Research Items

An Unexplored Culture-Area in Yucatan. An account of discoveries of ruined cities discovered on a journey of archæological exploration in Campeche has recently been published by Mr. Cyrus Longworth Lundell (*Proc. Amer. Phil. Soc.*, Philadelphia, 72, No. 3). The area, which was approached up the Champoton River, lies midway between the two great regions of Mayan civilisation, the Southern, which reached its apogee about A.D. 731, and the Northern, which centred at Chichen Itzá and attained its highest development in the two centuries after A.D. 1263. Important as a link between the two cultures, this country was archæologically unexplored. The first site to be discovered was that of Calakmul, which is now being excavated under the direction of Dr. Silvanus P. Morley and has proved to be one of the most important cities discovered in recent years, ranking with Copan, Tikal and Palenque. The second site to be discovered was Nohoxna, a city built on a natural acropolis, twenty miles to the south-west of Calakmul, which appears to have been a great astronomical observatory, as well as one of the most important Mayan ceremonial centres. Nine stelæ, a "Mound of the Three Temples", a "castillo", exceptionally well preserved, and other remains were found. Eleven more sites of ruins were located, while information concerning several others was obtained. An impressive and unique monument along the south-western edge of the Calakmul lake, now silted up, is the "Wall of the Kings", a wall about ninety feet long, now more than twenty feet high, and about a metre thick. It is remarkable for five identical grotesque masks representing the jaguar, which appear at intervals on the lower part of the frieze, with a life-sized human figure on a projection above each of the masks. At each end of the wall is another life-sized human figure, apparently neither a priest nor ruler. Further information and observation indicated the vast field here open to archæological exploration; but for the moment investigations are to be confined to Calakmul.

Training in the Acquisition of Skill. Mr. John W. Cox has recently published the results of some researches into the problem of formal training in the acquisition of skill (*Brit. J. Psych.*, 24, Part 1). That training in one skill, or some one branch of knowledge, automatically improves the ability to learn others has been an axiom for numbers of educators. Laboratory experiments for the most part have failed to support the view; nevertheless it persists. Mr. Cox contributes evidence of considerable importance. He experimented with adults and children, using simple industrial operations required in assembling, wiring and stripping the parts of an electric lamp-holder. His aim was to discover how far the effect of practice at any one of the operations would be transferred to the others, and then to investigate the effect of training as distinguished from practice. He found that skill, developed by the mere repetition of one manual operation, conferred little advantage on the performance of other operations afterwards undertaken; but that when such repetition was replaced by instruction, which aimed at helping the subject to grasp some of the general principles involved, then the skill, developed at no additional cost in time, tended to transfer to other operations, manifesting itself not only in superior ability but also in a superior rate of progress. These results help to explain some of the conflicting views on the subject, and suggest that the custom of allowing beginners to pick up processes by unthinking repetition might with advantage be altered.

Researches on Plankton Production. Dr. E. Steemann Nielsen in his paper "Einleitende Untersuchungen über die Stoff-produktion des Planktons" (*Meddelelser fra Kommissionen for Danmarks Fiskeri- og Havundersøgelser*. Serie Plankton. Bind 11, No. 4. 1933) gives the results of some respiration and assimilation experiments with natural plankton, undertaken in the Marine Biological Laboratory at Fredrikshavn during the summer of 1931. Respiration was measured by the oxygen absorption in covered flasks, carbon dioxide assimilation by the oxygen production in uncovered flasks. The oxygen determination was carried out in a special Winkler flask. For drawing the water a Meyer's drawer was used, containing about 2½ litres. A series of 100 c.c. flasks with glass stoppers were filled as quickly as possible and one prepared for oxygen estimation, the others being sunk in different depths and made fast to a buoy. It was found that at 2 m. and at 0·2 m. the assimilation intensity was practically the same. A flask lighted from noon to sunset and one from sunrise to noon were together the same as one lighted for the whole twenty-four hours. The oxygen numbers vary a good deal according to the amount and quality of the plankton present. The compensation point, where the respiration and assimilation balance, is found to be about 7 m. This is much higher than if pure cultures of diatoms were used, the mixed plankton including both autotrophic and heterotrophic forms altering the results in many ways. Transparency of the water affects the assimilation at different depths, and this depends on the amount of plankton and detritus present.

Worm Infestation of Lambs. In a paper on worm infestation of lambs in the north of Scotland, prepared primarily for farmers, D. Robertson (*Scot. J. Agr.*, 16; 1933) gives a list of the different species of worms, found in the food canal (which harboured eleven species) and in the lungs (in which were two species of worms) of eight lambs suffering from parasitic gastritis, examined in September and October 1932. The author directs particular attention to the stomach worms, especially to the lesser stomach worm, *Ostertagia circumcincta*, and describes the symptoms of infestation, the life history and control. In two lambs examined, the fourth stomach contained respectively 16,930 and 18,110 of these worms. The second of these lambs was from a farm where overcrowding of the pasture had occurred during the last three years, and affords a good example of the danger of sheep farming on a large scale—260 acres of pasture were carrying about 375 ewes and their 500 lambs—with only a limited grazing area available. Four years of overcrowding has rendered the farm useless for sheep rearing as the ground has become heavily infested with worms. As a result of counts made of the worms present in lambs, it would appear that symptoms of disease due to the lesser stomach worm are unlikely to appear unless the number of worms present exceeds 8,000. Among other suggestions it is recommended that

lambs be moved on to clean grass as often as possible during the months (July to August) which are most suitable for development of the larvæ of the worm, so as to avoid reinfection.

A Fungus Parasite of Calabash. A serious wilt disease of calabash is caused by the fungus *Corticium centrifugum*, which has recently been studied in detail by T. Watanabe (*Bull. Utsunomiya Agric. Coll., Japan*, No. 3, "Studies on some characters of *Corticium centrifugum*", pp. 1–16, and "Vitality of *Corticium centrifugum*", pp. 17–28, July 1933). The fungus grows on a wide variety of nutrient media, but produces sclerotia most readily on soy bean agar and apricot agar. Asparagin agar and Richard's solution produced mycelial growth only. The fungus has an optimum temperature of 28° C. and attacks a wide variety of cultivated plants. Mycelia and sclerotia remained alive on the host plant and in the soil throughout the winter in Japan. The effect of many substances upon the fungus has been tried in the laboratory, and it appears easy to kill the parasite, but no field trials have as yet been undertaken.

Rock Joints and the Cleat of Coal. P. F. Kendall and H. Briggs have recently contributed to the long-discussed problem of the origin of joints and cleat (*Proc. Roy. Soc. Edin.*, **53** (ii) No. 13, 164–187 ; 1933). After clearly reviewing all the relevant evidence, they reach the following conclusions : (*a*) joints are formed not long after the bed is deposited ; (*b*) the forces that cause jointing have acted throughout geological history ; (*c*) the regular orientation of jointing implies an equally regular orientation for the forces concerned ; (*d*) the species of stress most capable of producing joints is torsional ; (*e*) alternating stress alone satisfies the data ; (*f*) an alternating stress of small intensity of short frequency and lengthy duration is effective since it results in failure of the rock-mass by fatigue. Of these conclusions, (*e*) rules out the operation of continental drift or slowing down of the earth's rotation as effective causes. The only hypothesis competent to explain the facts is that originally suggested by Kendall to account for the cleat in coal, namely, that the responsible agent is the diurnal sweep of the earth-tide in an east to west direction round the earth. As a series of strata becomes consolidated by pressure, loss of moisture, etc., and gains in brittleness, it finds itself called upon to flex as a continuous elastic sheet under the alternating tidal torque. Eventually it fails through fatigue along the planes of maximum shear, and the joints then come into existence.

Variable Speed Cathode Ray Television. The *Journal of the Television Society* for December 1932 contains a description, by E. H. Traub, of a novel means of adapting the cathode ray oscillograph to television. In other systems the picture to be transmitted is scanned in horizontal or vertical strips by a spot of light moving along the strips with a constant velocity, and the picture current obtained from a photoelectric cell varies in intensity in accordance with the light and dark shades of the picture. At the receiving end the cathode ray or reproducing light beam moves across the screen with a constant velocity, but the intensity of the ray is varied in order to build up the picture. The new system, which is being developed practically by M. von. Ardenne, makes use of a suggestion due to Thun that the intensity of the ray should be kept constant, but that its velocity across the screen should be varied. The result is that where the ray is travelling slowly a light patch is obtained, and where the velocity is great a dark patch on the screen results. Owing to the high acceleration required in the scanning and reproducing beams to obtain satisfactory detail in the transmitted picture, this variable speed system can only be realised in practice by the use of cathode rays at both the transmitter and receiver. The article referred to states that satisfactory experiments have been carried out with this system over a land-line using a picture divided into 130 strips, and requiring a modulation frequency band of 25–200,000 cycles per second. A feature of the results obtained with this equipment is the remarkable brightness of the light spot at the receiver, so that the images can be observed on the screen in daylight or they can be projected.

Electrolytic Extraction of Slag from Iron and Carbon Steel. In view of the marked influence of slag in iron and steel upon the mechanical properties, and the difficulty of estimating the amount which is present with any real degree of accuracy, a paper on this subject read by R. Treje and Prof. C. Benedicks at the recent Sheffield meeting of the Iron and Steel Institute is of more than usual interest. The electrolysis is performed in a vessel which is divided by a diaphragm. The specimen is surrounded by a collodion bag, carried by a floating wooden ring, for the collection of the slag. The specimen itself forms the anode in a bromide solution containing sodium citrate. The cathode consists of a copper plate in copper sulphate solution. This arrangement, and choice of electrolytes, prevents any formation of oxygen gas on the anode—which would cause the liquid in the collodion bag to become acid and consequently to attack the slag—as well as avoiding the formation of hydrogen on the cathode and rendering the liquid there alkaline with the precipitation of hydroxides. The slag residue is collected by centrifuging after purification (? magnetically) from small quantities of metallic iron.

Bright-Line Stars. Since Secchi discovered, in 1866, that γ Cassiopeiæ and β Lyrae exhibit bright hydrogen lines in their spectra, 410 stars of early type have been discovered to possess bright hydrogen lines. Of these, 207 were detected at Mount Wilson, and Merrill and Miss Burwell have now collected the data together and published a complete catalogue of the 410 stars in the *Astrophysical Journal* (78, 87, September 1933). This Mount Wilson catalogue is accompanied by detailed notes on many of the spectra and by a comprehensive bibliography of the literature, both theoretical and observational, of the subject. The distribution of these objects in galactic latitude and longitude is especially interesting. The *Be* stars tend to group themselves about the galactic equator, and exhibit the interesting property of 'gregariousness', in that they tend to occur in marked groups. Merrill and Burwell point out that the Cepheids also possess the same property and that some of the favoured spots are common to both faint *Be* and Cepheid variable stars. While some of these groups may represent clusters, others may arise because both these classes of objects consist of very bright, but distant, stars which are most easily seen in those particular directions in which there is less obscuring matter in the Milky Way than the general amount. There are some regions which are deficient in *Be* stars ; in these regions dark clouds may hide the more distant stars.