

limits or be entirely characteristic of the centimetre wave-length range itself. Thus the bolometer is more usually recognized as a detector for infra-red radiation, whereas the barrier layer rectifier is a circuit element often used at radio frequencies. Both of these may be used for micro-wave measurements; but in addition there are the reflexion klystron and magnetron as sources of power, the waveguides and cavity resonators as transmission networks which are features peculiar to the microwave techniques and warrant a separate discussion.

The results obtained from the microwave measurements also have some similarity to those derived from the radio-frequency and infra-red regions of the spectrum, but yet have additional and important contributions to present. Gaseous spectra in the infra-red are usually concerned with transitions between the molecular vibrational energy-states, and the rotational motion gives rise to a fine structure while nuclear effects are rarely resolved. In the centimetre region, however, the absorption spectra arise directly from rotational transitions, and a structure from the electric quadrupole moment of the nucleus is readily observed. The Stark effect also now gives rise to large perturbations of the energy-states and provides not only a useful method for detecting the spectra and identifying the transitions, but also enables the molecular electric dipole moment to be determined accurately. The Zeeman effect is less frequently used for the investigation of gaseous spectra, since few molecules are paramagnetic in the ground-state; but the extension of microwave spectroscopy to the absorption spectra from the solid state has been confined almost entirely to the investigation of transitions between the ground-state energy-levels of paramagnetic sites in crystal lattices. These measurements have provided detailed information about the ground-state wave functions of transition-group ions, they have allowed the determination of a number of nuclear spins, and they are powerful techniques for the investigation of the different types of chemical bonding and the structure of lattice defects.

The first measurements at centimetre wave-lengths were carried out in 1934 by Cleeton and Williams; but there was little subsequent work in this field of research until 1946, by which time the development of radar had provided sufficient instruments and experienced operators. During the past ten years, however, there has been such enormous activity that a review of the principles, the techniques and the results is now both desirable and necessary. To discuss adequately the whole field of microwave spectroscopy would be a formidable task, and the title of the book by Prof. C. H. Townes and Dr. A. L. Schawlow disguises the fact that these authors have very wisely limited themselves to a considered treatment of the microwave measurements on gases. It is a well-written book which treats the subject-matter with authority and maintains the reader's interest. The early chapters give a thorough discussion of the theory of microwave molecular spectra, while the later sections are concerned with the various microwave spectroscopes and contain a great deal of useful information about the measuring techniques. There is also an extensive bibliography with about a thousand references.

The book by Dr. D. J. E. Ingram is of quite a different type. The author has endeavoured not only to cover the whole field of microwave spectroscopy in all its aspects but also to include the radio-

frequency measurements on molecular beams and nuclear resonance. The treatment of individual topics is therefore necessarily very brief, and the reader may soon lose interest. One is left with the impression that too much has been concentrated within the compass of one volume, an impression which is furthered both by the print and the diagrams, which also seem to be compressed. However, Dr. Ingram's book does include a great deal of information, and the reader seeking a more detailed discussion of any particular topic will find a carefully presented series of references. It is a book, therefore, which is a survey rather than an authoritative text and may be found useful by many of those who are wondering whether and how to start out into the field of microwave spectroscopy.

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POLYNESIAN TALES IN POETRY

Voices on the Wind

Polynesian Myths and Chants. By Katharine Luomala. Pp. iv+191. (Honolulu: Bernice P. Bishop Museum, 1955.) n.p.

ALL peoples have their folk-lore and fairy tales, often transmitted in the form of poetry. Their study is of great importance since past events as well as the outlook on life of the people themselves become enshrined in the tales. The story of Jason and the Golden Fleece probably results from an actual prospecting expedition to the head of the Black Sea. We can be very grateful, then, to Katharine Luomala for this volume, which recites a number of Polynesian tales. A Maori mother tells her mischievous son that he is a "Maui-of-a-thousand-tricks". The lad is flattered, since what boy in the South Pacific can ever hope to match a single prank of the demi-god, the hero of innumerable adventures. But who was 'Maui'?

The Fakahina Island (formerly Niuhi) folk live on an atoll around which blow violent winds tending to force canoes out to sea. Here is a poem about it by some unknown Fakahina composer:

This is Niuhi, land of gales.
Sail the canoe outside—it is driven to sea.
Sail the canoe inside—it is driven to sea.
Mark, will you, the form of the land of Niuhi,
Like a roll of Hala leaves,
When sinks,
When wanes,
The Northeast wind.
(Fails my breath!)
O speed the fame of Niuhi
to the world!

The account of the occupation of New Zealand is too long to quote here, but is equally fascinating. Naturally, some of the tales owe their origin to outside influences—often impossible nowadays to trace. Thus the story of the hero who builds a great boat just before a vast flood must have been introduced into the folklore. Few people have grown up in entire isolation; somehow or other, ideas developed in one area found their way around the world even in ancient times. But it is only when we have studies like those under review that we can obtain a picture of the ideas of a people and sometimes hints of past events in their history. The poems are charmingly rendered into English and the black-and-white illustrations are delightful.

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