Quantum mechanics for chemists

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Orbitals and Symmetry. By D. S. Urch. Pp.256. (Macmillan: London, 1979.) Pbk £5.95. *Chemical Structure and Bonding.* By R. L. DeKock and H. B. Gray. Pp.491. (Benjamin/Cummings/Addison-Wesley: 1980.) $21.95, £9.95.

THE flood of textbooks on quantum mechanics for chemists puts one in mind of that wilderness of monkeys which are supposed in time to produce the works of Shakespeare — not because the results are similar but because we are prompted to ask: why bother? We already have textbooks at every level which give clear, sound coverage of the principles of the subject. It is not enough for a new book to do the same; it must provide new insights, take account of advances in experimental and theoretical technique, or treat some aspect of the subject substantially better than before.

DeKock and Gray's angle is to relate the discussion of bonding and structure to the results of photoelectron spectroscopy. However, the book begins with the Bohr theory (what other superannuated theory has such resilience that it is still being taught 50 years after it was superseded?) and there is much emphasis on Lewis octets and valence-shell–electron-pair repulsions. Valence-bond theory is discussed at length, and molecular-orbital theory takes a bad second place. For example, a superficial and rather inaccurate account of a simple Walsh diagram is followed by the statement that "predicting molecular shape using molecular-orbital theory . . . is much more tedious than the valence-shell electron-pair repulsion method". This attitude to molecular orbital theory is curious in view of the detailed account of the relationship between photoelectron spectroscopy and bonding, which is the one useful feature of the book and which is done rather well — indeed, at a level which is noticeably higher than the rest of the book.

Urch's book is a reprint of a volume originally published in 1970 in the abortive Penguin Library of Physical Sciences, and although the preface implies some revision of the text, this version looks virtually identical to the original. Some errors have been corrected, but others have not, and the bibliography remains unchanged. My main criticism is that there is not enough attention given to the business of showing the student how to do the calculations. For example, the representation matrices for a set of d orbitals in the octahedral group (a notorious source of difficulty) are simply written down without comment. More importantly, the procedure for obtaining symmetry orbitals (the projection formula) is never mentioned, and symmetry orbitals are blandly produced, not merely without explanation but without any apparent appreciation that the reader might not see where they came from. The text could quite easily have been revised to correct these failings, but the opportunity has been lost and a potentially useful account remains incomplete. □

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Environmental chemistry, theory and practice

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Environmental Chemistry: The Earth–Air–Water Factory. By R. W. Raiswell *et al.* Pp.184. (Edward Arnold/Halsted: 1980.) Flexi £4.95, $14.95. *Experiments in Environmental Chemistry: A Laboratory Manual.* By P. D. Vowles and D. W. Connell. Pp.102. (Pergamon: 1980.) Hbk £10, $23; pbk £4.50, $9.95.

THE teaching of environmental chemistry as a component of environmental science, ecology and chemistry courses at university level has developed and expanded considerably over recent years, largely in the absence of adequate textbooks. A number of books have appeared recently, but there still exists a need for sound teaching texts.

Environmental Chemistry: The Earth–Air–Water Factory provides a broad introduction to the field written mainly from the viewpoint of the geochemist. The factory analogy is used apparently in an attempt to provide a better integration of subject matter and to encourage the student's appreciation of the strong links between the various areas of environmental chemistry. The book assumes rather little chemical background and even includes a glossary of chemical terms. It is written with clarity by authors acknowledged as authorities in their respective fields. The great detraction, however, is that no text of 154 pages (excluding glossary and index) can more than touch the surface of this vast subject area. It is difficult to see the book being used for university teaching other than at the most basic level as it will satisfy neither the lecturer's aims nor the student's curiosity.

Experiments in Environmental Chemistry: A Laboratory Manual concentrates upon pollution and ecological chemistry, the majority of experiments being analytical in nature. The presentation is similar to that used in laboratory manuals in universities, with an introductory section followed by experimental instructions and then guidance for writing up. The factual material is occasionally unreliable, although in some instances this arises from typographical errors. The experiments require a fair variety of analytical equipment which may be beyond the resources of some teaching laboratories, and some demand rather problematic starting materials — human milk; butterfly larvae and plants from the Southern Hemisphere; replicate 0.2 g samples of household paint removed from surfaces, for example. The book contains some excellent ideas for experiments but is more likely to find use as inspiration for the teacher than as a laboratory manual used directly by the student. □

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Environmental what?

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Ecology and Environmental Management. By C. C. Park. Pp. 272. (Butterworths/Westview, Boulder, Colorado: 1980.) £12.50, $26.25. *Natural Resource Conservation: An Ecological Approach.* 3rd Edn. By Oliver S. Owen. Pp.883. (Macmillan, New York/Collier Macmillan, London: 1980.) £12.95, $19.95. *Introduction to Environmental Science.* By J.M. Moran, M.D. Morgan and J.H. Wiersma. Pp.658. (W.H. Freeman: 1980.) £19.95, £9.80. Instructor's guide also available.

MANY different disciplines contribute to attempts to understand the environment. The rapid development of courses in environmental sciences or studies in recent years reflects the need to look beyond geography, geology, biology or economics alone for the range of material required. However, the variety of university and college courses calling themselves "environmental" suggests widely differing views as to what are the key subject areas, concepts and techniques to which students should be addressing themselves. That there are degree courses in "environmental *science*" implies that there are those bold or unwise enough to define a distinct discipline. A more sensible and pragmatic approach is to regard the sciences concerned with the environment as a federation. They may usefully be gathered together in one department so that environmental problems may be explored from a