

previous exposure to formal scattering theory up to the Lippmann-Schwinger equation. Armed with this and the rather brief exposition of  $nN$  dynamics given in the book, they can follow clear trails through the jungle of multiple scattering series (to fourth order, including nuclear excitation and anti-symmetrization), Fadeev equations, dispersion theory, optical models and Glauber approximation to confront data on elastic and inelastic nuclear scattering, knockout reactions, pion absorption and mesic atoms. The formal theoretical machinery is all there, and the precise relationship between exact solutions and approximations is quite clear.

The disappointment of the book is that, after all this effort, little qualitatively new physics emerges. This reflects on the subject, not the presentation. As yet, one does not know whether failures of calculation arise from approximations (necessary to limit computation) or from ignorance of fundamental interactions. This is a pity, since data like these potentially hold the key to understanding  $\Delta$ s in nuclei and nuclear matter at high densities (hence high Fermi levels), where a phase transition to a pion condensate may occur. □

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## Towards harmony in Polar geobotany

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*The Arctic and Antarctic: Their Division into Geobotanical Areas.* By V.D. Aleksandrova. Pp.247. (Cambridge University Press: 1980.) £15, \$34.50.

AT LAST an attempt has been made at reviewing the literature on the vegetation cover of both the Arctic and the Antarctic and also at classifying all Polar geobotanical areas from a single point of view. Such an extraordinary synthesis is the more important for coming from the eminent Soviet geobotanist, Vera Aleksandrova. One of the world's foremost authorities, she has been a leading figure in ecology for nearly three decades in the country with the lion's share of the Arctic.

Aleksandrova's contribution, now translated from Russian, should do much to bridge the gap between Soviet and other Polar ecologists. Apart from the formidable language barrier, there are fundamentally different traditions in concept and method; even the very terms are different.

Soviet geobotanists, in the traditional European mould, continue to classify vegetation as an end, a science, in itself. This book is fine testimony to the continuing preoccupation of the Soviet school of geobotany with discovering the ultimate phylogenetic ("phylocoenogenetic") hierarchy of plant communities. Western, particularly North American, ecologists largely have taken a much more pragmatic approach. Classification is a means to an end, a means of organizing the state of knowledge of vegetation.

Aleksandrova's objectives, to subdivide and classify the geobotanical areas of Polar lands and at the same time to summarize succinctly the vast amount of data on vegetation cover, have been met well. Interesting and potentially useful as her classification is, her vegetation summary is certain to prove the more valuable to

botanists generally, who until now have not had a single place to turn for such a detailed and yet generalized overview of the vegetation cover in the Soviet Arctic. Thus her bias toward greater detail and precision for Soviet territory is easily forgiven. We can be grateful that the basis did not exist for casting her study in the mould of some recondite phytosociological system of classification with its pointless nomenclature, even though she would not agree.

She divides the Arctic into the Tundra Region and Polar Desert Region. The first is further subdivided into two subregions: Arctic Tundras and Subarctic Tundras, differentiated mainly by the presence of shrubby birches (*Betula*) in the zonal associations of the latter but not the former. Both are further subdivided into provinces, subprovinces and districts. The Antarctic is divided into the Subantarctic Cushion Plant Region and the Antarctic Polar Desert Region. The latter is an analogue of the Arctic Polar Desert Region, but she finds no South Polar tundra analogue.

Her system of classification might be termed holistic for drawing on such a broad range of data. Two types of features are used: diagnostic and characterizing. The diagnostic features are zonal features that govern the delimitation of the major geobotanical areas. Ultimately, however, Aleksandrova, like geobotanists in general, must place strong reliance on floristics, little else being as tangible and objective. Certain species (*Salix polaris*, for example) do yeoman service in the characterizations.

Despite its small size, the book is rich in detail, perhaps too much so in places. This detail and the liberal use of phytosociological jargon do not make for light reading; it is clearly a book to refer to, not to read straight through. The book would have benefited enormously from some

well-chosen photographs of the main types of vegetation discussed. A bit too much geography, especially of the USSR, is taken for granted, and the reader wishes for a good map of the Arctic with major place names shown. A glossary of terms used in Soviet ecology would also be most useful.

The book is well produced with a minimum of errors, all minor. The extensive bibliography is invaluable. With few exceptions it seems amazingly complete for North America (Raup's work on the Mackenzie Territory seems to have escaped review). As translator, Doris Löve has done a remarkable job, and she is to be commended for undertaking this task on behalf of all of us.

Criticisms notwithstanding, this is an outstanding piece of work that will go far toward fostering understanding and harmony in Polar geobotanical research, while at the same time laying foundations for new efforts. This instantly indispensable reference is sure to become a classic. □

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## TAS, 45 years on

M.J. Seaton

*Atomic Structure.* By E.U. Condon and Halis Odabaşı. Pp.658. (Cambridge University Press: 1980.) Hbk £30, \$83.50; pbk £9.95, \$26.

*The Theory of Atomic Spectra* by Condon and Shortley, published in 1935 and familiarly known as TAS, is one of the great scholarly classics of twentieth-century scientific literature; it was reprinted many times by Cambridge University Press but there was never a second edition. From 1962, when he went to the University of Colorado, until near the time of his death in 1974, Ed Condon worked on a new book in collaboration with Halis Odabaşı who is now at Boğaziçi University, Turkey. I witnessed the work in progress on the tenth floor of the JILA tower; its fruits have now been prepared for publication by Odabaşı with assistance from many people, particularly John Cooper and Roy Garstang, and published as *Atomic Structure*.

We can cherish the treasures in an unfinished symphony without concealing the shortcomings of the work as a whole. For me the main source of delight in this new book is the first chapter, concerned with the historical developments which culminated in the modern formulation of quantum mechanics. Others may find particular merit in the chapters on group theory (of this subject, it was said in the