scientists and instrument makers of the United States, Britain and the different Continental countries each receiving their due amount of space. It is ironical, but no fault of Dr. King, that the largest two working telescopes in Britain at the time of his going to press were so lacking in novel features that they have correctly received no mention except: "Other large Grubb-Parsons instruments of the thirties are the 36-inch reflectors of Edinburgh and Greenwich..."

There are very few points to which the reader can take exception. Perhaps the most obvious of these is the incompleteness of the index. A book of this nature, packed with facts which frequently cannot be placed in chronological order, needs not only a complete index but also one with every possible cross-reference. In particular, it seems that references to instruments in British observatories are least complete. A second point is the omission of a summary of the important dates and events, together with a fairly complete list of observatories with their instruments. Otherwise, I have only noticed trivial errors in the text.

Perhaps naturally, there is little scope for humour in such a book. Consequently, the following remark produced a smile when in another context it might have been overlooked: "After Colby's survey of Scotland, the instrument [a portable zenith sector] was placed for safety in the Tower of London, where it was destroyed in the fire of 1841".

It is difficult to decide whether a history book should stop with the chronicling of all known relevant facts. Historical facts are of the greatest importance; but they become of even greater interest if they are accompanied by a critical examination of events. Why, for example, do certain developments take place at a certain time while other seemingly obvious developments have to wait for many years? Possibly Dr. King feels he has done his part by assembling the facts, and that the deductions are better made by the reader. Of this I am not so certain.

Dr. King deserves the very highest praise for bringing so much work to a stage where one has to look hard indeed to find any adverse comment. The book is well printed on good paper and has just the right number and choice of illustrations and diagrams. The price is not excessive by modern standards, and there is every reason to believe that the future will find this book on the library shelves of all concerned with astronomy, optics or scientific instruments.

H. E. BUTLER

ANALYSIS OF WEATHER CHARTS

Principles of Meteorological Analysis

By Walter J. Saucier. Pp. xvi+438. (Chicago: University of Chicago Press; London: Cambridge University Press, 1955.) 75s. net.

NOT long ago there were two schools of thought in meteorology: one school held that weather has its origin in the higher atmosphere and is only a by-product of more important events there; the other maintained that the irregular distributions of land and sea, mountain and plain, and heat and cold on the Earth's surface produce our weather systems and that these react on the atmosphere above with an intensity that diminishes progressively with height. Meteorologists now know that changes occur at the top of the troposphere as rapid, as frequent and as violent as those near the surface and are related to

them: though the bulk of differential heating and the friction in the atmospheric engine occur at the bottom, the main cogs and flywheels are higher up. But no one yet knows how the parts fit together.

Strictly, as a man of science, the meteorologist should eschew attempts to forecast the behaviour of the atmosphere until he has a coherent and properly tested theory of its mechanism: but the optimism of his predecessors, based on inadequate knowledge of the real intricacies of their task, and perhaps also the occasional successes of the weather-lore man, have forced his hand: the meteorologist has had to work empirically, using his hypotheses for forecasting as he goes along. Circumstances have now given him his chance to put things right. To cope with the flood of information about conditions up to great heights that is needed several times a day for aviation, he has sought the help of high-speed computing machines, and to use them he has had to devise models in mathematical terms for describing the simpler features of the atmosphere. These models have already been used with promising results for forecasting the changes of the next day or two; but until the potentialities of the newer processes are thoroughly explored, the forecaster will still need to analyse his own charts. Now this in itself is a complex task. It demands a long training in constructing a three-dimensional picture of the atmosphere from separate charts of horizontal and vertical sections, and also in accounting for the changes from one set of observations to the next.

But although analysis is an essential stage in the preparation of any forecast, the writing of the first text devoted wholly to the subject has been left to Prof. W. J. Saucier, associate professor at the Agricultural and Mechanical College of Texas, and formerly instructor in meteorology in the University of Chicago. In every respect Prof. Saucier has produced an excellent book—clear and comprehensive, with enough diagrams and physical explanations to make the reading easy, and with the right amount of mathematics for rigorous stiffening. The first third is concerned with the necessary tools and techniques—the atmospheric variables and their physical relationships, stability, the characteristics of the various kinds of chart and diagram, and the theory and practice of scalar analysis. In the main business of the text, the author discusses analysis of surface charts and isobaric and isentropic charts for higher levels, vertical cross-sections of the atmosphere and the kinematics of airflow; the chapters on each of these sections should make rewarding reading for the experienced forecaster as well as for the trainee, and will take him over a wide range of up-to-date thought on the functioning of the atmosphere from the forecaster's point of view. As befits their nature and their place in a book of this scope, large-scale and local features and charts for tropical regions are treated more sketchily (forty pages in all) in the last three chapters.

The text is well documented both by footnotes on each double-columned page for particular references, and at the end of each chapter for more general reading. Throughout the work the author has succeeded in combining a sound treatment of the physical processes with his account of the empirical principles of analysis, and he has striven to treat the atmosphere as a single system the parts of which interlock through great depths and over wide areas even though the mechanism is not yet fully understood.

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