

wool textiles is another laboratory problem. Blending of wool with other fibres, notably nylon, gives a more serviceable product. Recommendations of the textile laboratory have been incorporated in purchase specifications for army socks.

In organic chemistry, the structures of two new alkaloids, thermopsine and rhombifoline have been elucidated, and a new type of alkaloidal structure has been synthesized. An infra-red microscope has been designed and made with which it is possible to identify one one-hundredth of a milligram of an organic compound by its infra-red absorption spectrum. The instrument is being used in the study of the metabolism of cortisone and other steroid hormones.

*Physics.*—In the Division of Physics, one of the problems worked on during 1951-52 was concerned with improving the efficiency of fog horns. By the use of modern acoustical theory, it was found possible to make certain changes, and one of these, the exponential horn, showed an improvement of efficiency by a factor of 20 compared with previous installations. Another horn of the catenoidal design was found to be 59 p.c. better than the one of exponential shape. To attain the full efficiency of the new horns, careful regulation of pitch is required.

Extensive studies of cosmic rays are being made from recordings of Geiger counters at an Arctic post and at Ottawa to obtain information on the relationship between cosmic-ray activity and meteorological and magnetic conditions, and to aid in unravelling the mysteries of the atomic nucleus. Another research group is using photographic emulsions to record collisions between cosmic rays and atomic nuclei. Evidence has been obtained which indicates that both charged and neutral mesons (subatomic particles) are emitted when a cosmic ray strikes the nucleus of an atom. Further work may shed light on elementary interactions between particles having billions of volts of energy. Cosmic rays offer the simplest method for this study.

Valuable information on the genesis of mica and the age of the earth is being obtained by X-ray diffraction studies of the nucleus of dark circles, called pleochoric haloes, which frequently appear in mica.

Successful experiments, designed to secure information needed for the construction of a new type of radiation unit for cancer treatment, have been concluded using two large radioactive cobalt sources.

Increased accuracy in temperature measurements, important to industry, has been obtained by the precise determination of certain fixed points on the International Temperature Scale. The Division can now establish, with the highest accuracy, temperatures over a range of more than 1,000°

Spectroscopic studies of light emitted by chemical compounds have been used to increase the available information on their molecular structure. Investigations have been completed in nitric oxide, aluminium chloride, nitrous oxide, methyl chloroform, methyl cyanide, and pyridine. An improved method of producing sulphur monoxide has been developed and the structure of this compound has been accurately established; it contains two sulphur atoms and two oxygen atoms instead of one of each as might have been assumed on other bases. Examination of the composition of distant planets this year yielded a new discovery when some features in the spectra of the planets Uranus and Neptune were reproduced in the laboratory and it was thereby shown that hydrogen is abundant in the atmospheres of these planets. Work in theoretical physics is laying a firm foundation for the correlation of results of scientific speculation with experimental data.