

Research on mapping methods particularly suited to Canadian conditions has led to the development of a new instrument called the "Analytical Plotter", which uses electronic computations rather than optical projections for plotting maps from aerial photographs. The instrument is smaller than previous models and involves fewer mechanical components. It also permits correction by electronic computation of all known errors in the mapping process and indicates eventual automation of mapping.

Other problems currently under investigation include measurement of the thermal and electrical properties of a number of ceramics and oxides; detailed studies toward the realization of an improved primary standard of light; assessing the thermal insulation of fabrics in winds; and monitoring of artificial radioactivity in the atmosphere to study the movement of air masses, as part of the International Geophysical Year program.

**Pure Physics.**—Investigation is under way on cosmic rays, solid state physics, spectroscopy, X-ray diffraction and theoretical physics. The work is on various fundamental problems which do not have immediate application but advance the frontiers of knowledge and supply the basis for further progress in the applied fields.

Much of the cosmic ray work has been associated with the International Geophysical Year. Four cosmic ray stations—at Resolute, Churchill, Sulphur Mountain and Ottawa—provide data used to study intensity variations in relation to theories about the source of cosmic rays and their modulation by interplanetary matter shot out from the sun. The results show interesting differences between long-term intensity variations associated with the sunspot cycle and shorter period changes that sometimes correlate with magnetic disturbances.

The studies of the low temperature and solid state physics group cover three main fields: metals, semi-conductors and semi-metals, and insulators. An extensive experimental study of the transition metals has been completed; a new theory of the processes of strain hardening has been developed and a new type of phase transition in solids has been discovered. Progress has continued in the understanding of compound semi-conductors in terms of crystal structure and chemical bonding; research on the thermal properties of the inert gas solids continues.

The spectroscopy group has continued its investigations of the spectra of simple atoms and molecules; the theoretical physics group has been mostly concerned with general field theories and theoretical nuclear physics. X-ray diffraction work has involved the determination of the crystal structure of several organic compounds and minerals; additional programs have been written for crystallographic computation on FERUT and IBM 650 computers. The X-ray group played a major role in the organization of the Fourth General Assembly, International Congress, and Symposia of the International Union of Crystallography held at McGill University in the summer of 1957.

**Building Research.**—The search for technical improvements in housing dominates the work of this Division; considerable attention is paid to problems concerning the National Building Code of Canada and to fundamental studies on soil, snow and ice mechanics.

New laboratories for paint research and acoustical research and testing have been provided. A newly installed test floor and structural steel testing frame will enable the structural testing of housing components of all kinds to loads of up to 50 tons at several points. A unique fire research building provides facilities for full-scale wall and floor structure fire resistance tests, chemical and physical laboratories, a special room for carrying out model burns, and space for research into the hydraulic aspects of fire fighting and fire prevention. Fully instrumented fire tests to record in detail fire progress in structures were conducted on eight buildings abandoned in connection with the St. Lawrence Seaway Project.

Special attention has been paid to techniques that permit winter construction, including enclosure of construction projects and use of materials such as precast concrete. Studies in economical housing design have resulted in a standard roof truss, economical