

## Reviews

### I

*Radar Meteorology* by Louis J. Battan, published by The University of Chicago Press, Illinois, USA, 1959, pp. 161+*xi*, price \$ 6.00.

The subject of Radar Meteorology had made very rapid and phenomenal progress since its beginning during the Second World War; its achievements in some of its branches are really outstanding. The truth of this would be evident when one examines the mass of material already published and accumulated over the last decade and the number of papers which are being published annually in various journals; the technical and research reports which are coming out from individual organisations and the contributions which are being presented to symposia on this subject. Considering the progress made and the volume of literature on different aspects of radar meteorology already available, it is surprising that no book had so far been written on this particular subject after arranging these findings in a consolidated form. Excellent reviews and bibliography, technical and professional notes have, however, appeared from time to time, but their scopes being limited, the need of comprehensive treatise for the average reader remained unfulfilled. The author of the present book should, therefore, be congratulated for his excellent work of compiling and presentation within the compass of a small volume, more or less in the form of a text book, the results so far published on different aspects of radar meteorology. The need for such a book, it is needless to say, was not only keenly felt by research workers or by those actively engaged in routine operational work in their professional capacity, but also by the average meteorologists who are so often called upon to interpret a radar echo in relation to actual synoptic situation, by the teachers and students of meteorology who are often bewildered and perplexed on the scattered materials on this subject and by the electronic engineers who are not in a position to realise the full capabilities of their equipment in this respect. For them and for those who want to make a beginning in this new and fascinating subject, this book, scientifically organised and systematically written, starting from the very basic principles of radar reflection and incorporating the results of latest advancements, would certainly be acclaimed as a first landmark in the literature on the subject.

The book contains fifteen chapters, the first few of which deal with basic principles of radar, general properties of electromagnetic waves, reflections and scattering from spherical droplets and topics like attenuation of electromagnetic waves. Chapters from seven to thirteen are devoted mainly to precipitation and hydrologic measurements, cloud physics studies, large scale weather systems and meso-meteorology. In chapter fourteen, an outline of angel reflection has been presented. The last chapter deals with special instrumental techniques used for radar meteorological studies. The subject matter in all these chapters have been based chiefly on the results already accomplished by respective workers in the field. However, after going through the chapters one gets the feeling that the topics have been treated rather briefly, although there were plenty of scope for going into little more detail without being exhaustive; a little more elaboration of each topic, therefore, would probably had made the book more academic in character. The author has, however, explained in the preface, that his main purpose was to describe briefly in a small volume the progress made so far. This would have enabled the work to be used as a standard text book on the subject. The book in its present form has the appearance of a work of mere compilation, even though it contains a comprehensive bibliography of references on each subject. However, this compilation itself is a unique achievement when one takes into account the formidable task of collection of published papers,

preparation of their summaries and their presentation in a coherent, systematic and scientific way. Special mention must be made of chapters 5, 6, 7 and 10 which contain wealth of materials in a concise form.

It appears from the references quoted that the author, in presenting the subject has depended to a very large extent on works done in U.S.A. This is probably inevitable, when one considers that the majority of the papers on this particular subject has been contributed by workers in that country.

Scattered throughout the book, mostly in later chapters, are many suggestions on unsolved problems or items of work on which further data are required for proper assessment of results or for full understanding of mechanism involved in the weather processes. Research workers engaged in these studies are likely to be greatly benefited by these suggestions, which would provide incentive and stimulus for further research.

Written by no less a person than Prof. Battan who himself had been one of the notable figures in Radar Meteorological Studies, the book would certainly be welcomed by everybody having an interest in weather radar work. It would be an excellent addition to any meteorological library to which both the general reader, the specialist and the research worker will refer.

In Table 7.1 there appears to be a typographical error under AN/FPS-41 column for minimum detectable signal.

H. MITRA

## II

*Elementary Seismology* by Charles F. Richter, published by W. H. Freeman and Company, San Francisco, 1958, pp. viii + 768, price \$12.00.

Dr. Charles F. Richter, Professor of Seismology at the California Institute of Technology is too well-known to seismologists throughout the world, to need any introduction. Founder of the "Magnitude Scale" of earthquakes, Dr. Richter has devoted a life time to researches in seismology and imparting training in seismology to young men. This book is an outcome of his long experience with different grades of students possessing back ground knowledge either in physical or geological sciences. It has been written primarily to meet the requirements of the latter, who do not possess an advanced knowledge of physics and mathematics.

Although titled as "Elementary Seismology", the book touches upon almost all the current topics in seismology and will be helpful to all types of research workers in seismology. Being a pioneer worker himself on assessing the intensity of earthquakes, the author has throughout the book laid great stress on the correct recording of field observations and has cautioned the reader against the various pitfalls of observational work. Concrete suggestions for conducting proper field surveys have also been made.

Generally the author has dealt with various subjects by giving simple physical interpretation instead of rigorous mathematical treatment. In the chapters on Elasticity and Elastic waves, where mathematics is unavoidable, the author has accomplished his purpose by resorting to a treatment which could be understood by students possessing only a limited knowledge of elementary calculus.

The book is divided into three parts, the first dealing with the nature and observation of earthquakes, the second with geography and geology of earthquakes, and the third part contains a collection of seventeen appendices of interest to instrumental and field seismologists. The third part contains many important tables like the table of angles of incidence, Travel times etc. Details of practical procedures to be followed in day-to-day routine of seismological work, for subjects like epicentre location, magnitude determination, calculation of distances etc are also given in this part.

Part one consists of 24 chapters and deals with subjects like nature of earthquakes, their effects, causes, detection, types etc. Chapter fifteen deals with seismograph theory and practice but detailed description of seismographs in current use has not been given.

One feels that the mathematical treatment of elastic waves in chapters 16-19 is rather sketchy, but fortunately this subject is dealt with again in Appendix IV. Various types of seismic waves which are normally recorded on seismographs have been described in these chapters and simple physical explanation of their origin have been offered. The most interesting feature of these chapters is the reproduction of a number of seismograms with phases marked, illustrating the records obtained with different types of waves.

The author's most important contribution on earthquake magnitudes, statistics and energy has been described in detail in chapter 22, which contains a critical review of the evolution of the Magnitude Scale leading to its present status, and also the relation between magnitude and energy of earthquakes.

Part two of the book is mainly concerned with the geography and geology of earthquakes, and summarises his earlier work on *The Seismicity of the Earth* in collaboration with Dr. Beno Gutenberg. Several useful maps illustrating regional seismicity have been reproduced from the book *The Seismicity of the Earth*. The later chapters in part two deal mainly with fault systems in different regions in the world which give rise to earthquakes. Chapter 28, consisting of 70 pages has been devoted to a study of earthquakes in California alone. Apparently the author has chosen his own region as a model to illustrate the type of seismological studies which could be carried on if a very dense network of seismological stations was available. Other regions which have been discussed in detail are New Zealand, Japan and Formosa.

Throughout the text the author has been quite liberal in the use of diagrams and tables which are well selected and add considerably to the usefulness of the publication. Another noteworthy feature of the book is a list of references and reading material given at the end of each chapter. The book, on the whole, will be found extremely useful by Geologists and Seismologists alike and will be a valuable asset to any library.

A. N. TANDON

## III

*Between Earth and Space* by Clyde Orr, Jr., The Macmillan Company, New York, 1959, pp. viii + 253 and 26 photographs, price \$ 4.95.

As indicated by the author in the preface a considerable portion of the book deals with treatment of the physical phenomena occurring within the troposphere, its bottom layers receiving particular attention. Hence this excellent book is of considerable interest to meteorologists, although it would not be so obvious from the title of the book by itself.

Reading through the chapters one is fascinated with the thoroughness and precision of the treatment of each one of the topics dealt with. The reviewer is impressed by the pains the author has taken in collecting his facts, sifting them and then arranging them together in the beautiful account he has succeeded in giving of the region between the earth and the outer space. Practically on every topic he takes the story right upto the frontier where active research is pushing its limit further beyond to cover the hitherto unknown. It is perhaps natural that here specialists in some fields may strike a note of disagreement with the author for his preferences for certain hypothesis over others which may claim equal consideration.

Topics, such as, polar-white-out, bubble theory of atmospheric convection, jet stream and the attempts to use it in the explanation of numerous atmospheric phenomena, rain from stardust etc have been treated with remarkable clarity. In chapter ten the fundamentals of the Science of Meteorology have been explained; the chapter is intended to cover synoptic meteorology also. Numerical weather forecasting is mentioned and the difficulties of weather forecasting are admirably summarised thus: "Currently two ways of working at weather processes are being debated. One group of scientists holds that the fluid atmosphere conforms to definable hydrodynamic equations of motions and hence the weather situation at a particular time determines its course for some period into the future. The other group and presently the one in the minority, sees the weather as being always on the verge of instability, like a pencil balanced on its point. This second school of thought thus maintains that the weather is essentially probabilistic".

Naturally quite a number of analogies have been used to explain scientific concepts and no one can deny that analogies do have a very prominent role in popular scientific writing. But the degree of success in putting across the idea, which some of the analogies have achieved, seems sometimes to be in doubt. One such example would be the analogy of base ball players (page 23) brought in to explain the temperature of matter in a very attenuated state or that of electron temperatures.

The mechanism of formation of Hurricanes (tropical cyclones) described on page 50 would appear to some to be unduly simplified, and is not in balance with the treatment given to certain other themes in other parts of the book where advanced ideas and theories concerning these topics have been introduced. Incidentally it may be pointed out that the name for hurricanes used in India is "cyclonic storms" and not Bengal Cyclones (Page 48). These occur in the Bay of Bengal and in the Arabian Sea.

The chapter "Weather according to plan" gives a balanced up-to-date account and specially provides the correct historical perspective which, despite great deal of public interest in the subject, is usually lacking in most of the books.

In the twelfth chapter on 'Climate' are discussed factors on which climate depends, variation of climate through ages and ecological considerations including adaptability of life forms to climate. Here we find the author labelling men as "tropical animals"!

The author is to be congratulated on the very readable 13th chapter entitled "A ravaged realm", dealing with air pollution, nuclear and H-bomb explosions, gas and bacterial warfare. Apparently written with a great deal of feeling and knowledge, this chapter is thought provoking and deserves serious attention of the readers.

One criticism may, however, be made and this is a feature which is found to apply to much of popular scientific writing in general. This is that quantities when numerically expressed certainly help to convey the correct scale of magnitudes in discussions of the exact sciences. One notices the great care which the author has taken in explaining the unit of length  $\mu$  (Chap. 7) in order to make sure that the reader gets the correct idea about the order of magnitude of the sizes of the particles in the atmosphere. Yet in popular writing it is possible to quote isolated figures and statistics without adding to clarity and which may be for effect rather than for giving any idea about the magnitudes involved. A few cases in illustration may be cited: Referring to the earth currents (page 68) figures for ions quoted are about 150,000 per cubic inch of air, compared to the millions upon billions of ordinary air molecules in such a volume. As a second example, page 140, "nearly one billion tons of water vapour are produced each minute and nearly one billion tons of rain fall upon the earth in the same time".

Also at places there seems to be a tendency to choose the dramatic extreme values rather than the average. Thus while describing the electric currents in lightning it is said, (page 73), some 25,000 amperes are carried by an average stroke; often it reaches 60,000; and the highest record is of more than 300,000 amperes which carried energy sufficient to light momentarily about 600,000 sixty-watt bulbs. And describing the effects produced it is said that the temperature of the lightning channel itself probably rises to 50,000 degrees on the Fahrenheit scale, metal objects, like wires, pipes, or conduits, having no gaseous components, are sometimes heated to such temperature that they vaporize completely. Whereas under the description of 'Lightning arrestors' one reads "A good electricity conductor like a pencil-size copper rod can carry the lightning's current" (page 77). It must, however, be acceded that striving after a certain kind of "effect" may be necessary for making popular scientific writing attractive. The author is himself quite aware of this as can be seen from the references to the 'Flying Saucers' (page 115 ff).

An excellent feature of the book is the extensive bibliographical references at the end listing articles and reports published in standard journals and reference books.

The book is to be confidently recommended to those who wish to keep themselves abreast with the latest developments in the Sciences of the Atmosphere. It would also be a valuable acquisition for any library serving degree students in the physical sciences.

U. K. BOSE

## Errata for Vol. 10 No. 3

Page 269, Section 3(i), line 14,

$$\text{for } T_v = \frac{4\pi l}{j_{2v}\sqrt{gh}} \quad \text{read} \quad T_v = \frac{4\pi l}{j_{2v}\sqrt{gh}}$$

Page 270, equation (12),

$$\text{for } I(u) = \int_0^1 \left\{ \left( \frac{du}{dz} \right)^2 - \frac{\lambda}{\gamma(z)} \right\} dz$$

$$\text{read } I(u) = \int_0^1 \left\{ \left( \frac{du}{dz} \right)^2 - \frac{\lambda u}{\gamma(z)} \right\} dz$$

Page 350, Table 2 (Solar Flares),

against Mar 16 (i), for the co-ordinates 11°N 20°E read 29°N 37°E

“ Mar 16 (ii), for the co-ordinates 29°N 37°E read 11°N 20°E