

phenomena at the earth are magnetic storms, radio blackouts, and aurora. The effect on communications is of great commercial importance. There is probably some connection between this turbulence in nearby space and weather, although an understanding of it requires a great deal more research.

The earth's magnetic field is not symmetrical with the earth's axis. It may be represented approximately by its similarity to the field of a simple magnet near the centre of the earth. The axis of this magnet is tilted with respect to the earth's axis in such a way that the north magnetic pole is in Canadian territory. The region of maximum auroral activity, of almost continuous geomagnetic and ionosphere disturbances, surrounds this magnetic axis and the only place in the world that has readily accessible stations crossing the area of maximum auroral activity is in Northern Canada.

This, of course, has been well known for many years and centres of research on the ionosphere, aurora, geomagnetism and cosmic rays have grown in government laboratories such as the National Research Council, Defence Research Board and Department of Mines and Technical Surveys, and in Canadian universities such as the Institute of Upper Atmosphere Research in the University of Saskatchewan and the cosmic ray group in the University of Alberta, Calgary.

Canada's space objective is to a large extent to take advantage of new techniques in studying the upper atmosphere, particularly in this interesting region between balloon levels and satellite orbits. A certain scientific responsibility also exists because of Canada's geographic location in respect to the north geomagnetic polar regions.

The importance of getting scientific data from northern areas has been realized for many years and with the organization of the International Geophysical Year in 1957-58 the United States built a rocket-launching facility at Fort Churchill, Man., as an IGY project. This has been continued in operation since the IGY and several hundred rockets have been launched carrying scientific instruments far into the upper atmosphere.

Canadian scientists in the Defence Research Board laboratories have built instruments into rockets launched at Churchill. During the IGY and immediately after it, American rockets were used. However, with development of a rocket by the Canadian Armament Research and Development Establishment completed in 1959, Canadian rockets are being launched at the American-operated rocket range at Churchill. The objectives of the Canadian experiments include studies of infrared radiation in the upper atmosphere, the electron density in the lower ionosphere which is largely responsible for radio blackouts, and the measurement of energetic particles including cosmic rays from galactic space and from the sun.

In 1959 the National Research Council formed an Associate Committee on Space Research, the purpose of which is to act in an advisory capacity in co-ordinating Canada's space research activities of a non-defence nature and particularly to make it possible for university research workers, who have interest and experience in upper atmosphere physics, to take advantage of the new rocket techniques. Several university research groups are planning experiments on various problems related to upper atmosphere physics. Their instruments will be launched in rockets during 1961 and a continuing series of investigations is being planned.

Although, because of its geographical position, Canada has a strong interest in nearby space in polar regions, space activities are not confined to that region. The United States has offered to carry experiments planned in other countries in some of their satellites, and Canada was the first country to take advantage of this opportunity. An experiment known as the "Topside Sounder" will be launched in a United States satellite, probably early in 1962. This experiment being carried out by the Defence Research Telecommunications Establishment is a technique of studying the ionosphere by measuring the reflection of radio waves from the topside of the ionosphere or from above rather than from below as is done from the surface of the earth. The same satellite will carry cosmic ray measuring equipment built by the National Research Council's Division of Pure Physics.