

Research Items.

Roman Britain.—An account by Dr. R. E. Mortimer Wheeler of the first season's excavations at St. Albans, which appears in *Discovery* for December, admirably summarises the chief points of interest. It was thought that Verulamium, which at one time was the nearest approach to a metropolitan city and the only town in Britain dignified with the title of *municipium*, might well supply evidence of exceptional importance in its bearing upon Romano-British culture and organisation. This has been confirmed already in a striking manner. The 'London Gate', for its size and what must have been imposing appearance, is compared by Dr. Wheeler to the great continental gateways or triumphal arches such as have been found at Arles and Autun. The defences of the city are also impressive, consisting of fosse, wall, and reinforcing bank totalling a width of some 165 ft., and even in one part running to 265 feet. Light is thrown upon economic conditions in the city and its possible relations with Germany by the excavation of a dwelling-house and another building, probably a shop. The house was rebuilt at least thrice during the Roman occupation, and its successive phases show the rise to prosperity and the subsequent decline of the town. Exploration outside the city wall has revealed a cemetery and a prehistoric earthwork. The purpose of the latter is not yet clear, but one of the alternatives suggested is that it may be the site of the settlement of Cassivelaunus, the most important centre of southern Britain in the first century A.D. These latter discoveries have added thirty acres to the area to be investigated, the site within the Roman walls being 200 acres.

The Wishram.—Although the Wishram were one of the tribes earliest met by European explorers of the Columbia River, and their trading establishment was of great importance in the development of the north-west of America, their culture is very little known. Only a few of the Wishram now survive, some on their original site on the Columbia River opposite the Dalles, others on the Yakima reservation in Washington. Information obtained by Dr. E. Sapir in 1905 and Mr. Leslie Spier in 1924 and 1925 from the survivors is embodied in "Wishram Ethnography", Vol. 3, No. 3, of the University of Washington Publications in Anthropology. The Wishram were the easternmost Chinookan tribe on the Columbia River, and their language an Upper Chinook dialect. Dislocation of the tribe began at the end of the eighteenth century as the result of tribal movement so early as, or even earlier than, 1750, which brought the Sahaptin into Washington State. The Wishram depended primarily on fishing for their livelihood, and their culture was entirely a river culture. Fishing was supplemented by seed and root gathering. Hunting the deer and other game took an entirely subsidiary place. They lived in villages on the northern side of the Columbia River, roughly from White Salmon River to Ten-Mile Rapids above the Dalles. Their houses were semi-subterranean lodges built over a circular pit, or mat lodges. The earth-lodge accommodated from one to half a dozen families. As elsewhere on the north-west coast of America, class feeling was strongly marked. There were three classes, besides slaves. The classes were based on wealth; but chiefs were not always among the wealthiest class. There were also war chiefs. The chiefs had considerable power and were implicitly obeyed. They adjudicated in murder cases, assessing fines or other punishment. In cases of murder by witchcraft through a shaman, the shaman was not held culpable, but only the man who employed him.

Tunnies.—Because of their economic importance as food fishes, allied with their peculiar habits, the tunnies have formed the subject of a vast literature, spread over a period of fully two thousand years. Active researches into their life-histories and abundance still continue, and recent workers have felt the need of a reasonably complete bibliography—a need which is now fully met by "A Bibliography of the Tunas", by Genevieve Corwin (*Fish Bulletin* No. 22, Contribution No. 87, from the California State Fisheries Laboratory, Terminal Island, California; 1930). The compiler has endeavoured to find and to catalogue all works written previous to the close of 1929 dealing in any way with the five large tunnies—*Thunnus thynnus*, *Neothunnus macropterus*, *Germo alalunga*, *Euthynnus pelamis*, and *Sarda chiliensis*. All the papers listed, with only a few exceptions, have actually been consulted, and after the title of each a brief note is appended indicating its main theme and general scope. These notes add greatly to the value of the bibliography. A list is given of all the abbreviations used for periodicals cited, and a classified index of subjects facilitates reference to any point upon which information may be desired regarding these fishes.

Chirocentrus and its Eggs.—In *Treubia*, Vol. 12, 1, 1930, Dr. H. C. Delsman describes two fish eggs which, although easily distinguishable, give rise to closely similar larvæ ("Fish Eggs and Larvæ from the Java Sea"). Both belong to the genus *Chirocentrus*, the 'Parang-Para' of the natives. One of the larvæ is slightly longer than the other and has more myotomes. This interesting find is in accordance with the fact that Bleeker in 1852 distinguished two species, *C. dorab* and *C. hypsalosoma*, whilst other authorities found only one. Dr. J. F. Hardenberg, in another paper in the same number of this journal ("Some remarks on the Genus *Chirocentrus* (Cuv.)"), fully confirms the separation of the two fishes. Both are long and slender pelagic species, attaining the length of 90 cm. or more. *C. dorab* is the more slender of the two, with more vertebrae than *C. hypsalosoma*, larger scales, and other differences in the proportions of the various parts, the distribution being slightly different, although both species, old and young, and also the eggs, may be found together.

Antarctic Free-living Nematodes.—Dr. N. A. Cobb describes a large number of these worms, which are extremely abundant in the Antarctic marine waters, in a paper entitled "Marine Free-living Nemas" (Australasian Antarctic Expedition, 1911-14, under the leadership of Sir Douglas Mawson: Scientific Reports. Series C—Zoology and Botany. Vol. 6, Part 7, June 1930). They belong to twelve genera, collected from muddy sediment, three fathoms, Commonwealth Bay (Adelie Land), the larger forms from amongst the roots of brown algæ. A formula of measurements and signs is introduced in the systematic work, which conveys a large amount of information compressed into a very small space, and there is a key to the fifteen species involved. These Antarctic nematodes have several features in common. There is one new genus, *Hyptiolaimus*, created for the new species *cephalatus*, which may be related to *Oncholaimus*, and eight new species besides this. It is interesting to learn that one of these, *Monohystera naviculivora*, as its name implies, is a diatom feeder, especially eating *Navicula*. Sometimes the intestine is crowded with the frustules, many of which are as long as the width of the worm and half as wide as its head end; 150 diatoms have been seen in one individual.

The Walnut Tree in England.—Two papers in the *Journal* of the Royal Horticultural Society for September deal with this subject. Mr. H. Spence discusses the qualities of the timber and the cultivation of the walnut in France and California. He also comments upon the quality of the nuts obtained from the various isolated trees grown in Great Britain, so far as recent inquiries enable this to be gauged. Mr. A. W. Witt discusses the vegetative propagation of the tree under English conditions as ascertained by preliminary trial at East Malling. At present, grafting upon seedling stocks of *Juglans nigra*, or the common English walnut, seems to be most practicable, grafting under glass proving most successful. Stocks are also being raised vegetatively, the parent plant being planted in open, sandy ground, layered, and the buds covered with an inch of soil whilst still dormant. The young shoots thus etiolated afterwards root readily.

The Cultivation of Pyrethrum.—Of recent years knowledge has been gained as to the conditions necessary to observe if pyrethrum sprays are to be efficacious. Tutin has a paper upon its method of employment in the Annual Report of the Agricultural and Horticultural Research Station, Long Ashton, 1928, and there seems little doubt that this substance may prove a most valuable insecticide; at present it is one of many agents that are being tried out against the tsetse fly in Africa. An article upon its cultivation, in the *Bulletin of the Imperial Institute*, 28, No. 3, 1930, is therefore very timely. Known for many centuries in Persia, the plant itself, and the powder ground from the flowers, were introduced into Europe early in the nineteenth century. In 1881, the Dalmatian species, *Chrysanthemum cinerariæfolium* Vis., was introduced into Japan, where its cultivation flourished apace, especially around Hokkaido, and 70 per cent of the world's yield is now claimed by Japan. This article, by the British Vice-Consul at Seoul, Japan, shows that the great development of this crop in Japan resulted from War conditions, when cultivation of the plant was almost suspended in Austria. A very good quality of flower is produced in Europe, and subsequent years may see a development of the European product again, especially if the insecticidal use of the product undergoes wide development.

Stratigraphical Position of the Couchiching Series.—In the neighbourhood of Steep Rock Lake, Ontario, a series of schistose Pre-Cambrian sediments occurs, bordered on the north by Keewatin basic volcanics and on the south by intrusive granite. To the west these schists continue towards Rainy Lake, but to the east they gradually finger out and are lost in the granite. They have been alternatively correlated with the Couchiching (below the Keewatin) and with the Seine (above the Keewatin). In the *Jour. Geol.*, p. 521, 1930, J. E. Hawley presents evidence to show that although the schists appear to dip beneath the Keewatin, the contact is one of nearly flat shear-faulting, in which case the stratigraphical evidence of relative age becomes ambiguous. From the larger structures it is thought probable that the disputed series is of post-Keewatin age. This does not, of course, imply that genuine Couchiching schists may not exist in the Rainy Lake area.

Mineral Industry of Alaska.—The mineral industry of Alaska, if it has not been the mainstay of the country, has at least contributed largely to its economic development. Some thirty years of geological survey, fostered by the Federal Government of the United States, has produced results of in-

estimable value to the prospector, miner, and business executive, and abundant information relative to the origin, character, distribution, and extent of the various ore deposits is available. The total value of the mineral production in 1928 (*Bull.* 813-A, United States Geological Survey) was more than fourteen million dollars, furnished chiefly by gold and copper. There is also some silver, tin, lead, a little platinum, coal, and petroleum, while marble, gypsum, etc., are important. The gold is obtained from lode mines and placers in about equal quantities, the principal lodes occurring in the south-east. The Yukon Basin still figures as the prominent placer territory, though a considerable quantity of the metal comes from placers in the Seward Peninsula. Practically all the copper is derived from two mines in the Copper River region and from Latouche Island. The chief source of silver is the copper lodes, though it is also obtained from the gold lodes and placers. Lead is recovered as a by-product in the course of gold and silver mining. Platinum, together with palladium, osmium, and iridium, has been found sporadically in both lodes and placers. Tin has been mined from veins and mineralised rocks occurring in the Seward Peninsula, and the comparatively small tonnage finds its way to Singapore for reduction. The output of bituminous and anthracitic coals has increased, and in 1928 more than 126,000 tons were produced. Petroleum is mainly confined to the Katalla field. It is refined on the spot, and the products, gasoline and distillate, find a ready sale for the boats of the fishing fleets. This last industry has not apparently justified the optimism originally expressed or the vigorous search for fields in the past. Imports of oil from the United States supply most of the needs of the inhabitants.

Intensity of the Auroral Line.—It is possible, by the use of a special colour filter, to isolate effectively that part of the light from the night sky which extends for about 200 Å. round the green oxygen auroral line $\lambda 5577$ and so to follow variations in its intensity. Lord Rayleigh, in the November number of the *Proceedings of the Royal Society*, has given an account of an attempt to make these relative measurements absolute, which has been accomplished by determining the absolute values of the numbers in his arbitrary scale of intensities, by reproducing them with the illumination from a standard incandescent lamp. Actually the light from the sky which was transmitted by the filter used consisted only in part of the auroral line, this being superposed upon a continuous background, the relative intensity of which is known to vary considerably. Taking the fraction of the light transmitted by the filter and due to $\lambda 5577$ to be 0.37, the brightness of this line in the sky was found to be approximately 3×10^{-5} candles per square metre. The energy required to maintain this is 6.4 ergs per second per square metre, and the number of atomic transitions required to supply this energy 2×10^{12} per second per square metre. These numbers are known to vary from time to time, and to be quite definitely rather approximate, but should be of much value in testing theories of the light emission from the upper atmosphere.

High Velocity Positive Ions.—Work is now in progress in several laboratories on the production and properties of particles of high speed, the aim of such experiments being to provide electrical sources to replace radio-active sources of α -particles and β -particles. A preliminary report on some work of this nature, which is being performed with positive ions in the Cavendish Laboratory, is given by J. D. Cockroft and E. T. S. Walton in the November number of the *Proceedings of the Royal Society*. The problem can be

divided into two parts, so far as the generation of the high-speed particles is concerned; first, the production of a stream of ions in a form suitable for acceleration, and secondly, the method of acceleration. The source of ions which has been used is a canal ray tube, the cathode of which is pierced with a narrow tube from which emerges a mixed beam of protons and molecular ions, and the acceleration of these has been brought about by a potential of 300 kilovolts produced by rectifying the output of a low-frequency step-up transformer. Many difficulties were, naturally, encountered in the course of the work on account of the high potentials involved. The electron tubes used to rectify the high potential had to be specially built, and were kept continually exhausted by a diffusion pump, the latter containing oil instead of mercury. The bulbs in which the ions were accelerated and the potential rectified were blown from a hard Jena 'molybdenum' glass, and, with their stems, were each approximately a metre in length, to minimise the chance of sparks passing externally through the air between the electrodes. It was found that the ion beam could be focused by suitable choice of the dimensions of the electrodes. Very little space is devoted in this paper to applications of the fast ions, but it is mentioned that a non-homogeneous radiation has been found to be produced when metals are bombarded by the stream of ions, the intensity of the radiation being approximately one ten-thousandth of that produced by a similar electron source at the same voltage.

Radiation Distribution of a Radio Antenna.—To the September number of the *Journal of the Institution of Electrical Engineers*, R. M. Wilmette, of the National Physical Laboratory, contributes two papers on the radiation distribution which takes place from the antenna of a radio system. In the first paper, he obtains formulæ for this distribution from advanced theoretical considerations, and he shows how they can be applied in practice to the case of the beam antenna. He points out that even in complicated cases where we have an array of antennæ, it is possible to obtain solutions. In the second paper, he discusses experimental results on the radiation distribution in vertical planes from an antenna. The results were obtained by measuring in an aeroplane the strength of the received signals from an excited antenna on the ground. The position of the aeroplane was determined from the ground by means of a theodolite, and the signal strength was recorded on a cinematograph film. The results showed very definite maxima and minima, their positions being determined within a few degrees. But only rough values of the field strength could be obtained, as many experimental difficulties had to be overcome. In the case of low frequency, substantial agreement between theory and experiment was obtained. The radiation was also obtained for one of the beam stations of the Marconi Co. It was found that, owing to the sharpness of the beam, large discrepancies were sometimes observed. The average results obtained were, however, in good agreement with theory. It is concluded that the theory of radiation distribution is correct to a first approximation. The difficulties seem to be connected with the fact that in practice it is impossible to obtain a site which is theoretically perfect.

Hydrates of Hydrogen Fluoride.—In the October number of the *Journal of the American Chemical Society*, Cady and Hildebrand describe measurements of the freezing points of the system water + hydrogen fluoride, which indicate that, in addition to the solid hydrate $\text{HF} \cdot \text{H}_2\text{O}$ previously known, the compounds

$\text{H}_2\text{O} \cdot 2\text{HF}$ and $\text{H}_2\text{O} \cdot 4\text{HF}$ exist. The existence of two compounds with excess of hydrogen fluoride but none with excess of water indicates that hydrogen fluoride tends to assume a more complex polymerisation than water, and the formula $\text{H}_2\text{O} \cdot 4\text{HF}$ is in agreement with the existence of H_4F_4 as one polymer of HF. Berliner and Hann had suggested that this polymer exists, and had pointed out that hydrofluorides of amines have the general formula $\text{B} \cdot 4\text{HF}$. Other compounds such as $\text{KF} \cdot 3\text{HF}$ and $\text{MgF}_2 \cdot 2\text{HF}$ may be regarded as derivatives of H_4F_4 , and if water behaves in a manner similar to the amines, one compound formed should be $\text{H}_2\text{O} \cdot 4\text{HF}$.

Filter-cloth from Nitrocellulose.—In an article in the *Chemiker-Zeitung* for Nov. 8, Dr. Hans Gradl of Munich directs attention to the suitability of nitrocellulose as a material for the manufacture of filter-cloth. The resistance of various textile materials to the corrosive action of acids and alkalis appears to depend upon the amount of nitrogen which they contain, and numerous attempts have been made to increase this resistance by increasing the nitrogen content of the fibre. Thus, cotton cloth has been nitrated after it has been woven, but the best results so far have been obtained by using cloth woven from an artificial silk consisting of nitrocellulose, containing 12 per cent of nitrogen. This filtering material has given very satisfactory results during the last four years. It can be used to filter a 40 per cent solution of phosphoric acid at 90°C . without deterioration. It must be preserved damp, and the serious technical difficulties at first encountered in weaving it in this condition have been overcome. It can be cut into convenient shapes and sewn with nitrated thread.

New Inverted Metallurgical Microscope.—The Beck Inverted Microscope No. 30 is constructed on the same principles as the Beck-Hadfield microscope. By fitting a collimating lens in front of the vertical illuminator, it has been found possible to replace the long optical bench of the original microscope by a short fixed base, which makes the apparatus much more compact and robust. Apart from the camera, which has a variable extension of 10 in., all the major components are fixed. Just sufficient movement is allowed in the position of the source of light and in the illuminator to ensure that critical illumination may be easily obtained under all conditions. The simplicity of the new design, and the omission of the *macro*-photography equipment, have enabled the makers to reduce the price of the complete outfit from about £350 to £220. The whole apparatus has been designed to stand hard wear, and once it is set up it should need little attention. The microscope stage is remarkably rigid, and the coarse adjustment, which moves the stage, can be clamped in any position. The fine adjustment carries the objective only, and acts smoothly. The changing device for the objectives is positive in action, and very satisfactory. The thin glass illuminator can be replaced easily by a prism, though the makers recommend the use of the former type. The apparatus was tested with specimens of fine pearlite, the laminations of which were so close together that they could just be resolved with the $\frac{1}{2}$ inch oil-immersion lens. When the specimen was examined visually, using the thin glass illuminator, the resolution was found to be excellent. The illumination was even, and the image was satisfactorily free from glare. The definition at about 1500 diameters was good and the field reasonably flat. When the prism was substituted for the glass slip, however, the image was, of course, brighter but the illumination decidedly less even. The illuminant was a 'pointolite' lamp which has only about one-fifth the intensity of a carbon arc.