

## Research Items.

**IDENTIFICATION BY RECOGNITION.**—In a pamphlet called "Mistaken Identity" (London: Longmans, Green and Co., 1925, 6d. net), Mr. Clifford Sully discusses the psychology of recognition. A recent famous case has demonstrated only too clearly that to identify a person as a particular person is neither an easy nor a trustworthy process. Because we so frequently in ordinary life see people in their usual setting, we fail to realise how little we actually observe at the moment, as against the amount we bring to bear from memories of previous occasions. Perception and accurate observation are not the simple processes they are rashly assumed to be, nor can honesty of purpose guarantee accuracy of observation. Reference to any text-book of psychology will give the reader evidence of the complicated and personal nature of ordinary perceptions, and this can be easily demonstrated by studying some of the well-known illusions. If errors are frequently made when the mind is critical and unperturbed, how much more likely are they to be made when emotion forms the background, which would naturally be the case in connexion with police trials. Complicate the problem still further with the effect of the newspapers on witnesses, and we have a state of affairs when the probability of unbiased judgment is exceedingly low. No experimental psychologist would accept evidence given under such conditions, and yet it forms no insignificant part of police court evidence. Nor is a feeling of certainty any proof of the truth of the judgment. The author pleads that more attention should be paid to the psychology of human testimony.

**THE "ARCHAIC CULTURE" OF MEXICO.**—The sensational claims made for the antiquity of the relics of human occupation discovered beneath the lava flow in Mexico Valley give an added importance to the very careful investigations which were carried out there by Mr. A. L. Kroeber in the spring of 1924. A descriptive analysis of his results have now been published in Pt. 7 of vol. 17 of the *California University Publications in American Archaeology and Ethnology*. The archaic culture first began to be recognised as such in 1911 or 1912. A particular phase of it is the so-called sub-Pedregalense—a culture found beneath the lava flow or pedregal of San Angel. This is a sheet of lava of about twenty sq. km. or more in Mexico Valley which issued from the peak of Ixtle, covering earlier Pliocene or Miocene andesitic flows. In parts excavated on this occasion, the cultural deposits extended to a depth of so much as 3 metres below the lava flow. Careful comparison of material from this and other archaic sites, based chiefly on the pottery, have made it possible to work out a culture sequence which falls into four periods; but the absolute age cannot yet be fixed. In the geological sense the lava flow is quite recent. Culturally the archaic period is characterised by maize agriculture; but cotton may not have been in use, as spinning appears to have been undeveloped. All the important traits of the culture are found in more developed form in the Teotihuacan culture. While it includes the general objective features of Mexican religion, it precedes the individualisation of specific deities, symbols and acts of this religion. It has no specific features characteristic of any other area, such as the Pueblo, from which indeed it is definitely marked off by the occurrence of pyramid and step structures as well as other features.

**MARQUESAN MUSIC.**—Mr. E. S. Craighill Handy and Miss Jane Lathrop Winne have published in *Bull.* 17,

*Bernice P. Bishop Museum of Honolulu* a study of the native music of the Marquesas Islands based upon material acquired by the former when a member of the Bayard Dominick Expedition of 1920-21. In the olden days, chanting accompanied practically every activity of life among the Marquesans and formed the central feature in most rites and festivities. Twenty-five different types of chants for use on different occasions were collected on Hivaoa alone. Although solo singing was in use it was choral singing that was distinctive of their music. When a song was required for a particular occasion, the head of a family hired an adept who composed words and music. A chorus was then assembled and instructed, a special house being built for the accommodation of the singers while instruction was proceeding if the song was a tapu chant. The type of chant determined the nature of the chorus, i.e. whether of young girls, mixed voices, men or old men. Three types of voices in each sex were recognised, and each song had an established voice or register. For instrumental accompaniment, drums of wood and shark skin, bamboo mouth flutes and small resonant sticks were employed. The songs themselves were recreational, eulogistic or religious, while the natives themselves divided them into tapu (those with a serious purpose in view) and non-tapu (old songs which had served their purpose and were chanted for amusement, or those which were purely recreational).

**IRRIGATION IN INDIA.**—The Public Works Branch of the Department of Industries and Labour of the Government of India has published the Triennial Review of Irrigation in India for the period 1921-1924, from which it is to be gathered that the average area irrigated annually in British India by Government works of all classes during the triennium was 27½ million acres, as compared with 26½ million acres, the average of the previous triennium. In general, the results obtained have been as good as, or better than, those of the previous period, the notable exception being the United Provinces. The decrease in the area irrigated in this territory (rather more than a million acres) is attributable mainly to the favourable seasons experienced during the triennium. The total capital outlay, direct and indirect, on irrigation and navigation works, including works under construction, amounted at the end of the year 1923-24 to Rs. 89,25 lakhs. The gross revenue for the year was Rs. 10,65 lakhs, and the working expenses, Rs. 3,77 lakhs; the net return on capital was, therefore, 7.71 per cent. It is pointed out that the capital invested includes considerable expenditure upon three projects of the first magnitude, namely, the Sarda-Oudh canals, the Sutlej Valley and the Lloyd (Sukkur) Barrage projects, which are under construction and contribute nothing at present by way of revenue. The last named is the greatest irrigation scheme ever undertaken, and, when completed, it is expected to inaugurate an era of unprecedented prosperity for the Province of Sind in which it is situated. The Secretary of State for India sanctioned the project in April 1923, and the total expenditure on works, mainly of a preliminary character, including special tools and plant, during the year 1923-24 was nearly Rs. 23½ lakhs. The Sutlej Valley project in the Punjab, sanctioned in the year 1921-22, has made good progress, and the Sarda-Oudh canals are well advanced.

**SALMON AND RIVER POLLUTION.**—An interesting and important report on pollution of the River Tyne Estuary, 1922-1924, by Miss Edith M. Meek, produced by the Tyne Pollution Sub-Committee, is published

in the Dove Marine Laboratory Report for the year ending June 30, 1925. Pollution from various sources has resulted in a serious deterioration of the salmon industry in tidal and non-tidal waters; the ascending and descending fish both being involved, although it is specially the smolts which suffer. The smolts, about seven inches long and usually just under two years old, migrate down the river in large shoals at certain periods, and, unlike the older ascending fish, are not able to take advantage of specially favourable conditions occurring irregularly; they thus frequently enter polluted areas and are destroyed in numbers. The chief causes of pollution are sewage and effluents from works, the former causing suffocation through lack of oxygen, the latter direct poisoning. Of these, however, the sewage problem is by far the more dangerous, and crude sewage is the dominant factor in the pollution of the Tyne Estuary. The report of the sub-committee is of the opinion that sewage is by far the worst enemy of the industry. Two natural counteractions are the water temperature and the presence of freshets of pure upland water resulting from rainfall, which descend in time of flood, thus forcing the polluted water out to sea and enabling the ascending fish to take advantage of the pure water. Low temperature and abundant rainfall are essential for the escape of the fish. Appendices on the bacteriology and plankton contents of the polluted areas, with statements of the numbers of fish caught, follow the report, with accounts of physiological experiments undertaken by Miss Meek, mainly on the amount of dissolved oxygen and the keeping of fish in observation tanks in the polluted water.

**AN ARCTIC FISH IN BOSNIA.**—In the *Novitates Musei Sarajevoensis*, No. 3 (November 1925), Dr. St. J. Bolckay records the discovery of the capelin (*Mallotus villosus*) fossilised in nodules in a clay at an altitude of 580 metres in S.E. Bosnia. The nodules resemble those containing the same fish which are often found in glacial clays in Greenland and near Ottawa in Canada. The fish exists at present in great numbers in Arctic seas and in the colder parts of the North Atlantic and Pacific Oceans. Its occurrence in clays of the Pleistocene period so far south as Bosnia is therefore a fact of great interest.

**THE CLASSIFICATION OF THE FORAMINIFERA.**—The attention of students of recent and fossil Foraminifera may be directed to Joseph A. Cushman's introduction to the morphology and classification of the Foraminifera (*Smithsonian Misc. Coll.*, vol. 77, No. 4, 1925). A brief account of the life-history, of the structure of the test, and of the distribution in present oceans is followed by suggestions for collecting, washing, sorting, and mounting recent and fossil examples. The terms employed in systematic descriptions are briefly commented upon and a classification into ten families follows. Under each family the constituent genera are concisely defined, and in most cases a figure is given. From the point of view of the student of the test the systematic summary is admirable, but if the author had added an account of the cytoplasm and nucleus in two or three typical cases, and fuller details of the life-history, the memoir would have had a still wider appeal.

**THE LIFE-HISTORY OF GORDIUS.**—Dr. Jan Švábeník has issued (*Publ. Fac. Sci. Univ. Masaryk*, 58, 1925) the results of his observations on the life-history of *Gordius tolosanus*, one of the "hair worms." The primary host of this worm is the larva of some midge (Chironomidae); Corethra and Anopheles are not infected. The first host becomes infected not by

way of the mouth, but by the entry of the larvæ of the worm through the soft skin of the appendages at the hind end. The author has succeeded in infecting various carabid beetles by feeding them with midges developed from infected larvæ. The largest number of worms found in one beetle was twenty. Attempts to infect Pterostichus, Haptoterus, and Poecilus had little success, and Forficula failed to become infected. It would appear that each species of Gordius has its specific primary and secondary hosts. The development of the Gordius larva in these hosts is described and figured. The adult Gordius leaves the fat body of the beetle and issues to the exterior in the spring, the parasitic life in the two hosts having extended from July of one year to February of the next. The Gordius is free living for about four months. The author states that the gonads are endodermic in origin, and he regards the Nematomorpha as a very old group.

**ALTERNATE BEARING YEARS IN TREES.**—This phenomenon is very familiar in horticultural literature, so many fruit trees having a well-established habit of bearing well in alternate years; much horticultural pruning practice is directed towards restricting a habit which cannot unfortunately be given an inverse correlation with market price for the fruit. Now the same habit is reported by Mr. F. Kingdon Ward for the tree rhododendrons in his interesting account of his eighth collecting expedition in Asia, which is appearing in the *Gardener's Chronicle*. This subject is discussed by him in the issue of December 19, which contains an interesting account of a very difficult but interesting journey to the falls of the Tsangpo.

**CYTOPLASM AND CHROMATIN.**—Prof. Charles J. Chamberlain regards these two familiar concepts of cell structure from the point of view of the morphologist, and in the light of his wide experience of the structure of the very large cells forming the egg cells of the Cycads, in the *Botanical Gazette* for October 1925. Prof. Chamberlain points out that these eggs are the largest in the plant kingdom, reaching a length of 6 mm., with a diameter of 2 mm., and the nuclei are exceptionally large; thus the egg nucleus of *Dioon edule* may reach a diameter of 500  $\mu$ . Prof. Chamberlain endeavours to show that in the cycad egg cytoplasm there is an unbroken series, from large vacuoles of 100  $\mu$  or more in diameter, down to the smallest spaces demanded by the theory of Bütschli and Wilson, and that the largest and smallest spaces are of the same morphological nature. He also affirms his belief that chromatin in plants is a vacuolated substance like the cytoplasm, and that, in the plants studied, there are no such structures as chromomeres upon a linin ribbon; and he predicts that theories which cannot be reconciled with a vacuolated structure of the chromosome will have to be abandoned. It is interesting to have this definite expression of morphological opinion, though the question at issue will require examination from a much wider basis than is provided by morphology.

**THE ENSTATITE-AUGITE SERIES OF PYROXENES.**—The importance of the pyroxenes of the enstatite-augite series, generally referred to as *augite*, has not yet been recognised in text-books, though the last decade has seen the publication of many papers on plateau-basalts in which the very widespread occurrence of that series has been conclusively established. Dr. L. L. Fermor has conveniently summarised the evidence in the *Records of the Geological Survey of India*, vol. 58, Pt. 3, 1925. He confirms Washington's



conclusion that the common pyroxene of the Deccan Traps belongs to the enstatite-augite series of Wahl, the characteristic feature of these mixed pyroxenes being a small optic axial angle. It is pointed out that a research into the system  $\text{CaSiO}_3\text{--FeSiO}_3$  is necessary before the homogeneous ferruginous varieties can be adequately explained. From the natural occurrence of monoclinic pyroxenes a provisional attempt at a classification and determinative scheme has already been made by Dr. Bror Askund (*Sveriges Geologiska Undersökning*, Årsbok 17, Ser. C, No. 325, Stockholm, 1925). In this important paper it is shown that by taking into consideration both optic axial angles and refractive indices, the chemical composition may be approximately deduced from optical tests. Both writers direct attention to the fact that richness in  $\text{FeSiO}_3$  favours the growth of a single homogeneous pyroxene, whereas both monoclinic and orthorhombic types tend to separate from magmas richer in magnesia. Further complications due to the presence of alumina have not yet been satisfactorily analysed.

EFFECTS OF PRIMARY SPHERICAL ABERRATION.—An experimental study of the effects of varying amounts of primary spherical aberration on the location and quality of optical images has been made by Miss H. G. Conrady, and her results are published in the *Journal of the Royal Photographic Society* (January, p. 9). She has worked out results by the geometric theory, by the physical theory, and by experimental work, and found that the results of these three methods do not agree, except of course in the paraxial region. "Beyond the Rayleigh limit, neither the physical nor the geometrical curves appear to agree with what actually occurs." The author finds that "without doubt" the presence of primary spherical aberration does increase the depth of definition of a lens system. As to resolving power, the curve based on the geometrical theory "obviously has no recognisable bearing on the actual facts." The experimental results agree closely with the physical theory up to about the Rayleigh limit, but beyond it there is a practical loss of resolving power. Miss Conrady gives full details of her work, and generalises her results so that they are applicable to any lens system.

THE  $\gamma$ -RADIATION OF THE ACTINIUM SERIES.—In the issue of the *Zeitschrift für Physik* of Nov. 28, Fräulein L. Meitner, using measurements of the  $\beta$ -ray spectra of radioactinium and its disintegration products made by her in collaboration with Dr. O. Hahn, discusses the nature of the  $\gamma$ -radiation which is assumed to produce them. Both radioactinium and actinium X radiate  $\alpha$ -particles, and possess a somewhat complicated  $\gamma$ -ray spectrum. Owing to their short life it is possible to employ them in very thin sheets, with the result that the lines of the  $\beta$ -ray spectrum are much sharper than in the case of the longer lived  $\alpha$ -radiator radium. It is shown that the photo-effect by which the  $\beta$ -rays are liberated actually takes place, in both cases, not in the disintegrating atom, but in that which results from the disintegration; it follows that the  $\gamma$ -radiation is emitted after the  $\alpha$ -particle has been thrown out, and represents the spectrum of the nucleus after disintegration. It is shown that the absorption within the atom, or more correctly the Rosseland photo-effect produced without actual  $\gamma$ -radiation, takes place, when there are several electronic levels, only in the one for which the energy of expulsion is a maximum, in the case of the  $L$  levels, for example, only in the  $L_1$ -level. The probability of absorption of the  $K$ -radiation within atoms with atomic numbers  $Z=88$  and  $Z=86$  is found to be of the order of ten per cent.

THE DURATION OF X-RAY PULSES.—Previous measurements of the time during which an individual X-ray pulse continues to emit energy (*Abklingungszeit*) have led to contradictory results. Dr. F. Kirchner, in the *Annalen der Physik* for November, describes an improved method for the direct measurement of the velocity of cathode rays based on that of Wiechert, and shows how it can be adapted so as to measure the *Abklingungszeit*,  $t_1$ , of X-rays. Cathode rays are emitted in large numbers from an incandescent oxide-coated cathode, are accelerated by a powerful field, passed through holes in two screens so as to form a narrow beam, and then through a rapidly alternating electric field produced by means of two hot-wire cathode valves. The beam is thus deflected in opposite directions in turn, and falling on a screen with a hole, which lets it through when it is at one of its extreme positions, falls on an anticathode producing a sudden rush of X-rays. These pass into another tube and fall on a metal cathode, from which they liberate a swarm of photo-electrons, which are accelerated by a suitable field, formed into a narrow beam by means of diaphragms, and passed through an alternating field, worked by the same valve circuit as the first, which deflects the beam to and fro. In one position the electrons can pass through a hole in a screen into the collector of an electrometer, but this will only happen when the phase relations between the field and the electron swarms are right. This depends on the length of path and the velocity of the electrons, the phenomena being also influenced by the time  $t_1$  and by the time  $t_2$ , which is needed for the liberation of a photo-electron. The measurements show that  $t_1 + t_2$  is smaller than  $7 \times 10^{-10}$  sec. when the  $K$ -radiation of iron is employed;  $t_2$  is shown to be of the same order, so that the duration of an X-ray pulse must be small.

THE CATHODE RAY OSCILLOGRAPH.—In the *Journal of the Franklin Institute* for December, F. R. Terroux suggests some useful improvements of the cathode-ray oscillograph which will greatly extend its usefulness. At the present time there are two distinct types of this instrument, a modified form of Braun tube and a type originally suggested by Sir Joseph Thomson and developed by D. A. Keys and A. B. Wood. Although these types have proved of value in research, there are difficulties in operating them. In the Braun type the cathode beam traces its deflexion on a fluorescent screen inside the glass tube and the luminous streak is photographed by an ordinary camera. In order to get a good image the curve must be retraced several times by the cathode beam, and this greatly limits its usefulness. In the Thomson type, the photographic plate is enclosed within the evacuated apparatus. Thus a single transit of the cathode beam will leave a distinct trace on the plate. Whenever the plate is to be inserted or withdrawn, however, the apparatus must be unsealed or evacuated anew. Mr. Terroux obviates this disadvantage as follows. A plane sheet of quartz is sealed across the end of the oscillograph tube, opposite to the cathode. A fluorescent screen is deposited on the inner side of the quartz, and a photographic plate is placed flat against the outer surface. Thus when the cathode beam traces a luminous curve on the screen, the curve would be reproduced directly on the photographic plate and the losses due to dispersion and absorption would be eliminated. There are three obvious advantages of this instrument as compared with the usual type. First, a vacuum pump is unnecessary as the tube is permanently sealed; secondly, no system of lenses is needed as the plate is placed against the quartz; and thirdly, the instrument can be used to study transient phenomena.