Research Items.

CLIMATIC CONTROL OF WHEAT AND WOOL IN AUSTRALIA.—Mr. Henry Barkley, the Senior Research Meteorologist of the Commonwealth Weather Bureau, has published preliminary results of the control exercised by rainfall during critical periods on production in Australia. The first paper (*Wheat and Grain Review*, Aug. 6) shows that after allowing for the gradual improvement due to improved methods, 90 per cent. of the variations in the Victorian wheat harvest depend on fluctuations of the rainfall in August and September, thus enabling a very good forecast to be made two months ahead. The relationship is not linear, but the wheat yield is roughly proportional to the logarithm of the rainfall. In other parts of Australia the critical periods vary from June to August. Another interesting result which the author obtains is that there is very fair agreement between the spring wheat yields of Victoria and the contemporary autumn yields of Canada and, until 1916, Russia. This is attributed to a general control of the climates of all three countries by solar variations, which cause a cyclic change of roughly three years. Mr. Barkley's second paper (*Pastoral Review*, August) deals with the control of the wool yield in November by rainfall as early as January and February. The relationship is again very close; the weight of the wool clip shows a progressive increase as the rainfall of the two months together rises from 1 to 4½ inches; the latter is the optimum value and heavier rain causes a slight falling off. It is not yet clear, however, whether the increase of weight represents a real gain of that amount, or whether it is partly due to an increase of greasy matter, and further data are required to settle this and some other doubtful points. It is to be hoped that Mr. Barkley will be able to continue these valuable researches, which have a direct bearing on Australian production.

CANADIAN SALMON.—Few observations have been made on the biology of the Atlantic salmon (*Salmo salar*) from Canadian waters, and a recent publication by W. L. Calderwood on the salmon of the River Grand Cascapedia in the Quebec Province is welcome (*Proc. Roy. Soc. Edinburgh*, vol. 47, pt. 2, No. 10, 1927). The number of scales examined was unfortunately low, but they appear to furnish information of considerable interest. The smolt ages were remarkably high, the three and four-year-old smolts forming 58·8 and 34·1 per cent. of the whole respectively. There were no one-year-old smolts and two were five years old. In this respect they resemble those from certain northern rivers in Norway, although they do not agree with results from the River Moisie in Canada, which lies north of the Grand Cascapedia, where two-year-old smolts were the most common. There were no grilse, neither were there any small spring fish represented in the samples. In fact only eleven fish returned after two winters in the sea, while the majority did so after three winters. Although the fish do not come into the fresh water early because the river is not open, no summer feeding appears on their scales. The fish of the predominant three-winter group averaged 23·6 lb. and the average length was 38·3 in. Of the 182 fish, 62 had spawned previously—48 once and 14 twice.

TANNING MATERIALS OF AUSTRALIA.—The Council for Scientific and Industrial Research of Australia has just published a survey of the tanning materials of the commonwealth (*Bulletin No.* 32, by D. Coghill). The survey was designed to explore the possible commercial resources of Australia in vegetable tanning materials. With this end in view, all the barks, woods, twigs, leaves, and fruit from which tannin could be extracted have been examined, and their possible utilisation discussed. While no new sources of importance have been discovered, the availability and quantity of the tannins previously known have been thoroughly re-examined, with the view of establishing a flourishing tannin extract industry in Australia. Western Australia is rich in natural sources of tannins, while the eastern provinces provide a fertile and broad ground for the cultivation of those species which give a good yield of tan bark, and grow quickly. The proposition is a praiseworthy one. New sources of tannins are urgently needed. Already Australia has to import some of her tan extracts, and during the last few decades there has been an increasing dependence of the older countries on tan stuffs imported from new and less-developed regions, a condition of things accentuated recently by the ravages of the chestnut blight, which is seriously reducing the supplies of tanning materials obtained from that tree.

STIMULATION OF PLANT ACTIVITY.—Many chemical substances, apart from those ordinarily recognised as fertilising elements or yielding energy to plants by oxidation, are known to increase in several ways the rate of growth. F. E. Denny, of the Boyce Thomson Institute for Plant Research, discusses some such effects (*Proc. U.S. Acad. Sciences*, vol. 13, July 1927). The yellowing of commercially mature but still green lemons and oranges may be very much accelerated by exposure to minute quantities of ethylene gas—one part or less in 10,000 parts of air. A study of the respiration of lemons so exposed showed that the physiological activities of the fruit were greatly increased, the rate of production of carbon dioxide being doubled or trebled in 48 hours. So far, the mechanism of this respiratory increase is unknown. Furthermore, the stimulating effects of ethylene are not confined to Citrus fruits, for Rosa found that the rest period of dormant buds of potato could be shortened by suitable treatment with that gas. Denny now finds that several chemical agents will break the rest period of plants; *e.g.* ethylene chlorhydrine, ethylene chloride, various thiocyanate solutions, acetaldehyde. The chemicals that were found to cause stimulation varied greatly in character, so that no evident relation could be established between the type of chemical used and the result obtained. In most cases it did not seem possible that the substance was used by the plant directly as food, and in no case could it have supplied sufficient energy to account for the resulting increased activity. Now Carrel and Baker found that the substance in embryonic tissue which markedly stimulated multiplication of isolated cells was the product of the partial hydrolysis of a protein. The present author suggests that possibly the slight injury produced by those chemical stimulants may cause a slight and partial decomposition of constituents of the tissues, resulting in the release of growth-promoting substances which start up renewed cell division and bud growth.

ORIGIN OF MUTATIONS.—Some experiments by Dr. A. M. Banta and Mr. T. R. Wood of the Station for Experimental Evolution at Cold Spring Harbour are described in a recent bulletin of Science News Service of Washington. Dr. Banta has been investi-

gating the genetics of Cladocera for many years, growing great numbers of them in water bottles under controlled conditions. One mutation which appeared recently failed to thrive under the ordinary conditions, but flourished and multiplied when kept in water at a higher temperature. It is suggested that the organisms inhabiting hot springs have originated in a similar way, through mutations adapted to high temperature conditions occurring near a hot spring where their descendants could reach the environment necessary for their prosperity.

NORTHERN CYCLOSTOMES AND ELASMOBRANCHS.—Recent additions to the fishes in "Die Tierwelt der Nord- und Ostsee" (Leipzig: Akademische Verlagsgesellschaft, 1927) are the Cyclostomes (*Cyclostomi*, by W. Schnackenbeck, Teil XII. d), and the Elasmobranchs (*Elasmobranchii*, by E. Ehrenbaum, Teil XII. e). The cyclostomes in this area consist of three genera, each represented by one species, namely, *Petromyzon marinus*, the sea lamprey; *Lampetra fluviatilis*, the river lamprey; and *Myxine glutinosa*, the hag-fish. The true fresh-water lamprey, *Lampetra planeri*, although mentioned in this work, does not strictly come within its limits. Dr. Ehrenbaum gives a good account of the elasmobranchs. *Chimæra monstrosa* is the only representative of the Holocephali in north European waters, and most of this section is taken up with the description of the Selachii (sharks) and the Blatoidei (skates and rays). The low salinity of the Baltic bars the presence of elasmobranchs except as occasional visitors, therefore nearly all the species recorded are from the North Sea area and several of these are very rare, such as the electric and eagle rays and some of the sharks. On the other hand, certain rays, such as *Raia clavata* in the North Sea, the Skager Rack, and Cattegat, and *Raia batis* with a wider range, have here their maximum distribution, whilst the cosmopolitan *Acanthias vulgaris* is the commonest dogfish and is to be seen in swarms in the North Atlantic. Sharks and rays feed upon almost all the groups in the animal kingdom—fishes of all sorts, molluscs, crustacea, echinoderms, annelids, and even sea-anemones and ctenophores, *Selache maxima*, the basking shark, being entirely a plankton feeder, eating small crustacea and even diatoms. Good notes are given on the feeding and breeding habits of all known forms.

JAPANESE PLIOCENE MOLLUSCA.—The molluscan fauna of the lower part of the Kakegawa (Lower Pliocene) Series in the province of Tôtômi forms the subject of a monograph by Jirô Makiyama (*Mem. Coll. Sci. Kyoto Imp. Univ.*, ser. B, vol. 3). The beds in question, Dainitian, occur between Hutamata and Minamiyama on the Tôkaidô, or East Sea Road, and seem referable to the Plaisancian. The fauna contains 171 species of which 46·8 per cent. are known as living. Detailed descriptions of these, including many new species, are given and accompanied by six excellent plates.

PEAT AS A SOURCE OF WAX.—The curious metabolism of peat plants, which releases large quantities of fatty substances, and impresses very characteristic structural features on the plant form, was investigated a few years ago by Priestley and Hinchliff (see *The Naturalist*, 1922, p. 263, and 1924, p. 201). These fatty by-products are now being turned to commercial account. In the current issue of the *Bulletin of the Imperial Institute* (vol. 25, No. 3) an account is given of some experiments which have been carried on there on the extraction of wax from some samples of peat from Chatham Islands. The work follows on similar researches already carried out in Germany. Hot extractions made in a Soxhlet apparatus with chloroform as a solvent gave the remarkably high yield of 25 per cent. of crude wax, the yield in the case of most peats so far tested being from 6 to 8 per cent. The cost of chloroform, however, prohibits the use of this method as a commercial venture. Other experiments showed that benzene or mixtures of benzene and alcohol were almost as efficient for extracting wax from the peat, besides showing considerable advantage in regard to cost. Preliminary trials indicated that kerosene might possibly be used, but its high boiling point made the subsequent separation of the wax difficult. The crude wax had a dark colour, a melting point from 70° to 74° C., and could not readily be bleached. It is estimated that a market could be found for 500–2000 tons of the wax per annum for use in boot polish and related industries. An analysis of the peat remaining after extraction of the wax showed that the residue would form a useful fuel.

SMALL ELECTRIC FURNACES FOR THE LABORATORY.—The *Chemiker-Zeitung* of Sept. 28 contains a description of a new type of small electric furnace, with which a crucible can be heated in one hour to a temperature of about 950° C. The furnace is most easily adapted to a tension of 110 volts, and if the current does not exceed 2·2 to 2·4 amperes the heating coils will last for several thousand hours. The furnaces are made by the firm Hugo Helberger, of Munich, and are provided with specially adapted regulating resistances, by means of which it is easily possible to control the temperature.

THE WEATHERING OF TEXTILE FIBRES.—The *Chemiker-Zeitung* for Oct. 8 contains an account by Dr. H. Sommer of experiments on the weathering of textile fibres, carried out on the roof of the observatory at Neubabelsberg, near Potsdam. The complete record of the investigation will be found in the *Leipz. Monatsschrift für Textilindustrie*. It has been found that the weathering is chiefly a surface effect produced mainly by ultra-violet rays and is helped, particularly in the case of wool, by the presence of moisture. Of the different materials examined, silk proved to be the least and wool the most resistant to the disintegrating action of sunshine. The sunshine-hours required to produce comparable effects were as follows: silk, below 200; jute, 400; artificial silk, 900; cotton, 940; flax, 990; hemp, 1100; raw wool, 1120; chromed wool, about 1900; but differences in thickness were not taken into account.

THE CARBON ARC.—The issue of the *Physikalische Zeitschrift* for Sept. 1 contains a paper by Drs. R. Seeliger and H. Schmick, of the University of Greifswald, on the mechanism of the carbon arc. By the use of arcs enclosed in a vessel, they have been able to study the effects of reducing the air pressure from atmospheric to 2 or 3 cm. of mercury, on the positive crater and the light it emits, and on the volt-ampere characteristic of the arc. They find that in air and in nitrogen, the area of the crater increases, and the current per unit area of the crater therefore decreases as the pressure decreases. The increase of area of the crater is accompanied by a decrease of its temperature and a decrease of the voltage between the carbons. If the decrease of pressure is slow, at 1 or 2 cm. of mercury, the pressure rises from below 40 to 50 or 60 volts, and at about 0·5 cm. of mercury falls suddenly to 32 volts, at which it remains steady, the crater being much reduced in area. No theory of the arc has been propounded which will account for the facts observed.