

magnetic activity, although it must be realized that such a classification might not be fundamentally related to the mechanisms producing the precipitation. The article by B. J. O'Brien on the precipitation of energetic particles into the atmosphere discusses the observational knowledge on the bombardment of the atmosphere by intense fluxes of charged particles, stressing in conclusion that the problem of the origin of the precipitated electrons is still not solved.

The extensive work on radio studies of the aurora is covered in the contribution by R. L. Leadabrand.

The very promising field of co-ordinated measurements on aurorae, for example the distribution of particle fluxes, optical luminosities, and ionospheric electron densities, is discussed by J. E. Evans. A combination of known techniques on a more intense scale than hitherto envisaged would undoubtedly contribute much towards a complete understanding of auroral processes.

The numerous diagrams are extremely well produced. However, it is unfortunate that no index is included.

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## RUSSIAN CLIMATOLOGY

Climates of the U.S.S.R.

By Prof. A. A. Borisov. Edited by Cyril A. Halsted. Translated by R. A. Ledward. Pp. xxi+255+2 plates. (Edinburgh and London: Oliver and Boyd, Ltd., 1965.) 75s.

A BOOK which can be read from cover to cover in half a day can be no more than a brief introduction to its subject; with that understanding, and with the further limitation that it covers climatology with little physics and no mathematics, we may welcome a useful translation of Prof. A. A. Borisov's 'educational manual' on *Climates of the U.S.S.R.*

There is an introductory chapter on solar and terrestrial radiation, certainly a good feature; on synoptic climate, tracks of depressions, frequency of air masses, the passage of fronts and so forth, very elementary but worth while; and on the so-called moisture cycle, handled in a way which I found confusing. This first chapter forms a 30-page background for the main part of the book, a pleasant enough mixture of the cartographical, statistical and discursive. The climatic elements for the country as a whole are taken in turn—air and soil temperature, humidity, cloudiness and sunshine, precipitation, evaporation, snow cover—followed by regional notes and statistics for some twenty regions.

Among the better things are the maps showing the climatic regions of the U.S.S.R., according to various classifications, including one following the Köppen system, although the explanations in the text are quite inadequate. The narrative contains miscellaneous information of many kinds providing something new for most readers. For example: "Three quarters of the Asiatic part of the U.S.S.R. is occupied by permanently frozen ground or permafrost" (p. 45); "present low level [of the Caspian] has not been exceeded during the last two centuries" (p. 168); "Barnaul lies within foothills that have become especially dry since the felling of the nearby forests" (p. 205).

The book, now it has been translated into English, will, of course, be examined by everyone remotely interested in the subject, and will be enjoyed unless the dialectic is found too irritating. It is a style not unknown among British geographers and explorers, only quasi-scientific, which often tends to obscurity; but it must be partly the added complication of translation which leads to the following maze: "The most essential factor introducing 'intrazonal' differences consists of macro-meteorological processes, which are characterised not only by their

'dynamism' and areal expression, but also by . . ." (p. 91).

Too many blemishes have indeed escaped the editor, but in providing a good bibliography and an alphabetical list of place-names with almost all their latitudes and longitudes, he has done splendid service. A few places are not so located, but one minor mystery can be resolved from the internal evidence. The highest temperature ever recorded in the U.S.S.R., 50° C, assigned to the unlocated Chu-Adzhi on p. 83, identifies that place with Uch-Adzhi which is twice, on pp. 41 and 179, credited with the like achievement. Is it a case of "what I tell you three times is true"?

R. C. SUTCLIFFE

## THE CHALLENGE OF BRITAIN'S CHANGING CLIMATE

The Biological Significance of Climatic Changes in Britain

Edited by C. G. Johnson and L. P. Smith. (Proceedings of a Symposium held at the Royal Geographical Society, London, 29 and 30 October, 1964. Symposia of the Institute of Biology, No. 14.) Pp. x+222. (London: Academic Press, Inc. (London), Ltd.; New York: Academic Press, Inc., 1965. Published for the Institute of Biology.) 42s.

AFTER an introductory account of the dimensions of a change in the climate of Britain, by H. H. Lamb, *The Biological Significance of Climatic Changes in Britain* is divided into three sections: "The Effects of Climatic Change and their Implications"; "The Manipulation of Materials and Selection of Sites"; and "Perspectives of the Future". Despite variations in quality and aim from paper to paper, the volume is on the whole a stimulating one, though the discussions are often disappointing, sometimes serving simply to underline an unresolved disparity of approach between the contributors from different disciplines.

Two papers on fluctuations in marine communities, one by D. J. Crisp, the other by R. J. H. Beverton and A. J. Lee, are particularly interesting. The first is concerned with inter-tidal molluscs, the second mainly with economically important fish populations. By way of contrast, and lest anyone be tempted to accept simple interpretations of the influence of climatic change on terrestrial productivity, F. L. Milthorpe outlines the many problems posed by any attempt at a quantitative analysis of the relationship between growth or yield and environmental factors. The paper by J. P. Hudson proceeds from a brief practical account of the effect of different types of growing season on different varieties of one and the same crop to a discussion of the potential value of weather forecasts to the farmer or horticulturalist. He emphasizes the value of forecasts 3 to 5 months ahead of the growing season, at the time when crops and particular varieties are being chosen for planting. J. P. Cooper describes what are apparently genecotypic variations in seasonal performance between strains of single forage species, each strain obtained from a different source area. Further appreciation of the physiological and genetic basis for the variations in growth response with source area promises to provide a way of deriving new varieties suitable for special habitats; in the same way, selectively changing biotypes could also help to meet the challenge posed by changes in climate.

After the cautious approach of these and other papers, a return to some of the earlier contributions may come as a mild shock. The interpretation by J. A. Taylor of vegetational changes in parts of Cardiganshire seems very questionable, while his summary of Post-glacial ecological history in upland Wales is also open to serious challenge in the light of recent evidence. The fact is that despite