pressed and the line of no change must have migrated westward toward the land, because in spite of the repeated uplifts, there are no belts of marine deposits along the shore line. The last of these changes is comparatively recent. It was preceded by a long period of still-stand, during which the border of the mainland was worn down to low relief, even though it consisted of rather resistant rocks. Preceding that still-stand period, a tilting similar to the one that has recently taken place raised the land area and depressed the marine area. Inasmuch as the recent tilting introduced reef growth, there is every reason to think that the earlier tilting also introduced reef growth; but while the reef of recent introduction is still immature, because of its youth, the reef of the earlier cycle must have reached advanced maturity in the long still-stand that followed its beginning, and thus its original lagoon area must have been converted into a reef plain, overlapped by deltas built out from the initial shore lines of that time. It is on the outer part of this reef plain, now submerged, that the present reef appears to have grown up. The fact that, contemporary with both cycles of reef formations off the Queensland coast, a continental shelf was in process of formation by unimpeded marine action off the coast of New South Wales, in no wise invalidates the above conclusions: the two processes are going on at the same time on adjoining coasts now; they may have been similarly synchronous and neighborly at earlier times also.

Searching for a Doubtful Geological Zone in the Canadian Rockies: CHARLES D. WALCOTT.

The stratigraphic position of the Mount Whyte formation of the Cambrian system in the Canadian Rockies having been questioned, I searched for evidence of its place during the field season of 1916 and found that it forms the upper member of the Lower Cambrian terrane both from the evidence of its contained fauna and its stratigraphic position. This conclusion is supported by the sections of the Cambrian formations in the Lake Champlain and the Lower St. Lawrence valleys.

The Influence of Diet upon the Heat Production During Mechanical Work in the Dog: R. J. ANDERSON AND GRAHAM LUSK.

The energy production in a dog moving at the rate of about three miles per hour is the same whether he be given no food or 70 grams of glucose. However, when the dog is given meat the increase in energy production during exercise is equal to the sum of the increases which the two influences of exercise and chemical stimulation through the metabolism of amino-acids would individually have induced.

What Determines the Natural Duration of Life? JACQUES LOEB AND J. H. NORTHROP.

Each species seems to have a characteristic average duration of life. In order to find out the nature of the variables responsible for this duration, experiments were made on the temperature coefficient for the duration of life of an insect (*Drosophila*). The experiments were carried out on breeds free from all microorganisms to avoid the objection that bacterial poisons formed in the intestine influenced the result. It was found that the temperature coefficient was of the order of that of a chemical reaction as we had found previously in non-sterile cultures. This result means that the duration of life is due either to the cumulative formation of harmful substances in the normal metabolism of the body leading to the phenomenon of old age and death; or that it is due to the gradual elimination or destruction of substances without which life becomes impossible.

The Difference in the Action of Antipyretics according to Species of Animals Subjected to this Action, the State of Health of the Animals, the Height of their Normal Temperature and the Substance Employed: T. S. GITHENS (by invitation) AND S. J. MELTZER. From the Department of Physiology and Pharmacology of the Rockefeller Institute.

The principal point of this communication, arrived at by experimental observations, consists in the fact that subcutaneous injections of antipyretics administered to healthy hens, roosters and pigeons, whose normal temperature is regularly higher than that of normal mammals, reduces the temperature by several degrees centigrade, while injections of corresponding doses of the drug into healthy mammals have only either a slight effect or none at all. On the other hand, pyramidon reduces perceptibly the normal temperature in both classes of animals. In human beings all antipyretics reduce febrile temperatures more or less strongly, while the normal temperature is affected by them only slightly.

SCIENTIFIC EVENTS

NITROGENOUS COMPOUNDS IN GERMANY

ACCORDING to an article in the *Revue générale des Sciences* by Professor Camille Matignon abstracted in *Nature*, before the war Germany was the greatest consumer of combined nitrogen. In 1913 the consumption

amounted to 750,000 tons of Chilean nitrate, 35,000 tons of Norwegian nitrate, 46,000 tons of ammonium sulphate, and 30,000 tons of cyanamide. In 1913 great efforts were devoted in Germany to the preparation of materials necessary for war, and no attempt was made to conceal them. The German Ammonium Sulphate Syndicate had a reserve of 43,000 tons, and on the declaration of war there was probably a stock of 100,000 tons of Chilean nitrate. Immediately after the battle of the Marne, when a long war was evidently certain, the production of artificial nitrates and of ammonium sulphate was stimulated, the Badische Aniline Company and Bayer and Co. being subsidized to the extent of 30,000,000 marks for the installation of factories to convert ammonia into nitric acid. In peace time 550,000 tons of ammonium sulphate were produced annually in Germany, but this output was reduced once war was declared. As this substance is a by-product in the manufacture of gas and cast-iron, people in Germany were instigated to use gas and coke instead of coal, and by such means an annual output of 250,000 tons of ammonium sulphate was attained.

The problem of converting the ammonia into nitric acid was solved by the Frank and Caro and the Kayser processes. A French chemist, Kuhlmann, had discovered that ammonia is oxidized to nitrogen peroxide when mixed with air and passed over warm, finely divided platinum. The reaction was employed on a commercial scale by Ostwald, and improved both by Kayser and by Frank and Caro. By the end of 1915 the Anhaltische Maschinenbau Society of Berlin had established thirty installations for the conversion by Frank and Caro's process, and these had a capacity of more than 100,000 tons of nitric acid per month. But this was only one of the methods adopted. Given a cheap source of electrical energy, it was known to be commercially practicable to prepare nitric acid by the direct oxidation of nitrogen in the electric flame, and this process had been established in Norway by Birkeland and Eyde, who used the waterfalls as a source of energy. The Germans have established a factory employing Pauling's process (a modification of that of Birkeland and Eyde) at Muhlenstein, in Saxony, in the neighborhood of the lignite beds, which form the source of energy, and this has an annual output of 6,000 tons of nitric acid.

The third principal method adopted for the preparation of combined nitrogen was the direct synthesis of ammonia. Bosch and Mittasch, two chemical engineers of the Badische Company, had adapted Haber's synthesis to industrial conditions, and the company had established a factory with an annual output of 30,000 tons of synthetic ammonium sulphate. In April, 1914, the company increased its capital in order to raise the output to 130,000 tons, and after the battle of the Marne it was subsidized by the German government to increase the production to 300,000 tons.

Before the war the production of cyanamide in Germany was comparatively small, but it has increased largely under government stimulus. In the direction of the manufacture of manures, it was necessary to economize sulphuric acid, so ammonia was neutralized with nitre cake, and the resulting mixture of sodium and ammonium sulphates was mixed with superphosphate. Moreover, it was found that superphosphate will absorb gaseous ammonia, and although the calcium acid phosphate is thereby converted into the insoluble tricalcic phosphate, it is formed in an easily assimilable condition, and the product is found by experience to act both as a nitrogen and phosphorus manure.

THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY AND INDUSTRIAL RESEARCH

WHILE offering every facility of the laboratories of the Massachusetts Institute of Technology to the United States government for any research in which it with its staff of trained professors can be of service, the institute holds that in addition to the education of its students it has an important function in being helpful to the industrial world. An agreement with Technology by the U. S. Smelting, Refining and Mining Co., to be in force in April, whereby the latter is to avail itself of the