Book Reviews

Stellar Atmospheres

The A-Stars. Problems and Perspectives. SIDNEY C. WOLFF. Centre National de la Recherche Scientifique, Paris, and NASA Scientific and Technical Information Branch, Washington, D.C., 1983 (available from Stuart Jordan, Goddard Space Flight Center, Greenbelt, Md. 20771). xlvi, 211 pp., illus. Cloth. Monograph Series on Nonthermal Phenomena in Stellar Atmospheres. NASA SP-463.

The past two decades have seen the discovery of such bizarre and intriguing objects as quasars, pulsars, and x-ray sources, and there has been a tendency to dismiss stars as a solved problem. After the wave of discovery came the application of the new observing techniques to old problems. Not surprisingly, this enlarged perspective quickly showed that stars too have many aspects that are not understood at all, with the result that stellar studies are now enjoying a vigorous renaissance. Sidney Wolff's excellent monograph is one example of this revitalization.

The traditional picture of a stellar atmosphere is built on the primacy of temperature and pressure. New observations, however, have shown that the hot stars exhibit expanding atmospheres driven by radiation hydrodynamics. The cool stars, such as the sun, display hot chromospheres and coronas maintained by mechanical and magnetic energy generated in the subsurface convection zone. For both hot and cool stars nonthermal processes are of marginal significance in the photospheric layers most directly observable in the classical visible spectral region, but other spectral regions show that they become dominant higher in the atmosphere.

The A stars have intermediate temperatures, which places them in the transition region between these two extremes. Occupying the middle ground, the A stars should be free of extreme nonthermal influences, and consequently they should conform very closely to the classical thermal models. As Wolff's book shows in detail, this is far from the case. Freed of the dominance of extensive mass loss and convection zones, the A stars can exhibit directly in their photospheric layers other influences such as intense, localized magnetic fields, the effects of tidal interactions between close stellar companions, incipient convection, diffusive element separation, and radial and nonradial pulsation. As a consequence, many of the A stars display striking abnormalities on their surfaces. In extreme cases, they exhibit kilogauss magnetic fields and patches in which cosmically rare elements, such as europium, are 100,000 times more abundant than on the sun.

Wolff surveys our current knowledge of the A stars by devoting a generous chapter, complete with extensive references, to each of the major subjects: normal stars, magnetic stars, metallic-line stars, variable stars, supergiants, peculiar B stars, and model atmospheres. Though referring to the historical development of each subject, she aims to paint a coherent picture of our present understanding based on the insight gained from traditional and modern studies. Her treatment is non-mathematical throughout, making the concepts and problems readily accessible, although she does assume a thorough knowledge of astronomy.

This is an important book at an important time. Coming at the end of the first generation of space astronomy, it is the synthesis of what is known about a pivotal group of stars by a leader in their study. The outstanding problems are critically and clearly presented both in the discussions of the individual topics and in a final chapter; graduate students will certainly benefit from having the issues so clearly displayed. With the increasing availability of new detectors and with the second generation of space astronomy about to begin with the launch of the Space Telescope, this book should have a major influence on the direction of stellar studies for the next decade.

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Morphology of Cortical Cells

Cerebral Cortex. Vol. 1, Cellular Components of the Cerebral Cortex. ALAN PETERS and EDWARD G. JONES, Eds. Plenum, New York, 1984. xiv, 565 pp., illus. $69.50.

One hundred years ago the Golgi stain was first used by Golgi and by Ramón y Cajal to study the cellular constituents of the cerebral cortex. Since that time there has been a more or less steady stream of research using this technique to study cerebral cortex in various cortical areas and species. In the book under review this body of work is brought together in a single, coherent account. The book comes at an opportune time, since there is now considerable interest in understanding the cortical circuit and the functional architecture of the cortex. Many of the advances currently being made rest on the classical Golgi studies. Because the Golgi literature is so extensive, it is useful to have a single comprehensive account of cortical cellular morphology and synaptology.

The book begins with a chapter on the history of cortical cytology by Jones. Cytoarchitectonics, the division of the cortex into different areas based on the patterns of cellular lamination, is dealt with in chapters by Kemper and Galaburda and by Braak. Most of the chapters in the book are devoted to individual cortical cell types—pyramidal (Feldman), nonpyrimidal (Fairén, De Felipe, and Regidor), spiny stellate (Lund), basket (Jones and Hendry), double bouquet (Somogyi and Cowey), chandelier (Peters), bipolar (Peters), neurogliaform (Jones), layer 1 (Marin-Padilla), and layer 6 (Tömböl) cells.

In addition to describing the light microscopic appearance of the various cell types, the book summarizes the results of ultrastructural studies, which have described the synaptic patterns of input and the synapses formed by different cell types. Owing to the development of techniques enabling one to combine Golgi and electron microscopy, the Golgi technique has experienced something of a renaissance over the last decade. Studies using the technique have demonstrated an extraordinary specificity in the pattern of cortical connections. For example, one cell type, the chandelier cell, has been shown by Somogyi to synapse exclusively with the axon initial segments of pyramidal cells, providing a strong control, probably inhibitory, over the cortical output. Though the Golgi technique still suffers from a number of limitations, one expects that more modern techniques will soon add new in-