

functions, but is mainly concerned with the theory of conformal representation of simply and multiply connected domains in a plane including the correspondence of the frontiers. Many accounts containing more or less the same subject-matter have been published; but the present one is notable for the great care which has been taken with the proofs and explanations of the subtle and difficult features with which the subject abounds.

The first volume ends with Chapter 2, which has been rewritten and extended with the collaboration of Dr. Rogosinski. This commences with a brief but substantial account of the theory of subharmonic functions, and for the rest is concerned with a special group of comparatively recent discoveries based on the notion of 'subordination'. In elementary calculus we are accustomed to argue from geometrical properties of the curve representing a function to properties of its derivatives or integrals and vice versa. The analogous process for differentiable functions of a complex variable is more elaborate because of the four-dimensional nature of the geometrical representation, and because the values of the function and its first derivative even at a single point influence their behaviour throughout their whole region of existence. This property (exhibiting power series and Fourier series in sharp contrast) is illustrated by a discussion of some of the simpler results related to Bloch's theorem. If, on the other hand, the values taken by the function are in any way limited, then its rate of growth at maximum, in the average, and in terms of its differential coefficients is correspondingly restricted. This consideration is developed in the "Lectures" for functions the values of which omit certain regions, curves, or isolated points, including in particular the author's own theorems on functions omitting a sequence of points and the proof of the Bieberbach conjecture in special cases.

The book possesses two very unusual features which overshadow the mere contents in importance and distinguish it from the more common compendium of (sometimes inadequate) quotations. One is the extreme care which has been taken over every detail of logic and presentation; and the other is the remarkable artistry with which so many different aspects are arranged in a logical and readable sequence. It is therefore unfortunate that bibliographical references of the customary standards have not been added on publication of the "Lectures".

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MODERN METEOROLOGY

Descriptive Meteorology

By Prof. Hurd C. Willett. Pp. viii+310. (New York: Academic Press, Inc., 1944.) 4 dollars.

WEATHER is still one of the major factors in war; air warfare especially has resulted in the intensive teaching of meteorology on an unprecedented scale. Teaching requires books, and the last few years have brought a number of excellent text-books, mostly from the United States, where lavishness in printing is still possible. The latest example, by Prof. H. C. Willett, maintains the high standard; it is excellently printed on good paper, well illustrated, and, more important, it is lucid, readable and completely modern. The arrangement follows the usual

lines for a text-book of physical and dynamical meteorology (the title "descriptive" is over-modest); it begins with definitions, the composition of the atmosphere and the effects of vertical movements under adiabatic conditions. Chapter 3 deals with the heat balance of the atmosphere and includes a revision of the classic diagram due to W. H. Dines, which embodies the most recent data but is not quite so clear as its prototype. There are two striking vertical cross-sections of the atmosphere over North America from 72° to 18° N., based entirely on *radiosondes*.

The next two chapters, on evaporation and condensation, and wind velocity, are on accustomed lines and do not call for comment, but the treatment of the general circulation in Chapter 6 is of great interest. The vertical cross-sections of temperature and pressure are used to reconstruct the zonal geostrophic winds above North America, but these diagrams are not clearly explained; moreover, they could profitably be supplemented by sections showing the variations of the observed winds with height. Charts of observed normal winds at 10,000 feet are given in a later chapter, but these afford only a very limited comparison. From these sections the author comes to the unorthodox conclusion that the variation of height of tropopause with latitude results from the dynamics of the general circulation and not from the strong heating of the tropics.

"Secondary circulations" include the rather odd grouping of monsoons and hurricanes. The account of the Asiatic monsoons is perhaps over-simplified; for example, the author implies that there are no rain-producing agencies in central China in winter, omitting mention of the storms associated with the passage of shallow continental depressions. The account of the development of a hurricane is excellent, especially the analysis of the conditions within the 'eye' of the storm.

The chapter on air-mass characteristics contains a good deal of new matter, including sub-categories for stable and unstable air based on thermal stratification at high levels, which make a useful extension of the earlier classifications. It is now recognized that "air masses which come from the same source region at the same season and by the same trajectory may differ greatly in their upper level stratification". The world charts of air-mass source regions are of great interest, but need to be studied in relation to maps of the prevailing winds. Unfortunately such maps do not appear anywhere in the book—a notable omission which ought to be remedied. Extra-tropical depressions, both surface and upper air, come under the heading of "secondary circulations of dynamic type", and along with much that is familiar, include a good deal of recent analysis of upper air conditions. "Tertiary circulations" embrace a miscellany of phenomena, from land and sea breezes to tornadoes; there is a new theory of the Föhn as primarily a change of air-mass rather than a result of dynamical warming. The book ends with a chapter on synoptic representation and a sketchy section on forecasting.

From this brief account it is evident that Prof. Willett has achieved something of a feat; at a time when meteorology is developing rapidly he has almost completely eliminated the usual lag between the publication of research in the scientific journals and its appearance in text-books. No doubt this is largely due to his own activities in one of the storm-centres of research.

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