

there should be more discussion of more recent or more advanced areas in order to whet the reader's appetite. One need only give a taste. Often a single word would do. The author has tried to do this as, for example, in the section on the Dirac equation (itself a formalistic titbit) where the exotic words "spinor calculus" appear. More of this is needed.

There would be no sense in discussing omissions in what is an admittedly selective text, but I think it regrettable that nowhere do the words group theory occur. The ideas can hardly be classed as recent or difficult and a few words only would have served to link vectors, tensors, spinors and angular momentum in a significant way and could have provided a tempting foretaste of symmetries and the classification of elementary particles.

Nevertheless within the limits set by the author this is a really excellent text and can be highly recommended either for teaching or self study. The style is lucid and the various sections are nicely arranged.

Finally, one error of detail caught my eye: the "four" in the four dimensional Dirac matrices is not the same "four" that occurs in the four dimensions of space-time, as the author seems to imply on p. 213.

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SATELLITE PROBLEMS

Principles of Celestial Mechanics

By Philip M. Fitzpatrick. Pp. xvii+405. (Academic: New York and London, June 1970.) 119s.

THE title of this book does not adequately indicate its contents: although Professor Fitzpatrick certainly expounds the principles of celestial mechanics, his principal concern is with the problems of artificial satellites and the treatment is directed to that end. The first six chapters are chiefly occupied with the fundamentals, two-body orbits, expansions in elliptic motion and systems of coordinates. Chapters seven to eleven cover Lagrange's planetary equations, Hamiltonian functions and Hamilton-Jacobi theory. In chapter twelve gravitational potential is discussed, and in chapter thirteen the drag and gravitational perturbations of Earth-satellite orbits. The final chapter is really quite separate, being an account of the rotational motion of an artificial satellite.

The early sections of the book provide a sound introduction to the various concepts and problems of celestial mechanics, and the bias towards space will be welcomed by the majority of students of the subject who will make their careers in the space industry rather than in pure astronomy. Occasionally the mathematical treatment is a little laboured, or even clumsy, but again many students may like an intelligible step-by-step approach better than smart but mystifying tricks. The part of chapter twelve on the Earth and its gravity field is not entirely satisfactory: there are several misleading remarks, particularly on page 287, where it is implied that satellite orbital theory has not been developed for high-order harmonics. In fact there have been many generalized treatments covering all harmonics such as those of Groves (1960) and Kaula (1961), and also explicit formulae for the variations in orbital elements, such as those of Merson (1963). Chapter thirteen also has faults: the lengthy discussion of atmospheric drag effects, although correct as far as it goes, remains entangled in academic complications instead of exposing the practical problems. But the final chapter is particularly thorough and is a valuable addition to the material.

All in all, this is a competent and useful university textbook. Although it has defects, they are outweighed by the virtues of its clear and straightforward exposition.

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Short Notices

The Upper Thames. By J. R. L. Anderson. (The Regions of Britain.) Pp. 301+40 plates. (Eyre and Spottiswoode: London, July 1970.) 75s.

For a river which has been associated with human settlements for as long as a quarter of a million years or more, it seems a little strange that the exact origin of the River Thames is still disputed. The author of this readable and informative book seems, however, to favour a spot in a clump of trees at Trewsbury Mead, near Cirencester, and so does the Thames Conservancy, for it has appropriately marked the place with a statue of Old Father Thames which once adorned the Crystal Palace in London. From Trewsbury Mead, the river wanders, with a few unexpected twists, to London and the sea. Mr Anderson, however, has restricted his book to the Thames's upper tracts, well westward of London, in a region bounded by the hill country of its source to the west, Banbury in the north, Thame in the east, and Newbury and Kennet in the south. The emphasis is on the history of human settlements in this remarkably unified region, but the author also describes the character of today's towns and villages. The book is supplied with a splendid set of photographs, several maps, a gazetteer, and an itinerary for a river cruise. It is a delight to read.

Collins Guide to Tree Planting and Cultivation. By H. L. Edlin. Pp. 349+59 illustrations. (Collins: London, September 1970.) 42s.

IF you have a drooping oak which looks near to collapse it may be time to call in the tree surgeon to bolster it up using his armoury of antiseptic creosote, cables, saws and hatchets. If, however, there is a well established stump to be removed he may have to bring his explosives and stump gobbler. Although H. L. Edlin advises amateurs against attempting any but the simplest surgery, he explains the techniques in this thoroughgoing guide. But this is not just a book for amateurs; it is packed with every sort of information for tree planters, whether operating on a tiny scale in the back garden, or on a large scale in the forest. Half the book is taken up with a catalogue telling which trees should be planted where and when, and how they should be tended thereafter. If this advice is heeded, many trees might be saved from certain death as a result of being planted in unsuitable conditions.

Geological Highlights of the West Country: A Nature Conservancy Handbook. By W. A. Macfadyen, with contributions by A. W. G. Kingsbury. Pp. 296. (Butterworth: London, July 1970.) 60s.

MOTORISTS with a bent towards geology who are heading for the south-western counties of Britain may like to tuck this new handbook into a handy pocket in their motor-cars. By planning their route to take in some of more interesting geological features to be found in Somerset, Gloucester, Dorset, Devon and Cornwall, they may also find they have missed the traffic jams. This guide describes ninety interesting sites, with their special interests indicated, and several caves, some noted for their association with Palaeolithic man. Exact locations are given, and Dr Macfadyen has also included maps of each county with the described sites marked on them so as to make the planning of a geological itinerary all the easier. There are also plenty of helpful map sections and stratigraphic successions, but the six photographs are poor.