result of this skew distribution is that some of the important topics are missed out. Thus a reader brought up on this book will be unaware of Fred Hoyle's brilliant solution of making carbon through a *resonant* nuclear reaction involving a triple alpha fusion. Nor will the pioneering work of Burbidge, Burbidge, Fowler and Hoyle (commonly referred to as B^2FH) on stellar nucleosynthesis ever enter the reading horizons of the readers of this book. Attempts to locate these topics through the index failed; although in the process it became clear that the index also left out many important names and topics. Further, this reviewer could have added some texts to the list given for 'suggested reading' at the end.

These are shortcomings that may be easily corrected provided the author and the publisher consider them important enough. Even as it is, these books will bring the subject of stars to the attention of the typical physics undergraduate who should not miss the chance of reading an exciting account.