Greek independence

Michael Rowan-Robinson

Cosmology: The Structure and Evolution of the Universe. By G. Contopoulos and D. Kotsakis. Translated by M. Petrou and P. L. Palmer. *Springer-Verlag: 1987. Pp. 235. Pbk DM58, £21, $32.50.*
Discovering the Universe. By William J. Kaufmann III. *W. H. Freeman: 1987. Pp. 385. Pbk. $24.95, £24.95.*

COSMOLOGY has changed dramatically in the past decade. The advent of Grand Unified Theories, inflation, axions, photinos and other -inos, strings and superstrings, has turned the subject from an impressive synthesis of general relativistic models of the Universe with observational evidence for a hot Big Bang, into a hot-bed of wild speculation about the particle physics of the very early Universe.

As it will take some time for these ideas to settle down, and probably even longer to find any observational evidence for them, this is a difficult moment to be bringing out a new book on cosmology. Contopoulos and Kotsakis's *Cosmology* is a translation of a revised and updated version of their 1982 book in Greek. It survives the pitfalls of this fashion-conscious era by pursuing a rigorously independent-minded attitude to contemporary ideas. The level is introductory undergraduate, with rather little mathematics but a strong physical basis.

The authors have divided their material into three parts, "Observations", "Theory" and "Fundamental Problems". The first part is adequate, though somewhat derivative of other texts. It has not been updated as well as the rest of the book and is especially bad on the late stages of stellar evolution. Stars are said to evolve to black holes if they are more than three solar masses: planetary nebulae are created "by an explosive release of matter from the central star".

The second part, on general relativity and cosmology, provides a good account of modern theoretical ideas, from rotating black holes to Grand Unified Theories and inflation. The third part is an excellent and profound discussion of the fundamental problems of cosmology: the universality of the laws of nature, the uncertainty principle, causality, the origin of time and time's arrow, teleology, the anthropic principle, metaphysics. For anyone with a philosophical turn of mind this section alone makes the book essential reading. And it gives me great pleasure to come across scientists who can write, in discussing Socratic scepticism:

> the basic problems of man are the meaning of life and death. Such problems can not be solved either with unjustified optimism or with an arrogant approach. The inadequacy of naive agnosticism becomes clear in matters like this. Such problems give us a glimpse of new aspects of reality that are not less important than the laws of physics.

Congratulations are due not only to the authors, but also to the translators, Maria Petrou and Phil Palmer, for bringing us an English edition of this original book.

Discovering the Universe by William Kaufmann is a condensation of his earlier *Universe* (which, as it happens, has just appeared in a second edition), to provide a one-term introductory course on astronomy for non-scientists. One has to admire the professionalism of the illustrations, which have been brought up to date to include some of the IRAS images. However the book lacks both the soul and the accuracy of *Cosmology*. Life is too short to spend much time with someone who writes of black holes: "Gravity around one of these massive stellar corpses is so strong that it punches a hole in the fabric of space". □

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Distant demands

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Introduction to the Physics and Techniques of Remote Sensing. By Charles Elachi. *Wiley:1987. Pp.413. $42.50, £46.95.*
Satellite Remote Sensing: An Introduction. By Ray Harris. *Routledge & Kegan Paul:1987. Pp.220. Hbk £22.50, $62.50; pbk £10.95, $27.50*

REMOTE sensing draws together specialists from many fields. Physicists provide the theoretical basis for the interpretation of data derived from sensors carried by aircraft and satellites, while electrical engineers are concerned with the practical aspects of instrument manufacture. Oceanographers, geologists, agronomists, ecologists, meteorologists and climatologists all interpret and use remotely sensed data, while mathematicians, statisticians and computer scientists are involved with techniques of data processing.

The 'remote sensing specialist' is thus a mythical creature; the discipline is essentially collaborative rather than exclusive. Just as remote-sensing techniques employ electromagnetic wavelengths ranging from centimetres to nanometres, so specialists in the subject range across a broad spectrum of interests and abilities. The two books under review address different ends of this spectrum.

Elachi envisages that his readers will have attained a junior level in physics, specifically that they will have taken introductory courses on electromagnetic and quantum theory. His book aims to provide the scientific and engineering background for students and researchers interested in the basic physics of wave – matter interactions, data collection techniques and applications of remote sensing. Coverage of physical principles and of sensor technology is excellent, although some examples are limited and there is no discussion of data-processing techniques.

In the first part of the book, Elachi covers basic physical principles, followed by studies of the use of remote sensing in solid- (including ocean-) surface studies. Five chapters in the second part are devoted to atmospheric and ionospheric sensing, using examples from several planets. The quality of the black-and-white illustrations is surprisingly low, although in partial compensation there is a 16-page colour section. In the book of this nature, which is likely to be widely used for reference, a comprehensive index is essential; unfortunately, that provided by Elachi runs to only four pages, which is quite inadequate.

Harris's book is aimed not at the physical scientist or engineer but at undergraduate-level environmental scientists, particularly geographers, geologists and climatologists. The first part contains a sound coverage of physical principles, sensors and platforms, while the second is devoted to a number of examples of applications drawn from the literature.

The level of presentation is considerably lower than Elachi's and reflects Harris's experience as a teacher. His style of writing is clear and enjoyable, and this book should be essential reading for first- and second-year undergraduates who intend to proceed to an advanced remote-sensing course. Like Elachi, Harris provides only a minimal index, and although the quality of the illustrations is good, the benefit of the two-page colour section is dubious.

Neither author considers remote sensing within the broader context of geographical information systems, although it is clear that the synthesis of digital spatial datasets using advanced information-handling techniques will be the theme for the 1990s. But in terms of their own specific aims, both are successful. Elachi has provided a basic reference volume which will be perused, rather than read from cover to cover, by researchers. Harris's book, on the other hand, is a gentle introduction to an exciting, fast-changing and essentially multidisciplinary field. □

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