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**The Guide to the Galaxy.** N. Henbest and H. Couper. Cambridge University Press, Cambridge. 1994. pp. 265. Price: £35/\$49.95 (hardbound); £17.95/\$24.95 (paperback).

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The last two decades have seen great advances in astronomical colour photography and in computer-generated images of data obtained at all wavelengths from both ground-based and space observatories. These made possible the appearance of 'picture books' in astronomy, of which there have been several in recent years. Apart from adorning coffee tables, which they do very well, such publications serve to convey to non-astronomers some idea of the great beauty there is in the heavens albeit inaccessible to the unaided eye. They also transmit some of the excitement surely felt by the astronomers in the difficult and time-consuming process of creating such images. Even more useful is the role that such books can play in arousing the interest of the young, if not in pursuing a career in astronomy, at least to learn of some of its wonders. The book under review has gone much further and could well become a Bible for the amateur astronomer who really wants to know what he or she is looking at whether through a small telescope, or binoculars, or just gazing at the night sky.

A short description of the book on the flyleaf reads:

'Nigel Henbest and Heather Couper take us on a personal tour of the Milky Way in this delightful guide to our home Galaxy. This book is written in non-technical language, for the general reader and the amateur astronomer. The lucid text is supported by a dazzling portfolio of colour photographs of stars, star clusters and gas clouds in the Milky Way. Specially created maps locate the hundreds of tourist spots visited in this journey through space.'

The guide introduces the nature and structure of our Galaxy as a whole. All types of objects that it contains are then described. These include mysterious black holes, the giant globular clusters of stars, every kind of star, regions of star formation, exploding stars and their remnants and the enigmatic objects at the galactic centre, as well as the giant halo surrounding the Galaxy.'

That is accurate as far as it goes, but there is more to the book than that. On

the very first page the authors call their effort 'a celebration of the first clear, panspectral view of our own star-city . . . , a book that could not have been written until now'. Putting together what we have seen through all the astronomical windows from radio to gamma rays, the authors succeed in presenting a 'holistic' picture of our Galaxy illustrated with maps that really 'could not have been drawn up even a few years ago'.

Scattered all through the book, and particularly in the early chapters, are engaging accounts of how certain profound discoveries and advances came to be made by the great names in the history of astronomy. A score of portraits/photographs of particular individuals starting with Galileo adds to the character of the book, much credit for which must surely go to Michael Marten, the picture editor.

The word 'Guide' in the title of the book is serious. The book is aimed at the genuinely interested visitor to the Galaxy and not the kind of tourist that would like to do the Taj Mahal in ten minutes and get back to the hotel. Adopting a geographical approach the authors lead the reader firmly by the hand through the highways and byways of our Milky Way system and keep feeding more information than any intelligent lay reader could ever absorb in one go. The maps, which are brightly coloured, are innovations and contain a lot of information obtained from a variety of sources, much of it in very recent years. There are a great number of large boxes which I found somewhat distracting at first; in retrospect, however, I feel that the number of topics covered could not have been handled otherwise. Indeed, I find it amazing how much astrophysical knowledge has been touched upon as and when relevant to whatever object in the Galaxy or phenomenon in the sky was being described.

Everything said above could well be called praise. Is there any criticism I have of this fine book? Almost nothing as far as the content is concerned, but there were a few places where the choice of words grated a bit. An example of such infelicity is (p. 125): 'Determined to punish Onon's chutzpah, Hera . . . .'. Something else which appeared more than once is, . . . star X or black hole Y or whatever weighing 'in at' so many Suns, pp. 205, 245, etc. Astronomical objects are not boxers or jockeys and the authors could

please remove the prepositions in future editions.

To sum up, *The Guide to the Galaxy* is a must for the serious amateur, a worthwhile acquisition for any scientific library and even for the professional astronomer, a source of information outside one's own area of specialization.

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**Crustal Evolution of Singhbhum – North Orissa, Eastern India.** A. K. Saha. Memoir 27, Geological Society of India, Bangalore. 1994. pp. xii + 341. Price: Rs. 350 00; \$50.

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The Precambrian terrain of Bihar–Orissa has attracted the attention of Indian geologists for more than a century, probably because of the presence of rich mineral deposits. The work of Dunn<sup>1,2</sup>, Jones<sup>3</sup>, Krishnan<sup>4</sup> and Dunn and Dey<sup>5</sup> laid down the basic framework of the geology of this region. Since the middle part of this century, there has been a spurt of research activity on structural, petrological, geochemical and geochronological aspects and the new work has greatly enriched our knowledge on this important segment of the Indian shield. Saha and his group have been in the forefront of this modern research and several of our current notions stem from their work. Saha has drawn on his vast experience in writing this monograph on the geology of Singhbhum–North Orissa, which would remain a standard work of reference for many years to come. In a book of this type the author's own perceptions are bound to come out strongly in the writing, though Saha has made conscious effort to refer to opposing viewpoints. As the title of the book indicates, he has attempted to integrate the information coming from different lines of study to build a model of Precambrian crustal evolution of this terrain.

Chapter 1 places the Singhbhum region in the perspective of the Indian shield by highlighting the salient points about the evolutionary history of the different Precambrian provinces. No mention is, however, made about the Precambrian sedimentary basins, e.g.

the Vindhya and the Cuddapahs. A brief summary of the current status of our knowledge on the Singhbhum–North Orissa region in Chapter 2 is followed by the chapter describing the regional structural framework of the terrain. The work of R. K. Verma and his coworkers on the gravity field is summarized. Upper crustal structures interpreted from the gravity data are described. The thermal model for the formation of the West Singhbhum Iron Ore Basin is discussed in some detail. However, one of the major tectonic problems of this region, namely the structural relations between the North Singhbhum fold belt and the Singhbhum Granite Complex and the Iron Ore Basins, is not thoroughly discussed. It is stated that the Archaean nucleus subducted southward below the Granulite Belt, but no firm supporting evidence is offered, nor is there any attempt to explore how this southward subduction fits with the supposed northward subduction along the northern boundary. A convincing demonstration of the subduction of an Archaean (>3.2 Ga) cratonic nucleus below another plate during the Proterozoic would have been of great geodynamic interest.

Chapters 4–8 describe the different units in the Archaean craton: Older Metamorphic Group and Older Metamorphic Tonalitic Gneiss, Iron Ore Group, Singhbhum Granite, Bonai Granite, Nilgiri Granite, and Pallahara Gneiss. Saha and his group have carried out sustained work on these rocks and the chapters contain a wealth of information, particularly on field relations, petrography and geochemistry. The structural geometries in the different units are described and the evidences for inferring the relative ages of the supracrustal and granitoid rocks are cogently discussed. Modal and chemical (major, trace and REE) analyses of the different rock types provide valuable documentation. Interesting new results on the petrogenesis of the granitic rocks are presented. These are based on petrogenetic modelling from geochemical data, a novel exercise in Indian Precambrian geology. Such studies provide important constraints in building up tectonic models.

Chapter 9 summarizes the available data on the geochronology of these

rocks. The author has emphasized the importance of multiple methods of dating. However, for a region of such complexity the dates are too few and the picture that emerges is rather confusing. Some of the dates are interpreted as metamorphic dates, others as ages of crystallization while still others are thought to represent partially reset ages. However, no clear rationale for such deductions are presented. It is disquieting that Saha is adhering to the idea of 3.8 Ga old OMTG despite the fact that Basu and his coworkers could not reproduce their earlier isochron. In a recent publication Sharma *et al.*<sup>6</sup>, have repudiated their earlier conclusion and have upheld the *ca.* 3.3 Ga age of the OMTG. It is fairly certain that the OMTG is at least 3.3 Ga old and during the next one billion years there were several episodes of granitic activity. But much more work needs to be done to discriminate geochronologically all the different events: the 3.8 Ga emplacement age of OMTG is still to be established convincingly.

Chapters 11–14 deal with the Proterozoic fold belt of North Singhbhum. The broad structural features and metamorphic pattern are described, though no reference is made to some new contributions on structure and metamorphism in the belt, for example, Bhattacharya<sup>7</sup>, Bhattacharya *et al.*<sup>8</sup>, Chakraborty and Sen<sup>9</sup>, Mukhopadhyay *et al.*<sup>10</sup>, and Roy<sup>11</sup>. The Dalma volcanic belt is described as a synclinorium though there is no structural evidence in favour of this idea nor are there any data to suggest that the supracrustal sequences north and south of the volcanic belt are equivalent. A welcome inclusion is the sedimentary facies analysis of a part of the Chaibasa Formation. There is an excellent treatment on the geochemistry of the volcanic rocks, particularly the Dalma and the Dhanjoris. The compilation of the chemical parameters of the different metabasic suites, the granitoid rocks and the other intrusive rocks would be useful for all earth scientists interested in this belt. Petrogenesis of the Mayurbhanj Granite has been discussed in some detail using mass balance calculations.

Chapter 17 describes the major thrust zones in the region, the most important of which is the Singhbhum shear zone. The author has preferred to use the term

Copper Belt Thrust, though it is a ductile shear zone several kilometers wide and no discrete thrust surface can be mapped. The thrust is stated to grade into a high-angle gravity fault in the west (p. 177), but there is no structural indication of gravity faulting. There are scanty structural data on the Northern Shear Zone and even less on the Sukinda Thrust Zone.

The author's synthesis on the Precambrian crustal evolution of the Singhbhum–North Orissa region is summarized in Chapter 19. It is implicit from his discussion that the model is not tightly constrained. There are many gaps in our knowledge, some of which the author has highlighted; these need to be bridged before we arrive at a fuller understanding of this part of the Indian Shield.

A large number of well-drafted maps and diagrams supplementing the text have added to the value of this monograph. Unfortunately, many of the localities referred to are not marked on the geological map (Figure 2.3) nor are their latitudes–longitudes given. Some mistakes have been noticed in the list of references.

The monograph presents a fairly balanced view of the existing state of our knowledge on the different aspects of the geology of this terrain. The wealth of petrological and geochemical data culled from different sources and the exhaustive bibliography are the main attractions of this volume. It should find a place in the bookshelf of all serious students of Precambrian geology.

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**Annual Review of Phytopathology, 1994.** R. James Cook (ed.), Annual Reviews Inc., 4139 El Camino Way, Palo Alto, California 94303-0897, USA. Vol. 32. 639 pp. Price: USA \$49, elsewhere \$54.

As a professional plant pathologist, the reviewer himself has been an avid and regular reader of this review series and has all the volumes in his own library. This series has been popular with plant pathologists all over the world because of its wide coverage of topics, ranging from historical to those covering the cutting edges of the science of plant pathology. Many topics chosen are of international interest. Volume 32 once again follows the rich tradition.

The volume has 30 review topics classified into 13 groups: Prefatory chapter; Pioneer leaders; Diagnosis and appraisal of plant disease; Pathogens: Fungi; Pathogens: Bacteria; Pathogens: Nematodes; Pathogens: Viruses; Physiology, morphology, anatomy, biochemistry and molecular biology of host-pathogen interactions; Epidemiology and influence of climate; Toxicants and chemical control; Biological and culture control; and Special topics.

The first two groups – Prefatory chapter and Pioneer leaders – relate to historical aspects. There is only one article under the first group written by Dr George A. Zentmeyer about his own 55-year innings as a professional pathologist. It is very readable and particularly useful to young plant pathologists, who could learn from the varied, exciting experiences narrated by the author. The second group has three articles on

three pioneers in the field of plant pathology – Harry Marshall Ward, Tom Goodey and Frederick Charles Bawden – all from the United Kingdom, whose work has had tremendous impact internationally. There is an interesting account of how the rust disease of coffee wiped out the crop from Sri Lanka and was replaced by tea towards the end of the last century, despite efforts by experts like Harry Marshall Ward. Tom Goodey is today considered the father of nematology in Britain. Bawden's contribution to the field of virology in 1930s has been a landmark; he and his colleague Pirie provided for the first time evidence that viruses are nucleoproteins. All the three articles make very interesting reading.

The third group, Diagnosis and appraisal of plant disease, contains three articles. The first one deals with ash (*Fraxinus* spp.) yellows disease, the second with dogwood (*Cornus* spp.) anthracnose, and the third with the so-called beech (*Fagus* spp.) bark disease. The three articles will be of interest mostly to the scientists of North America and possibly Europe and other temperate regions.

The next four groups cover topics related to fungi, bacteria, nematodes and viruses as pathogens. There is a very interesting review on the presence of double-stranded ribonucleic acids (dsRNA) in the rust fungi. The presence of dsRNA seems to be a normal feature of most rust fungi even though these fungi continue to be damaging pathogens of crop plants. In the next few years the role of dsRNA in the pathogenicity of rust fungi should become clear. Another article describes the molecular biology approach that might help in improving our taxonomic understanding of *Rhizoctonia*. There is an excellent review on our status of knowledge regarding the secretion of extracellular virulence factors by phytopathogenic bacteria. Another review worth reading is the one by Sijmons *et al.* highlighting the recent advances made in the areas of parasitic strategies and host cell responses. Again, modern molecular biology techniques have helped and will further help in improving our under

standing of the host–root nematode interactions. Modern molecular biology techniques have contributed in rapidly improving our understanding of plant viruses. There is an interesting review on the evolution of closteroviruses, which are known for having by far the largest positive-strand RNA genomes among RNA viruses of plants. Another excellent review covers the topic of plant viral RNA synthesis in cell-free systems. Though our knowledge of initial stages of virus multiplication in plant hosts has increased substantially in the last two decades, it is far from being complete. Another review discusses our recently gained knowledge of RNA–RNA recombinations and evolution in virus-infected plants. Seed transmission of viruses concerns plant pathologists all over the world and this volume has an excellent review discussing the work mainly done in the last 25 years. Another review covers our knowledge of the role of plasmodesmata in viral transport in plants. Though annual reviews are normally edited very well, it is difficult to understand how the editors made the mistake of including the review on the molecular systemics and population biology of *Rhizoctonia*, a fungus, in the group of articles on bacteria.

In the remaining groups of reviews, the readers will find articles dealing with topics like (i) early events in the activation of plant defence response, (ii) social and political implications of managing plant diseases with decreased availability of fungicides in the USA and Europe, and (iii) the role of plant clinics in disease diagnosis and education in North America.

The volume includes a thoroughly prepared subject index. The reviewer is once again convinced about the outstanding service that the volumes of the *Annual Review of Phytopathology* provide to plant pathologists of the world.

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