Nuclear magnetic resonance

NMR and the Periodic Table. Edited by Robin K. Harris and Brian E. Mann. Pp. 459. (Academic: London and New York, 1978). £35.

THE great bulk of nuclear magnetic resonance work has been done on the nuclei of hydrogen, fluorine, phosphorus, carbon, boron and nitrogen, but most elements of the Periodic Table have at least one nuclide with a magnetic moment. Although quite a lot of work on many elements has been done in a few laboratories in the past twenty years, it is only relatively recently that commercial instruments with good enough resolving power and sensitivity have encouraged their wide use. In this book the editors and an authoritative and experienced group of authors have gathered together most of the work described so far in the literature, together with some unpublished work. The commonly studied nuclei mentioned above are dealt with only briefly and most of the book is devoted to work on the rest of the Periodic Table. The result is a remarkably

comprehensive and fascinating account of an extraordinary range of chemical studies using chemical shifts, nuclear relaxation times, and scalar coupling constants.

The chapters on the various groups of elements also provide tabular data culled from the literature and presented in a convenient way which is likely to be valuable to those working or planning to work on those nuclei; and the coverage of the literature seems to be remarkably comprehensive.

There is a short account of experimental methods, and brief chapters to remind the reader about the theory of the chemical shift, nuclear spin coupling and nuclear relaxation. These are not intended for the beginner nor are they authoritative accounts, but are very useful for reference from time to time when reading other parts of the book.

Dr Harris and Dr Mann are to be congratulated on producing such a useful and interesting book and on having persuaded so many co-authors to cooperate in writing such a compendium.

Rex Richards

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Geochemical mapping

Regional Geochemical Atlas: Orkney. Compiled by the Institute of Geological Sciences. (Institute of Geological Sciences Bookshop: London, 1979.) £35. *An Introduction to the National Geochemical Data Bank.* (IGS Computer Application Report No. IGS/CAR/78/2.) Second edition. (Institute of Geological Sciences Bookshop: London, 1979.)

THE acquisition of regional geochemical data, based on the collection and analysis of stream sediment samples, had its origin in mineral exploration geochemistry. Individual mining and prospecting organisations would undertake regional geochemical surveys in order to delineate those parts of an exploration area which had the highest probability of containing mineral deposits.

The areas covered by such surveys varied from a few square kilometres to tens or even hundreds of thousands of square kilometres, and great success was achieved with the technique. The data obtained, however, seldom became widely available due to the competitive nature of the mining industry, and as a result some areas in well mineralised environments were surveyed many times. Certain areas in the Irish Republic, for example, are believed to have been surveyed five or six times.

Subsequently, further applications of regional geochemical data have been discovered. The relationship between certain human and animal ailments and the occurrence of abnormally high, or abnormally low levels of certain specific elements in the soils and vegetation of certain areas has been appreciated. The influence of the levels of many elements upon the success or failure of some crops has also been investigated. There can be little doubt that many new uses of regional geochemical data will be discovered in the future, especially if such data become freely available. The publication of the *Regional Geochemical Atlas* by the Institute of Geological Sciences will be especially welcome in this connection.

In the first instance, the atlas will cover the whole of Scotland. The atlas is not the first such publication to appear. As long ago as 1973, the Applied Geochemistry Research Group at Imperial College, London, produced its *Provisional Geochemical Atlas of Northern Ireland*; the somewhat less ambitious *Reconnaissance Base Geochemistry of Parts of the Counties Wicklow, Wexford, Kildare and Dublin* was published by The Geological Survey of Ireland in 1977; and the Applied Geochemistry Research Group published the impressive *Wolfson Geochemical Atlas of England and Wales* (Oxford University Press: Oxford) in 1978.

In the IGS atlas, the distribution of 15 elements in stream sediments is illustrated

in the same number of maps, plus another showing the distribution of uranium in stream waters. Other maps illustrate the relief, geology and mineralisation of the area, together with data collected from a smaller number of sites on the pH and conductivity of the streams themselves.

The maps, on a scale of 1:250000, were produced by automated cartographic methods which were developed jointly by the IGS and the NRTC Experimental Cartography Unit. The level of the relevant element at each sample site is illustrated graphically by the use of lines which are proportional in length to the concentration of the element in the sediment, the lines for each element being orientated in a specific direction.

This method of presentation has the advantage that the results for each sample site are clearly represented, as distinct from the smoothed 'grey-scale' approach adopted by the Imperial College group. Whether or not this manner of data presentation can be considered to be entirely successful, however, is a matter of personal opinion. The reviewer did not find it completely satisfactory, especially where several sample sites occur in close proximity, so that individual lines tend to merge into a single mass which is difficult to interpret.

The prospect of having such regional geochemical maps freely available in the future is clearly one which will increase the scope of geochemical studies. Indeed, one can imagine the time in the future when geochemical maps are regarded as being as basic a requirement as geological maps are today. Nevertheless, many areas will have been the subject of geochemical studies other than those presented in such atlases, and the need to make the data from these studies both available and accessible is also a matter that calls for attention.

The Regional Geochemical Atlas series is part of the Department of Industry's wider Regional Geochemical Reconnaissance Programme under contract to the Natural Environment Research Council. This programme includes the IGS National Geochemical Data Bank which holds data compiled in the production of the geochemical atlases, as well as regional geochemical data from other sources. The establishment of this Data Bank is also to be welcomed, as the use of a central computer for the storage and management of geochemical data could obviously lead to a more effective use of information available.

Data to be accepted initially will be related to igneous, sedimentary and metamorphic rocks, drainage samples (that is, stream sediment samples) and soils, the results for each type of material being stored separately on the basis of geographical location. The bank will be under the control of a manager, who will be responsible for maintaining a suitable level of quality of the data in the bank. Before being archived, data will also be examined by an Advisory Committee consisting of