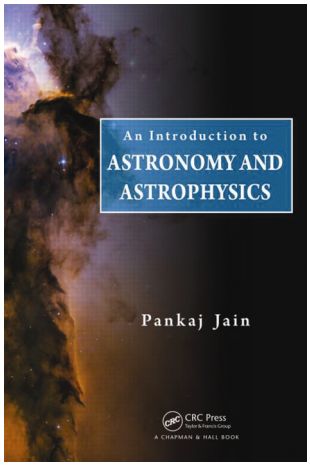

An Introduction to Astronomy and Astrophysics. Pankaj Jain. CRC Press, Taylor & Francis Group, 6000 Broken Sound Parkway NW, Suite 300, Boca Raton, FL 33487-2742, USA. 2015. xiv + 351 pages. Price: £ 49.99.

In the context of space missions triggering the interests of laymen and students, this book is a welcome entity. It is aimed at junior or sophomore-level students, who can be considered as undergraduates. It tries to mainly cover the basics of astrophysics (not much of astronomy as such). Thus, in principle, any person with exposure to basics of physics will be able to digest the contents of the book and get a deeper insight into astrophysics.

The first three chapters cover basics of what may be termed as astronomy covering the observational aspects. The discussion on telescopes explains the finer details of interferometry. Astrometry covers the coordinate systems, with discussion on space velocities, precession corrections and transformation of coordinate systems. Subsequent chapters deal with astrophysics. The measurement of brightness of a star starts with blackbody radiation and is extended to the meaning of magnitude scale. Chronologically it is the other way round. The need for coining a colour index and using it for the estimation of temperatures is lost in this approach. However, the physics is conveyed effectively.

The chapter on gravitation and Kepler's laws starts with the two-body problem and application to the solar system. Application to the astrophysical context is also explained. Then there is a jump to tidal forces and Roche limit. The extension of two-body problem to mass estimates of stars in the binary system is described much later in chapter 13. There, the emphasis is on the mass transfer in compact systems.

The discussion on stellar spectra reads well, but fails to convey the importance of the application of Saha's ionization formula, especially in the context of the distinction between dwarfs (main sequence) and giants through spectroscopy.

It seems to be a general trend in the book to discuss finer details; in the process the links between the concepts are lost. Chapter 6 talks about the determination of ages of star clusters, while the evolution itself is discussed much later.

The stellar spectra, structure, formation and evolution in that order, constitute a comprehensive coverage. Though it appears to be beyond the undergraduate level, it is not a deterrent to a physics student who is keen on learning the physics of stars. The flow is apt and provides a good background. It may be recalled that these subjects are covered exhaustively in a textbook by Abhyanakar[1], used by postgraduates.

The chapters on stellar structure and stellar nuclear reactions are extensive; the discussion and flow of concepts drive home the physics efficiently.

The next chapter covers star formation and evolution. The discussion on supernova, which appears after introducing neutron stars and black holes, does not highlight the difference between the two types. Type-I supernovae are identified typically by the absence of hydrogen in the spectra. Quite naturally one would expect it to appear in the discussion on binary stars. But it makes its way in chapter 14 under distance ladder.

The chapter on solar system covers elementary ideas like the phases of Moon and eclipses, while the problems section has more involved topics. The topic of retrograde motion reappears here. The coverage on topics appears disjointed. The status on Pluto could have gone into a box. Are the students expected to gather the relevant basic ideas elsewhere?

The chapters on binary stars, the Milky Way and galaxies make good reading. The questions at the end of the chapters are also thought-provoking.

The last two chapters cover many complex ideas explained briefly. In spite of the simplicity of the language, it is likely that the reader may not understand most of it.

That brings us to the question of the probable readership. As the preface describes, it was offered as an introductory course at IIT, Kanpur. Further it recommends that the chapter on cosmology should be included in any course offered, though only for one semester. And that requires the basics described in the rest of the chapters.

Yes, it is a valuable addition to those who already know the subject, but are mathematically oriented. This is because of the problems that are listed at the end of each chapter, which can trigger a curious reader to sit and solve them.

Thus this will serve as a useful resource book to teachers of the undergraduate courses; they can decide on the depth of the concepts to be covered depending on various parameters like the potential of the students, constraint on the syllabus and most importantly, the time allocated for teaching the subject. There is a note on the back cover 'Solutions manual and figure slides available with qualifying course adoption'.

There is a big cry now-a-days about light pollution and the associated problem of the next generation being deprived of the beautiful night sky. This book does very little to take the readers out to take a look at the night sky. The very first exercise in the first chapter directs the reader to the software stellarium.

Some sentences in the book require revision. Here are some examples:

- A star is *approximately* fixed in space.
- The stellar spectra *is* very complicated.
- A planet … has sufficient mass for its self-gravity to overcome … it assumes *a hydrostatic equilibrium (round) shape.*
- Observations suggest a period of intense crater formation *around* 3.9 billion years.
- *After taking birth*, a star goes through… .
- *The atmosphere is always changing with time.*

It is conventional to use the symbol ⊙ for the Sun like radius $R\odot$, mass $M\odot$, etc. R_S and M_S are used for any star other than the Sun. This convention may be followed in the future editions of the book. It is also available as a Unicode font U + 2609 (⊙).

Ignoring all these minor shortfalls, the book is definitely interesting to teachers and post graduates who would like to sit back and digest what he/she had missed while studying physics. Further, it is strongly recommended for students who

enjoy working out solutions for problems.

1. Abhyankar, K. D., *Astrophysics: Stars and Galaxies*, Universities Press, 2002.

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Annual Review of Nutrition, 2014. Robert J. Cousins, Dennis M. Bier and Barbara A. Bowman (eds). Annual Reviews, 4139 El Camino Way, P.O. Box 10139, Palo Alto, California 94303-0139, USA. Vol. 34. viii + 458 pages. Price: US$ 90.

Countries around the world continue to be plagued by the increasing prevalence of obesity – the incidence has more than doubled between 1980 and 2014. In 1997, the World Health Organization (WHO) claimed that 'obesity should be regarded as today's principal neglected public health problem'[1], and the National Institutes of Health (NIH), USA recognized that 'obesity has multiple causes and that there are different types of obesity'[2].

The number of papers published in this area has more than tripled in the last 10 years. In line with this, the volume under review has devoted almost half of its contents to the important topic of energy metabolism and adipose tissue function. Recent studies are focused on understanding the differences between 'metabolically healthy' and 'metabolically unhealthy' obesity[3]. In this volume, Martinez-Santibanez and Lumeng have provided a framework to understand adipose tissue remodelling, and introduced the field of 'immunometabolism', connecting regulation of immunity with that of metabolism and its role in the remodelling of adipose tissue from 'healthy' to 'unhealthy' (macrophages and the regulation of adipose tissue remodelling). On the same lines, Trayhurn discusses the role of hypoxia in inducing adipocyte dysregulation, leading to obesity-associated disorders. He also introduces the concept of a third distinct form of adipose other than the white and the brown – the brite adipose tissue, which shares certain overlapping features of the white and brown. The hypothesis here is that the expanding white fat in obesity is not accompanied by a corresponding increase in blood flow – thus resulting in areas of relative hypoxia. Hypoxia in adipocytes influences the synthesis of the key hormones – leptin and adiponectin, which influence feeding behaviour, as well as the inflammation related adipokines – IL-6, MIF, VEGF, SAA and MMP-2. Increased inflammation results in the conversion of adipocytes from a 'healthy' to an 'unhealthy' condition – leading to adipocyte dysfunction and insulin resistance.

Different aspects of energy metabolism and control of food intake are also covered in this volume. Hardie has delineated the classical role of AMPK in maintaining energy homeostasis. AMPK is an interesting molecule – it is well preserved in eukaryotic cells and its ancestral role appears to be in the switching from glycolytic metabolism in rapid cell growth, to the oxidative metabolism in quiescent or slow-growing cells. In humans, it appears to play a key role in regulating whole-body energy balance, especially the control of feeding behaviour. The possibility of two commonly used drugs in the treatment of type-2 diabetes and CVD – metformin and aspirin – acting through the activation of AMPK is also discussed. Hayes *et al.* have focused on the crosstalk between the GI tract, the pancreas and the brain in the control of food intake. This is an area of interest both from the pharmaceutical as well as nutritional point of view, since the first step in the battle against the bulge has to be at the level of control of food intake. This review describes the complex overlapping pathways of three anorexigenic peptides – GLP-1, GIP and amylin. GLP-1 and GIP are incretins, which are secreted by the enteroendocrine 'L', and 'K' cells, and which induce insulin secretion by pancreatic b-cells. On the other hand, amylin is co-secreted by the pancreatic beta cells along with insulin, and acts by suppressing food intake by delaying gastric emptying. Recent findings that GLP-1 and amylin act on the mesolimbic reward system to control energy balance are exciting, especially since this model is also applicable to other diseases such as drug addiction and depression. These peptides are therefore likely to be good pharmacological targets to combat diseases linked to dysfunctions in perception of reward and pleasure. Waterland has given a novel twist to the problem of obesity, by adding the role of epigenetics and/or developmental programming in the control of food intake and energy expenditure. In the ongoing debate as to which component is more important in the control of obesity – food intake versus energy expenditure – many more studies have focused on the former rather than the latter. Recent animal studies, however show that epigenetic mechanisms are involved in an individual's propensity for physical activity[4,5]. Rapid improvements in technology have increased our understanding of role of epigenetic modifications on cellular differentiation. Although much more work is needed in this area, the idea that epigenetic mechanisms are involved in promoting obesity in our current environment of food surfeit is attractive, especially since it offers an additional route for pharmacological manipulation of food intake.

The fight against obesity in countries like USA has mainly focused on reducing intake of fat, especially saturated fats. This has however led to an increase in the consumption of refined sugars and processed food – leading to the 'American paradox' of increasing obesity in spite of a decreasing fat intake. Pepino *et al.* have elucidated the role of the fatty acid transport receptor (CD36) in different aspects such as taste perception, fat intake, absorption and utilization by muscle and adipose. Although at present human perception of taste does not include fat (the five taste qualities are sweet, sour, bitter, salty and umami), the role of CD36 as a 'taste receptor for fatty acids' has been proposed on the basis of growing molecular evidence. Together with its role in various aspects of fatty acid signalling such as FA-induced gut peptide secretion, hepatic VLDL output and the activation of mitochondrial FA oxidation by muscle cells, the evidence for a key metabolic role of CD36 is strong. This may eventually serve as another novel target in the fight against obesity. Apart from the amount of fat consumed, the time of day when fat is consumed may also play a role in absorption and storage of fat. Hussain discusses the role of clock genes (histone acetyltransferases) in the regulation of intestinal lipid absorption. Disruptions in circadian rhythm due to modern lifestyles can deleteriously affect intestinal activity, thus increasing the risk of obesity and associated disorders.