

with the United Kingdom Atomic Energy Authority and the General Electric Company. The materials irradiated included prototype fuels, beryllium and beryllium oxide samples, and cobalt for the production of cobalt-60.

New buildings in the Research Establishment were officially opened on May 27, by the Minister for National Development, the Hon. W. H. Spooner. They consisted of the canteen, adjoining the building provided by the Commonwealth Government as the headquarters of the Australian Institute of Nuclear Science and Engineering, and a building devoted to isotopes and technical physics. A 10-kW. graphite moderated reactor, named *Moata*, ordered from the United States of America, is to be installed in the new reactor physics building to be finished this year. *Moata*, which will have a maximum thermal neutron flux of  $10^{11}$  neutrons  $\text{cm}^{-2}$   $\text{sec}^{-1}$ , is designed for flexibility of core and reflector arrangement, and will be used to measure thermal and resonance neutron cross-sections, to study slowing-down properties of moderators such as beryllium, and to investigate long-term changes in fuels and moderators. Studies of the feasibility of a reactor system require intensive investigation into nuclear materials, and the various aspects of the research into the fabrication of graphite, beryllium, beryllium oxide, and sample fuel elements; the effects of irradiation on selected materials; and the compatibility of each material with the others, are described in some detail in the annual report. For the study of beryllium and for work on solid-state physics in co-operation with the Commonwealth Scientific and Industrial Research Organization and Australian universities, two neutron collimators are in operation on *Hifar* for the production of neutron beams, a long wave-length neutron spectrometer has been installed, and two other spectrometers are being constructed.

During the period under review, Australian industry showed increasing interest in the adoption of radioisotope techniques for the solution of its problems, but the field for potential industrial applications is still largely unexplored. A second detailed survey of

the extent of the applications of radioisotopes in Australian industry is being prepared, and information already available shows that a substantial increase since the first Commission survey in June, 1958, has occurred. Two changes were made in the Advisory Service: a direct consulting service to industry was initiated on a limited scale, and early in 1960 the Isotopes Section commenced making direct approaches to various firms. Seventy technical discussions were held with inquirers at the Research Establishment and members of the Advisory Service made ninety visits to factories and laboratories. In consultation with the Isotopes Section, the Commission's Engineering Services Design Group undertook the design of a cobalt-60  $\gamma$ -irradiation unit for the study of plant mutations, and the long-term research programme includes the technical uses of radiation for insect pest control, sterilization of medical supplies and equipment, and food preservation by radiation. At the end of May 1960 the Commission sponsored a conference on the "Technological Use of Radiation". The three-day conference was attended by 165 delegates, and sixteen papers were presented and discussed (the proceedings are now available in book form from the Melbourne University Press, Parkville, Melbourne, N.2, or from the Commission).

The number of staff employed at the Establishment increased by 189 to 673 during the year. A few members of the Commission's scientific staff were stationed in the United Kingdom, United States of America and Canada, and an atomic energy attaché was appointed to the staff of the Australian Ambassador in Washington for closer working contact. The Commission provided £60,000 for the building housing the Australian Institute of Nuclear Science and Engineering which was opened in May, and gives £50,000 annually for Institute research and training. Although no undergraduate scholarships have been awarded since 1957, ten students are still undergoing training in geology, geophysics, metallurgy and chemical engineering. The students graduate this year. Forty-three research contracts have been awarded to eight universities and two hospitals.

## MENTAL HEALTH

THE tenth report of the World Health Organization Expert Committee on Mental Health is devoted to a review of present mental health facilities and resources and to the establishment of priorities for a mental health programme on a world-wide scale\*. Essentially it is based on a summary of work carried out in the field of mental health by the World Health Organization during 1949-59, and on the responses to an inquiry circulated to specialists in many countries in an attempt to ascertain what is being done and what needs to be done in that field.

The report first examines trends in mental-health work during the past decade, covering such subjects as mental health aspects of public health, psychiatry of childhood, treatment methods and facilities, organization of psychiatric services, education and training, and research. Under each heading attention is directed to the contribution made by investigations

sponsored by the World Health Organization, particularly those reflected in the reports of previous Expert Committees and Study Groups.

An examination of the aims of mental-health work and of the ways of achieving them is followed by a discussion of psychiatric and mental-health services, their organization, planning and priorities. Emphasis is placed on the importance of training programmes, since "even the most efficient organization and the best physical facilities will not prevent a badly staffed service from soon becoming unsatisfactory". The training of each category of mental-health worker is dealt with in turn. In addition, an idea is given of the kind of education in mental health required for personnel from the other health professions, as well as for community leaders and the general public, so that all may help to promote the mental health of the community.

The report touches briefly on team work and describes the attitudes required in a team leader and qualities desirable in team members. Considerable space is given to research in the field of mental health

\* World Health Organization. Technical Report Series. No. 223: *Programme Development in the Mental Health Field. Tenth Report of the Expert Committee on Mental Health.* Pp. 56. (Geneva: World Health Organization; London: H.M.S.O., 1961.) 2 Swiss francs; 3s. 6d.; 0.60 dollars.

and it is pointed out that, although investigations undertaken in various countries over recent years show encouraging results, the complexity of the problem makes progress slow. The areas of research considered of foremost importance in mental-health work are enumerated and discussed in detail. Among the many subjects recommended for investigation are studies on brain function, epidemiology, health and social studies of communities undergoing rapid

change, the hospital *milieu*, ecology of mental illness, problems of ageing, the effect of nutrition on mental health, and genetics.

The report concludes with a consideration of the vital part that the World Health Organization can play in future planning for mental health, by fostering international co-operation and exchange of information, and by facilitating and stimulating research.

## APPLICATION OF PALÆOMAGNETISM TO THRUST MECHANICS

By D. K. NORRIS and R. F. BLACK

Geological Survey of Canada, Ottawa

THE surface trace of the Laramide Lewis thrust fault in the south-eastern Cordillera of Canada exhibits a change in direction of approximately 35° from a north-west trend east of the Clark and Lewis Ranges to a north trend east of the Flathead Range (Fig. 1). The nature and genesis of this change of direction has been the subject of much controversy in recent years, and explanations have included differential erosion of the thrust plate and differential rotation of the plate. The purpose of this article is to show that palaeomagnetic directions in conjunction with surface geological data suggest that the Lewis thrust plate moved as a coherent tectonic unit and that the gross geometry of the plate may have been established at the time thrusting was initiated.

For convenience in reference, the Lewis thrust plate will be divided geographically into two parts, termed respectively the Flathead Range segment and the Clark and Lewis Ranges segment.

These two parts are structurally and stratigraphically continuous with one another at their common boundary in the vicinity of North Kootenay Pass. Precambrian rocks of the Purcell system have been mapped without interruption between them, and no major transverse faults are there to suggest that the two segments of the Lewis thrust plate operated as independent tectonic units<sup>1</sup>. The continuity as well as the simplicity of the structure between the two segments would suggest rather that the plate moved as a single structural unit.

The change in trend of the surface trace of the Lewis thrust therefore must be due either to differential erosion of the plate, such that the Flathead Range segment has been eroded to some considerable degree farther west than the Clark and Lewis Ranges segment, or to the poss-

ibility that the latter segment was always structurally farther east than the former. The fact, however, that the fold and thrust fault elements in the Clark Range do not end abruptly at the margin of the plate where the surface trace of the Lewis thrust swings west but rather swing sub-parallel to it suggests that the re-entrant at North Kootenay Pass is not due to differential erosion of the Lewis thrust plate. The possibility of differential rotation, therefore, is especially impor-



Fig. 1. Location map