

In the Division of Applied Chemistry, on the other hand, work is focussed more directly on practical problems such as chemical engineering studies, research on textiles, corrosion of metals, development of more efficient processes for the production of chemicals from natural gas, the properties and uses of natural and synthetic rubbers either alone or in admixture, and the applications of colloid chemistry in the improvement of lubricating greases. A new building for this group was completed and occupied during the year.

Improvements or new processes developed in the laboratories are passed on to industry through Canadian Patents and Development Limited, the Council's patent and licensing agency. In 1952 this Crown company entered an important new field of activities. It arranged for the carrying out of extensive pilot-plant operations on a commercial scale to assess the possibilities of the Cambron process, developed within the Council for the production of ethylene oxide by direct oxidation of ethylene, an important constituent of natural gas.

On the biological side, the laboratories have been actively working on the causes of rot and decay in textiles, wood and related products. Many moulds and bacteria attack the cellulose in these products by producing a ferment or enzyme which breaks down cellulose into simple sugars. Although the existence of the enzyme has been known for over fifty years it has only recently been isolated and purified in its biologically active form, thus opening the way for studies on its mode of action. Research has already shown that traces of certain acid dyes inhibit its activity, a finding that suggests new approaches to the practical problem of preventing decay. On the other hand, it has been found that some dyes and proteins stimulate the enzyme and this stimulatory effect may have a bearing on the ultimate use of cellulosic materials, such as wood-pulp, in fermentation processes.

In physics, a contribution has been made to the knowledge of how certain metals behave over a wide range of temperatures from close to the absolute zero (459.4° below zero F.) up to 200°C. (392°F.). Striking anomalies, hitherto unsuspected, have been found in the heavier alkali metals (rubidium and caesium). Comparison is being made with basic theory and considerable progress has been made in a deeper understanding of fundamental metallic behaviours.

In another physics laboratory it has been found that the so-called alpha bands of ammonia are due to the free "NH₂ radical" and this observation has been put to practical use by the physical chemists in the determination of the NH₂ radical in other chemical reactions. Thus does one science laboratory serve another.

Progress has been made, too, in other important fields in physics. Although the present-day fog-horn has been in general use throughout the world for over 35 years (48 years in Canada), no improvements have been made on it during all this time until recently. Canada pioneered its introduction in 1904 and has again pioneered substantial improvements, which are important not only to Canada but to the whole world. By the application of modern acoustical theory, the horn was redesigned to improve the loading to such an extent that in a comparison test the efficiency was raised from 0.2 p.c. to 15 p.c. There is every reason to believe that the new unit will have a longer life than the old and require less servicing. The practical aspects of the development work were made particularly easy by the experience and co-operation of the Marine Services, Department of Transport.