

Research Items.

ELECTRICAL REPRODUCTION OF SPEECH.—The production of sound pictures has made it necessary for research engineers to study very closely the fundamental principles of speech, hearing, and music. In the United States there is now a Society of Motion Picture Engineers, and some of the papers read before it are reproduced in the *Bell Laboratories Record* for November. Such problems as sound recording, wax recording, recording with the light valve, speed control, sound projector systems, and the fundamental principles of speech, hearing, and music are discussed in an able and interesting way. Studies on the wave forms of speech sounds have shown that the pitch of a man's voice is of the order of 128 cycles per second, whilst that of a woman is of the order of 256 cycles. In both cases overtones occur. Woman's speech is more difficult to interpret than man's. This may be partly due to the fact that it does not disturb the membrane of hearing in so many places. The more difficult consonant sounds in woman's speech are not only fainter, but also require a higher frequency range for interpretation. When by electrical methods frequencies below 100, 200, . . . 1000 cycles are progressively eliminated from speech, its character changes in a marked way. Timbre or 'tone colour' best describes the characteristic lost. For the correct interpretation of speech sounds, frequencies below 300 cycles do not appear to be necessary. When frequencies above 8000, 7000, . . . 3000 cycles are progressively eliminated, the character of the speech again changes markedly. The characteristic lost may be described as sibilance. It refers to the hissing or frictional character of speech. The impairment produced by eliminating higher frequencies is generally greater in the case of female voices. Timbre seems to be more important in music than in speech. In order to distinguish the tones of various instruments, the fundamental and the first three or four overtones are essential.

FISHES FROM THE PHILIPPINES.—In the *Philippine Journal of Science*, May 1928, Mr. Albert W. Herre and Mr. Heraclio R. Montalban describe twenty-two species of Goatfishes (The Goatfishes, or Mullidæ, of the Philippines). This family includes upwards of forty species belonging to five closely related genera, three of which, *Upeneoides*, *Upeneus*, and *Mulloides* occur in the Philippines. They are shore or reef-dwelling fishes found in all warm seas and living on the sea bottom, where they feel and test everything with their two long barbels as they search for food, which consists of small crustacea and fishes. All are coloured in the most gorgeous way with characteristic patterns of various spots and stripes and are some of the most striking and beautiful fishes in existence. Many of them are valuable food fishes, reaching to a size of 300 or 400 millimetres. The paper is well illustrated by one uncoloured and five coloured plates. In the same journal for June, one of the authors (Mr. Herre) deals with the Belonidæ (the Philippine Gars or Needlefishes). Like the British Garfish, the body is more or less green, the flesh and bones being green also. One species of *Ablennes* and eight of *Tylosurus* are described in detail. They live near the surface and are exceedingly voracious and carnivorous, but prey only on small fishes (chiefly atherines, anchovies, and pilchards), the gullet being very narrow. The larger gars are valuable food fishes, and may reach a length of more than one and a half metres. Also in the June number, Mr. Abelardo Valengueta discusses the composition and nutritive value of Philippine food fishes. Approximately one-tenth of all

the known fishes are found in Philippine waters, most of which are edible. From the investigation of forty species of fresh fishes, the author finds an average protein content of 20.15 per cent, while smoked or dried fish (six species) has as much as 44.92 per cent. Fresh fish has an average fuel value of 99.02 calories; smoked or dried, 237 calories per 100 grams. Some of the commoner shell-fishes were also analysed.

INSECTS OF SAMOA.—Since last referred to in our columns, six further fascicles of "Insects of Samoa," in course of publication by the British Museum (Natural History), have appeared. In Part 6, Fasc. 2, dealing with the Nematocerous flies, Mr. F. W. Edwards mentions that only eleven species were known prior to 1926, and with the material now available the list is raised to one hundred. He concludes that the Samoan fauna of these insects is purely of Austro-Malayan origin. Regarding the Thysanoptera (Part 7, Fasc. 2), Mr. R. S. Bagnall notes that with one exception the species either form leaf-galls on *Ficus* or are inquilines thereof, and all the species are described as new. The Geometrid moths studied in Part 3, Fasc. 3 by Mr. L. B. Prout bring up the known Samoan species of that family to thirty: they are included in eighteen genera, none of which is endemic or even restricted in its range. In Part 7, Fasc. 3, dealing with the Neuroptera, Mr. P. Esben-Petersen adds twelve species to the Samoan fauna which belong to the three families Chrysopidæ, Hemerobiidæ, and Myrmeleonidæ. He remarks that, as a whole, these insects indicate close relationship with the Austro-Malayan fauna. The Apterygota are dealt with in the same fascicle: they present no startling novelties, and Dr. G. H. Carpenter finds only eight species, of which two Thysanura and one Collembolan are new. Other reports deal with Hemiptera, Anoplura, Mallophaga, Trichoptera, Plecoptera, Siphonoptera, Orthoptera, and Dermaptera, and are written by leading specialists in the groups concerned.

ENGLISH-GROWN PYRETHRUM.—In the *Annals of Applied Biology*, vol. 15, No. 3, August 1928, Messrs. J. C. F. Fryer, F. Tattersfield, and C. T. Gimmingham contribute the first part of an interesting paper on English-grown pyrethrum as an insecticide. The use of certain species of this plant for insecticidal purposes has been known for some time, and the authors' object has been to determine whether pyrethrum grown under English conditions retains its killing powers. The species *Chrysanthemum cinerariifolium* was grown from Swiss and Japanese seed, and the flowers from plants grown in six different English localities showed practically the same toxicity from the insecticidal point of view. Artificial drying of the flowers had no significant effect on their properties, although prolonged exposure of pyrethrum to wet conditions led to some loss of toxicity; but contrary to the usual opinion, if stored in a reasonable manner, they remained without deterioration for long periods. The data given in this paper show that pyrethrum can be successfully grown in England and harvested without loss of toxicity under our climatic conditions.

STOCK DISEASES CAUSED BY TOXIC PLANTS.—The importance of plants which are toxic when eaten by his flocks and herds has long been recognised by the stock-owner, and in Great Britain the yew and rhododendron are well known to be poisonous to cattle and sheep. In the Kimberley District of Western Australia a disease of the horse ('walk about disease') has been determined by Mr. Murnane and Prof. Ewart to be

due to slow poisoning by saponin derived by the ingestion of the leaves of a local plant, *Atalaya hemiglauca* (whitewood), a tall shrub or small tree with pinnate leaves belonging to the Sapindaceae. 'Winton' disease of horses in New Zealand has been shown to be due to the ingestion of ragwort, *Senecio jacobaea*, which is likewise rich in saponin (*Bull.* No. 36, Council for Scientific and Industrial Research, Australia).

TIMBER INVESTIGATIONS.—The investigation work into the properties and strength of home-grown and imported timber being carried out by the Forest Products Research Laboratory at Princes Risborough has been already alluded to in NATURE. In what was designated as *Forest Products Research Project I.*, the mechanical and physical properties of timber, based on experiments with small clear specimens, was dealt with. A second pamphlet on the results attained with tests on British home-grown ash, Douglas fir, European larch, Corsican pine, and Scots pine has recently been issued under the title *Project I.: Progress Report I.* ("Tests on some Home-grown Timbers in their green condition," by C. J. Chaplin, London: H.M.S.O.). It may be suggested that a simplification of the titles of these reports would perhaps result in their being more widely read; or at any rate more readily obtained in a library or elsewhere. For example, the average member of the public, unless he had the two publications before him, would not readily appreciate the fact that the first, termed *Project I.*, and the one under review entitled *Project I.: Progress Report I.* were two different pamphlets. In connexion with the experimental work being undertaken on the above-mentioned timbers, it is stated that the object in carrying out the tests is not primarily to determine the strength of timber as used for commercial purposes (which is dealt with under another series of investigations) but to determine the strength of timber, selected free from all defects. The value of this research work, it is contended, "lies in the fact that it is necessary to select timber free from defects, termed clear timber in *Project I.*, so as to obtain data on the species that will be strictly comparable with similar data of another species." Of the five specimens dealt with, the wood of the ash came from Coleford, Gloucester; the Douglas from Taymount, Scotland; the European larch from the Forest of Dean, Gloucester; the Corsican pine from Wells, Norfolk; and the Scots pine from Bedgebury, Kent. The localities chosen for the larch and Scots pine appear to be curious. It might have been confidently expected that the latter at least would have come from Scotland, and the former from a locality where larch has been grown over a far more extensive area than has been the case in the Forest of Dean. Mr. Chaplin's work has been carried out with considerable care and the results attained are of interest.

NATURE RESERVES IN NEW ZEALAND.—The policy of making State-owned reservations for the protection of scenic features and the preservation of flora and fauna is steadily pursued in New Zealand. Since 1904, nearly half a million acres have been acquired for these purposes at a comparatively small expense to the State. The number of reserves is now 806, including about eleven thousand acres added during the last year. These recent additions are described in the Scenery Preservation Report of the New Zealand Department of Lands and Survey for the year 1927-28. Many of the reserves are small, and some of these are of no value for cultivation. Others are not easy of access at present, but will be appreciated as settlement increases. The supervision of most of the reserves is delegated to local authorities or speci-

ally constituted local boards. In some of the reserves there are specially appointed caretakers. The report concludes with an account of the present state of the fauna and flora of Kapiti Island, at the western end of Cook Strait.

EXTERMINATION OF BRACKEN.—Many acres of grassland are rendered useless for grazing in Great Britain by the growth of bracken, which largely prevents the growth of the grasses as a result of the dense shade thrown by its fronds, whilst their dense stiff foliage excludes the sheep. At the same time, the extermination of this plant, although its normal habitat may be the deeper soils of the natural woodland, presents many practical difficulties. Dr. W. G. Smith gives the results of some recent experiments upon the farm of the Edinburgh and East of Scotland College of Agriculture in the *Trans. and Proc. Royal Botanical Soc. of Edinburgh*, 30, 3-12, 1928. Cutting has proved most effective if carried out when the fronds had grown up for about seven or eight weeks. They have then taken a maximum amount of food from the underground rhizomes and not yet commenced to replenish these supplies as the result of their own photosynthetic activity. Sheep have also been induced to graze down the young fronds by dressing the ground with crushed rock salt. A hopeful preliminary experiment is also described where the young fronds were destroyed by a dressing of potassium chlorate.

FOSSIL BACTERIA.—In 1922, Prof. Hans Schneiderhöhn (*N. Jahrb. f. Mineral.*, Beil.-Bd. 47, pp. 1-38) announced the discovery of sulphur bacteria in the Permian copper-shales of Mansfeld in Saxony. Mr. Sven V. Bergh now publishes in *Geologiska Foreningens i Stockholm Förhandlingar* (50, pp. 413-418) photographs of polished sections of Ordovician alum-shales from Kinnekulle, Sweden, seen by reflected light. They show small, somewhat rounded, fragments of bituminous substance, closely surrounded by minute grains of pyrites. These grains also occur in roughly spherical aggregates. In the opinion of Mr. Bergh, Prof. Schneiderhöhn, and some unnamed bacteriologists, these are fossilised sulphur bacteria.

PALÆOZOIC BRACHIOPODS.—In a memoir on *Plectambonites* and some allied genera (*Mem. Geol. Survey Gt. Britain*, Palæont., vol. 1, pt. 6, pp. 367-527, plates 21-25; 1928) Prof. O. T. Jones describes in great detail the morphology, classification, affinities, and distribution of some late Ordovician and Silurian Brachiopods, many of which have hitherto been referred to the genus *Plectambonites* which was founded on Ordovician species. The limitations of that genus are discussed, and it is shown that the forms of later age should be separated from it. Three new genera are established, *Leptelloidea*, *Sowerbyella*, *Chonetoides*, and many new species are described. *Plectambonites* is reminiscent of *Billingsella*, and it is probable that both genera are descended from a common ancestor. The memoir concludes with two tables, one showing the correlation of the divisions of the strata from the Llandeilo to the Ludlow in Great Britain, the other giving the geological ranges and localities of the species described.

THE ETIGO (JAPAN) EARTHQUAKE OF OCT. 27, 1927.—Though not of great strength (intensity 9, Rossi-Forel scale), this earthquake showed some features of considerable interest. According to T. Matuzawa (*Earthq. Res. Inst. Bull.*, vol. 5, 1928, pp. 29-34), it occurred at 1h. 53m. 35s. G.M.T. The devastated region was very small, so that the position of the epicentre could be determined precisely, as in lat. 37° 27'

N., long. 138° 46' E., that is, close to the north coast of Japan, a short distance to the west of Nagaoka. At the request of Prof. A. Imamura (*Tokyo Imp. Acad. Proc.*, vol. 4, 1928, pp. 56-59), the precise levelling over about 170 miles of the Etigo province had been carried out about three months before the earthquake. It was repeated over the central area soon afterwards, when it was found that over a distance of 2½ miles, including the epicentre, there had been an upheaval of 2.1 cm. or about four-fifths of an inch. This change may be taken as wholly due to the earthquake, the first result of the kind quite free from error due to secular variations of land-level. Mr. Matuzawa has also examined the records from 23 stations in Japan (*Earthq. Res. Inst. Bull.*, vol. 5, 1928, pp. 1-28), and finds that the velocity of the earth-wave in the upper or granitic layer was 4.99 km. per sec., and in the layer below 6.4 km. per sec. The depth of the focus cannot be estimated with accuracy, but it was apparently about 12 miles.

A NEW TRANSIT INSTRUMENT.—Prof. C. V. Boys has designed a new type of transit instrument which embodies the principle of the diploidoscope in a solid prism (*Proc. Roy. Soc., A*, 121, Nov. 1). Two stellar images are obtained from the latter, one formed by two internal reflections, and the other by direct reflection from the face of emergence of the internal rays. The two images are thrown on to a moving cinema film by a long focus object glass mounted in the tubular support of the prism, and the beats of a standard clock are also recorded on the film as discontinuities in the stellar trails, produced by the controlled rocking of a plate of glass in the path of the light. Two coincidences are registered, the first with the star about 1' to the east of the meridian, and the second with the star to the same extent past the meridian. Prof. Boys has given exact details for the construction and mounting of the instrument—one of the prism's supports is a bar passing through a hole drilled in the glass—and points out that many of the troubles encountered with instruments now in use do not arise. The mechanical requirements of an absolute character are reduced to a minimum, and the crucial point would appear to be whether or not a prism of the necessary perfection for work of this type can be manufactured; a two to one ratio of the angles, and freedom from pyramidal error should each be to within 1' of perfection.

ATTENUATION OF WIRELESS WAVES OVER LONDON.—An interesting paper by R. H. Barfield and G. H. Munro on the attenuation of wireless waves over towns was read to the Wireless Section of the Institution of Electrical Engineers on Dec. 5. The work carried out was part of the programme of the Radio Research Board. To obtain measurements a motor van was employed with a frame coil fitted on the top as a receiving aerial. The strengths of the received signals were indicated by the deflection of a microammeter in the anode circuit of the detecting valve of an amplifier. When occasion offered, a few experiments were made on the effects of trees and wires. In most cases their proximity resulted in a reduction in the signal strength and also in a flattening of the minimum of the curve obtained by rotating the aerial coil. In one case, beneath a set of telephone wires, the minimum exceeded fifty per cent of the strength of the maximum. An interesting new radio contour map of 2 LO (London) made in March 1927 was given. The earlier map (1926) was constructed mainly by taking observations in seven radial directions at equal angular intervals round the transmitter and interpolating for the intermediate spaces. Blind directions therefore may have remained undetected.

Alterations made in the transmitting aerial also made it advisable to construct a new map. Over the greater part of the area the changes are slight. The chief point of difference is the appearance in the later survey of two distinct 'crevasses' in the contour lines in the directions west-south-west and east-north-east from the transmitting station. These are almost certainly produced by the directional properties of the 2 LO aerial, and correspond to the minima in a polar curve obtained by the authors and ascribed to mast shadow. These 'blind' directions were probably present during the earlier survey and were undetected owing to the method of observation adopted.

WIRED WIRELESS TELEPHONY.—In view of the increasing demands continually being made on the overcrowded ether, researches are being made for further channels for broadcasting which will not congest the ether further. So far back as 1900, Duddell realised that his whistling arc not only solved the problem of wireless telephony, but might also be utilised to transmit music, produced by a band playing in an electric lighting station, into the houses of all connected to the station, the electric currents producing the vibrations being carried by the lighting mains. This was an early illustration of 'wired wireless.' In the *Wireless World* for Nov. 14 and 21 the underlying principles of this system, sometimes called wireless wave telephony, are explained. The high frequency oscillations developed by some suitable type of high frequency generator are used. They are modulated by the currents produced in a microphone by speech or music. The resulting modulated oscillations, instead of being radiated into space from an aerial as in radio telegraphy, are introduced into a land line circuit along which they are transmitted as electro-magnetic waves. A recently suggested application of wired wireless is the broadcasting of programme matter over existing wire networks without interfering with the main services for which the wires are intended. Although at present there are few commercial applications of the method, the Western Electric Co. of America has worked out in detail and patented (Brit. Pat. 192,359), a complete wired wireless system utilising the ordinary telephone wires. Several broadcasting programmes can be superimposed on a telephone system without interfering with its ordinary use by subscribers. Electric filters are essential for this method. As a rule these are complicated and expensive. If, however, a power or lighting system like the British 'grid' were employed, these filters would be unnecessary.

THE ATOMIC WEIGHT OF BORON.—Briscoe, Robinson, and Stephenson (1926) concluded that the atomic weight of boron depended on its source. Their determinations involved the densities of beads of fused boric oxide and the different densities observed could not be explained by temperature changes. The *Journal of the Chemical Society* for October contains a paper by A. Cousen and W. E. S. Turner, in which these results are criticised on the grounds that the fused beads were not free from strain. The density of fused boric oxide is now found to be about 1.844, while Briscoe, Robinson, and Stephenson found it to be 1.795. Cousen and Turner show that this difference is probably due to the careful annealing of their beads, which were also prepared at a higher temperature (1400°). In view of the difficulty with which the last traces of water are eliminated from boric acid, this may further contribute to the discrepancy. It appears that the densities of boric oxide glass cannot be relied upon as evidence that the atomic weight of boron varies according to the source of the mineral containing it.