articles, almost exclusively on instruments for upper-air observation); laboratory investigations (three articles, use of models in meteorological research); radio meteorology (four articles, radar cloud echoes, refraction of high-frequency electromagnetic waves, use of location of atmospherics in weather forecasting); and microseisms (two articles, causes of microseisms and their application in forecasting).

The book shows that, as is natural, the greatest progress has been made in those parts of meteorology in which experiment is possible. Experiments in cloud physics, stimulated by the scientific desire to understand the processes of condensation of water vapour and formation of precipitation, the attraction of artificial precipitation and artificial cloud dispersal, and the need to minimize ice accretion on aircraft have led to great progress in that subject. Development in radio apparatus has given the meteorologist much better instruments than before 1939 for examining cloud structure and measuring pressure, wind and temperature in the free atmosphere.

Though techniques have improved and the number of stations increased, we learn that the accuracy of observation of some elements is not high enough for numerical forecasting and that over much of the equatorial regions and southern hemisphere stations are too sparse for scientific needs. Disappointment at the failure of the increase in the amount of information to provide more accurate forecasts of general weather is strongly expressed. The writers on synoptic meteorology and the general circulation are clear that more effort needs to be devoted to study of the circulation as a whole and to basic research in meteorological physics, at the expense of study of local circulations and development of empirical forecasting techniques.

The articles on meteorological dynamics and thermodynamics provide excellent summaries of these subjects and show very clearly their immense difficulties. The differential equations can only be solved for simplified states of steady motion or for first-order perturbations from those states, and the observed effects are given in the equations as the relatively small differences between two large terms the values of which are not known with sufficient accuracy for calculation of the differences. In his article on numerical prediction J. G. Charney is hopeful about allowing for radiation and condensation of water vapour but pessimistic about the turbulent transfer of heat and momentum.

At the end of his article on the forecast problem, H. C. Willett calls for the establishment of an international centre for global meteorological research. In this connexion it is of interest to see that the first number (April 1952) of the *Bulletin of the World Meteorological Organization* shows that attention is being given to this proposal. One of the features of the developments of the past fourteen years has been the growing realization of the value of meteorological knowledge in civil and military planning and in the control of industrial and agricultural processes. The articles by C. S. Durst, H. E. Landsberg and W. C. Jacobs, R. Geiger and E. W. Hewson on these matters deserve study by planners, engineers and agriculturists as well as meteorologists.

Considered as a picture of developments since 1939 the book is very complete, and there seem to be few omissions. More might have been said on condensation trails in the articles on cloud physics; and the subject of turbulence in clear air at great heights, to which much effort has been devoted during the past five years, is not mentioned. Very few misprints have been noted. The type and illustrations are very clear and the binding good. The editors have evidently taken much care to ensure uniformity of notation in the mathematical articles. The index contains about twelve hundred entries and seems very complete.

Meteorologists and all to whom meteorological knowledge is important will be grateful to the American Meteorological Society and the Geophysics Research Division of the United States Air Force, which supported the preparation in financial and other ways, for the production of this magnificent book.

THE WORLD OF TOUCH

Psychology and Art of the Blind

By Prof. G. Révész. Translated from the German by Dr. H. A. Wolff. Pp. xxiv+338. (London, New York and Toronto: Longmans, Green and Co., Ltd., 1950.) 42*s*. net.

As the title of Prof. G. Révész's book seems to suggest, there are here really two books combined into one. The first deals with the fundamental theory of haptics ("the impressions conveyed by the tactile and kinematic sense"); the second deals with the æsthetic experience in haptic perception and with the creative activity of the blind. The work as a whole opens up a field of investigation for haptics comparable in its way with the fields of optics and acoustics. Besides being an important original contribution to psychology, it will doubtless be of considerable interest to the student of æsthetics. Erudite, clear and critical, it carries the mark of the mature scholar.

The method employed is chiefly that of searching phenomenological analysis, supplemented where appropriate by experiment. The experiments are not of the 'stream-lined' variety favoured by many of the American psychologists. They are ingeniously simple and usually conclusive. The Continental tradition of phenomenology has never taken root in Britain, and among psychologists in the United States, with very few exceptions, the very word 'phenomenologist' is almost a term of abuse. Yet, on studying such a work as this, one cannot help feeling that psychology in these countries has been impoverished as a result. Only two of the eighty references cited by Prof. Révész are to American sources; and in a well-known symposium on perception (edited by Blake and Ramsey), published in the United States in 1951, more than five hundred references are cited; but Prof. Révész does not appear among them, although he has devoted a large proportion of a long and distinguished career to research on perception. These signs are disturbing.

One of the main conclusions reached by Prof. Révész involves a rejection of the alleged universal applicability of *Gestalt* principles to all modes of perception. It had been more or less tacitly assumed that the principles that are probably valid for vision hold also for touch, although the world of touch has been left almost unexplored by the *Gestalt* theorists. Prof. Révész argues that haptic and optic space are autonomous, and that the first is just as real psycho

logically as the second. The world of those born blind is just as spatial as the world of the sighted but in a phenomenologically different way. In haptic space we proceed from structure to form; in visual space we proceed from form to structure. Apprehension of form means the appreciation of a unity of elements fused in a total impression. Apprehension of structure means consciously acquiring knowledge of the spatial and temporal relations of the perceived object. Prof. Révész derives a number of principles which he believes govern haptic perception in a distinctive way.

Much of the second part of the book is taken up with a careful study of the life-histories and artistic achievements of a number of blind sculptors. Here one must pay a tribute to the immense effort expended by the author in collecting and checking his data. He concludes that the æsthetic 'function' of the haptic sense is very limited. The blind are unable to apprehend objects as individual entities because haptic perception merely gives type images devoid of individuality. This may explain why they have no desire to finger objects of art or to learn details of their form and structure.

The foregoing indicates the kind of issue raised by Prof. Révész. The reader interested in almost any aspect of human perception or in the nature of æsthetic experience is bound to learn a great deal from his book. He had also better prepare himself to unlearn, because he will encounter a challenge to many of his preconceptions. JOHN COHEN

TEXT-BOOK OF SILVICULTURAL SYSTEMS

Silvicultural Systems

By Dr. R. S. Troup. (Oxford Manuals of Forestry.) Second edition, edited by E. W. Jones. Pp. xv+216+43 plates. (Oxford: Clarendon Press; London: Oxford University Press, 1952.) 25*s*. net.

TROUP'S "Silvicultural Systems", published in 1928, has long been recognized both as one of the best forestry text-books in the English language and the best survey in any language of the subject with which it deals. Changes in the methods of handling forests, however desirable, can only be a very slow process, as variation in future treatment is unavoidably largely circumscribed by what has been done in the past. A consequence of this fact is that although changed practices inevitably become necessary with increase of experience and the progress of knowledge, a book such as this does not quickly become out of date. It is therefore not surprising that even after twenty-four years the editor of the new edition finds that he can accept almost unchanged the greater part of the text, and that, apart from a few relatively minor amendments, changes in view and in practice can mostly be dealt with in an additional final chapter. Dr. E. W. Jones has among British foresters an unrivalled knowledge of the silviculture and silvicultural practices of western Europe, derived from repeated visits, particularly to France and Switzerland, and he has also first-hand knowledge of some of the silvicultural problems of tropical forests. As, also, he was on Troup's staff teaching silviculture and carrying out research in the position to bring Troup's book in line with current thought and practice.

In his preface, Dr. Jones enumerates the main changes he has made, and, except for modifying Troup's rather unqualified acceptance of the view that the selection system with all-aged crops gives timber inferior to that obtained with the more or less uniform (even-aged) crops, it is clear that his original contribution is concentrated in the new Chapter 20, "Developments of the Last Twenty Years". This is, indeed, a masterly and valuable summary of recent trends of thought in this field. Dr. Jones, man of science that he is, is very careful to keep in view the economic and practical considerations that must always play a large part in choosing between possible alternatives, and I only disagree with him in his reluctance to accept the view that supervision of uneven-aged forest is more difficult than that of more or less even-aged forests worked under the other systems; above all, when the technical standard of the staff is not first-class.

This chapter brings out the greatly increased importance now attached to the maintenance of soil fertility, leading to a growing preference for less regularity both in age and size, and in species, and to the maintenance of the canopy, avoiding clear or very heavy fellings at all times. I miss at this point an assessment of the alleged merits of periodically admitting light and warmth to the soil, as there are certain conditions where the claim is made that undesirable accumulation of raw humus occurs without it; there are also conditions in the tropics where, with appropriate treatment, any damage that may ensue from such exposure may be more than compensated, both economically and silviculturally, by the quick establishment of a better new crop.

The second important point made is that there is now a demand for more freedom of action to adapt current work in the forest to economic changes, the nature and direction of which cannot be predicted. The feeling is very general that any operation which ties the hands of the forest manager for a long period is to be avoided: this is just one more of the reasons that is giving a bias in favour of woods of mixed ages and species. It might perhaps also have been noted how generally the stress has shifted from getting each area unit of a forest into a form fitting into a preconceived pattern under a silvicultural system, to getting it into a condition in which it is producing the maximum growth in quantity and quality. Attention is very rightly directed to the new factor of forest genetics to be kept in mind.

The five pages devoted to natural regeneration in tropical forests (pp. 200–4), together with p. 207 on the enrichment of tropical forest and scrub, while perhaps not entirely up to date, give a very fair idea of the position. The merits and demerits of clear felling with artificial regeneration, notably with agricultural crops ('taungya') as a method of quickly bringing a mainly unproductive forest into more or less full production, will appear to many to be of sufficient importance for fuller discussion; such drastic measures might quite well only be necessary once, when the forest is first brought under intensive working.

Dr. Jones has done forestry another considerable service in undertaking this revision, and it can confidently be predicted that the new edition will meet most requirements for another twenty years.