

A.N.Z.A.A.S. - PERTH, AUGUST 1959

At this Congress, the session of most interest to meteorologists was that in the Astronomy, Mathematics and Physics Section, on the International Geophysical Year. The Presidential Address, delivered by Professor H.C. Webster, Convener of the IGY in Australia, will be published in the Australian Journal of Science.

The paper presented at this session by Mr. W.J. Gibbs of the Bureau of Meteorology is published in full elsewhere in this magazine. Mr. Gibbs also presented a paper to the Geography Section, an abstract of which is given below. The papers presented by Messrs J.N. McRae and D.O. Gaffney of the Bureau, to the Geography and the Engineering and Architecture Sections respectively, are also published in this magazine.

Following are abstracts of other papers of meteorological interest.

1. Section on Astronomy, Mathematics and Physics

"The Mathematics of the Earth" by Professor J.C. Jaegar (Australian National University)

Professor Jaegar gave a survey of the present state and history of the mathematics of a number of geophysical problems and of the interplay of this mathematical work with physical and geological observations and thought. He discussed the deformation of the earth's crust, the stability of its axis of rotation and the possibilities of polar wandering and continental drift. He showed that for these, study of the rheology of the earth's material is fundamental and for this, in turn, a study of the temperature of the interior is essential.

"The Green Flash" by Emeritus Professor A.D. Ross (Western Australia)

Professor Ross discussed observations he had made of this phenomenon at sunrise and sunset and the published work of Father O'Connell of the Vatican Observatory. It is fairly certain that atmospheric dispersion, selective atmospheric absorption and Rayleigh scattering each play a major part in the phenomenon but it seems that abnormal refraction, scintillation and total reflection by low density atmospheric layers also exert their influences. Professor Ross discussed the relative importance of the various factors and thought that meteorologists could help unravel the complexities of the problem.

"Seismology and the IGY" by Professor K.E. Bullen (University of Sydney)

Professor Bullen discussed the expansion of the recording network prior to and during the IGY and discussed the analysis of seismic waves from hydrogen bomb and the Maralinga atom-bomb explosions and work on long period surface waves.

"Work of the Bureau of Mineral Resources on Geomagnetism, Gravity and Ice-thickness" by J.M. Rayner (Bureau of Mineral Resources).

Mr. Rayner discussed the equipment used in these fields and some of the results of this work in Antarctica during the IGY. Accurate measurements of ice thickness were obtained from explosions made at 100 ft or so in the ice through the agency of special boring equipment.

"Some Aspects of the Morphology of the Aurora" by F.G. Bond (Antarctic Division, Department of External Affairs).

Mr. Bond stated that, associated with solar disturbances, aurora occur at heights of 100 to 200 km. For aurorae seen from Macquarie Island and eastern Australia during the IGY the most northerly latitudes of auroral arc and band forms are found to be roughly linearly related to the magnetic disturbance index.

It was found that movement of the auroral forms at Macquarie Island coincided with negative bays in the horizontal component of the earth's magnetic field. Although examples of east to west motion were few, some support was found for an association between this motion and positive bays on the magnetograms.

Mr. Bond said that observed zonal speeds of the aurora were of the order of 500 m.sec^{-1} whereas, from rocket observations, winds at 100 km were normally of the order of 50 m.sec^{-1} .

"Long Ocean Waves" by Professor J.C. Jaegar (Australian National University)

The waves in ocean swell have periods of up to about 10 to 15 seconds. Tide gauges frequently record, in addition to tides, small oscillations in water level whose periods are most frequently in the ranges 2-5 minutes and 20-30 minutes. Special recorders with peak response in this period range have been built and operated in specially selected sites during the IGY.

Waves with periods in the 2-5 minute range (surf-beats) are regarded as being caused by the arrival at the beach of a combination of waves of ocean swell of slightly different periods. The waves of longer period may be caused by either submarine earthquakes or meteorological effects. It is proposed to examine the relation between atmospheric disturbances and these waves.

"Antarctic Physics" by P.G. Law (Antarctic Division, Department of External Affairs)

In discussing the mass budget of Antarctica, Mr. Law said that most of the precipitation occurred in a comparatively narrow band around the coast line where it was removed by the calving of icebergs, by run-off of snow melt and by outward blowing snow. He discussed the topography of Antarctica and its effect on the low level wind circulation (katabatics) and on the paths of cyclones. He pointed to the desirability of investigating possible relations between cyclonic development near Antarctica and later developments over Australia. In discussing ice-thickness he said that apart from the central part of eastern Antarctica much of the rock was below sea level.

"Seismological Investigations in Queensland" by O.A. Jones (University of Queensland)

This paper (distributed) first discusses the relation of earthquake epicentres to tectonic structure as obtained from seismic observations at Brisbane and Charters Towers prior to and during the IGY. Analysis of microseismic observations at Brisbane and Townsville indicates that the generation of "group" microseisms and their amplitude are related to the intensity and position of the cyclone, its distance from the station and the depth of water beneath it, while the period is related to distance and position. However the problem is complex and no nearer solution.

2. Section on Geography

"Methods and presentation of meteorological data" by W.J. Gibbs (Bureau of Meteorology)

The two main methods of presenting meteorological data are the "synoptic" and the "climatological". The "synoptic" method makes extensive use of maps, diagrams and tables and attempts a presentation

of conditions for a selected period of observations. This period is usually a stated time of day, but in the case of maximum or minimum values or "integrated" values, may be 24 hours or more. The "climatological" approach uses statistical methods to summarise a series of observations, generally for one particular locality. The form of the frequency distribution of the data has an important bearing on the particular statistical treatment to be used. The above two methods are frequently combined to give a "synoptic-climatological" presentation of the data which may be a summation of a series of synoptic charts or may be a representation on charts of particular statistical values. In presenting meteorological data it is important to adopt the method most suitable for the purpose for which material is required and at the same time to indicate the limitations of the methods used and the particular significance of the type of observations made. Some examples are given of methods of presentation of data for specific requirements together with illustrations of the significance of certain types of observation.

"A Method of Expressing Climatic Content of an Area" by
Professor H.R. Bailey (University of California)

To express the content of a climatic region it is necessary to abandon definitions of its boundaries in favour of internal analysis. Such an analysis is accomplished by arraying selected data in a frequency distribution, and specifying the 25th and 75th percentiles. Those two statistics (the lower and upper quartiles) furnish general ideas of both the level and the dispersion of a given climatic element within a region. Their difference (the interquartile range) is also useful in analysing the comparative merits of two or more systems of subdividing a parent region into climatic types.

3. Section on Engineering and Architecture

"Flood Studies of the Ord River Project" by J.G. Lewis (Public Works
Department, Perth)

Mr. Lewis, after describing the Ord River Scheme, the catchment and the available rainfall and river gauging data, discussed the rainfall associated with storms of February 1956 and January 1959. In the 1956 storm the peak discharge was 1,590,000 cusecs and the volume of discharge over 5 days was 7.3 million acre feet while in the 1959 storm the figures were 1,510,000 cusecs and, in 8½ days, 13.5 million acre ft. Mr. Lewis discussed the derivation of the unitgraph and maximization of these storms illustrating the use of these methods where data are limited or incomplete. He stressed the care which must be used in transposing storms to this catchment. These storms were chosen from the last 15 years of records. Earlier records will be examined for heavier storms.

"Hydrology and Water Resources" by Professor C.H. Munro (School of Civil Engineering, University of New South Wales)

This paper argues that hydrology, as a science underlying the planning and development of water resources, has been neglected in Australia and that leaders of the profession of Civil Engineering in Australia are not sufficiently appreciative of the importance of a modern approach to engineering hydrologic problems, and do not devote sufficient resources to the investigation of projects. It reviews a number of water projects carried out in Australia in recent years, and suggests that this review supports the above arguments. It states that expenditure in research on water engineering is inadequate compared with expenditure on research in nuclear engineering, wool technology etc. A review is made of the efforts of various bodies over the past few years to stimulate interest in hydrology and the conclusion is reached that progress has been disappointingly slow. Methods of improving matters are discussed, such as the creation by the Commonwealth Government of a Central Water Resources Bureau, and the setting up of a Division on Water in C.S. and I.R.O. The need for research groups at various levels co-operating with water Authorities is stressed, and the suggestion is made that Universities have a role to fill in this regard. The desirability of including engineering hydrology as an under-graduate subject in its own right in engineering curricula is emphasized, and a suggested detailed syllabus submitted. The aims and content of the University of New South Wales Master of Technology course in hydrology and hydraulics are described.