

Research Items.

DISINTEGRATION IN PRIMITIVE SOCIETIES.—Capt. G. Pitt-Rivers, in his presidential address to the Section of Ethnology and Anthropology of the Australasian Association for the Advancement of Science in 1923, which has recently been issued in the Report of the Association, offers some interesting suggestions in reference to tests which might be applied in estimating the trend of development in any given community, referring in particular to the changes which are brought about in a primitive society when in contact with white civilisation. For this purpose a comparison of different cultures and their social and moral systems is not adequate; but a standard or norm is to be found in the tendency to integration or disintegration. Taking, for example, the Papuo-Melanesian and Micronesian cultures, the principal factors of social integration are: (1) the chieftainship; (2) magic and sorcery; (3) the system of exchange of gifts, partly economic, partly ceremonial and non-economic. In the case of each of these the effect of contact with white civilisation has been disintegrative. In Papua the institution of a village policeman as the chief district authority has undermined the position of the chief without ensuring that the substitute shall be of a type to take his place in the native's estimation; while by suppressing sorcery and magic the administration has destroyed the strongest influence which made for law and order.

FORAMINIFERA OF LORD HOWE ISLAND.—Messrs. E. Heron-Allen and A. Earland (Journ. Linn. Soc., Zool., vol. 35, 1924) describe a collection of Foraminifera, made by Prof. R. D. Laurie at Lord Howe Island, South Pacific, which contains 199 species and varieties. Two new genera are described—Craterites, which is related to Orbitolites, and Diffusilina, the neatly constructed test of which and the high proportion of cement in its finished exterior surface indicate affinities with the Lituolidæ, but it has no close relationship to any previously recorded type. The authors direct attention to the profuse occurrence of species in reproduction, both by viviparity—young examples being found in a cavity resulting from the absorption of the internal septa of the test—and by “budding” from the aperture. The material was from the reefless area of the island only, and the authors believe that many species would have been added to the list if a collection had also been made among the reefs and in the lagoon. The material shows that a large proportion of the specimens are not of local origin but are more or less water-worn and have travelled some distance. Many of the species recorded have a wide range, from East Africa through the Malay and Australian seas to the Pacific.

MEDICAL PROTOZOLOGY.—In a recent lecture on medical zoology (*Amer. Naturalist*, vol. 58, pp. 1-23, 1924) Prof. R. W. Hegner surveyed the recent investigations on protozoa carried on in his department of the Johns Hopkins University. He said that various theories had been put forward to account for relapses in malaria, and that one of these seemed now to be proved, for Dr. Ben-Harel had been able to show, by working on canaries infected with *Proteosoma*, that when parasites are apparently absent from the blood they exist in small numbers in the spleen and bone-marrow, where they undergo asexual reproduction in a normal manner. He referred to the work of Dr. Taliaferro on *Trypanosoma lewisi* in rats, and stated that pure lines of this species had been obtained by inoculating clean rats with single trypanosomes, and an intensive study had been undertaken of the resistance which the rat offers against infection. There are three manifestations of such resistance: (1) the rate of reproduction of the parasites is retarded

until it is inhibited altogether by about the tenth day; (2) a large number of parasites are destroyed between the 10th and 14th days; and (3) the rest of the trypanosomes—non-reproducing adults—are finally destroyed. The first resistance is due to the formation in the blood of the rat of a reaction product which inhibits reproduction of the trypanosomes but does not destroy their vitality; the second resistance is as yet not explicable, but the third—the destruction of the organisms—is brought about by the formation of a lysin. Suggestive observations are recorded on the effects of a change of diet on *Trichomonas muris* in the cæcum of the rat—for when heavily infected rats were put on a well-balanced carnivorous diet for a week, the number of *Trichomonas* decreased almost to disappearance, apparently owing to alterations in the bacterial content of the cæcum and in the products of their activity. Prof. Hegner suggests that a carnivorous diet might be an effective method of treatment of flagellate dysentery in man, and states that the method has been put into practice in a few cases with “remarkably rapid and satisfactory” effects.

ACIDOPHILUS MILK.—Artificially prepared soured milks have been made use of as articles of diet in various parts of the world from time immemorial, and years ago Metchnikoff introduced the use of milk soured with the Bulgarian bacillus as a preventive of the onset of old age! Recently Prof. L. F. Rettger, of Yale University, has found that the *Bacillus acidophilus* produces a soured milk of considerable value in the treatment of intestinal toxæmias (*Science*: Science Service Supp., June 13). Skimmed cow's milk is boiled and cooled and inoculated with the organism, which is allowed to grow for twenty-four hours. At the end of this time the milk is curdled with a soft curd, and on shaking assumes the consistency of thin cream. Taken daily in quantities of from one to two pints, the fermentive and putrefactive bacteria in the intestines are much reduced in numbers with corresponding benefit in suitable cases.

TEMPERATURE IN THE NETHERLAND INDIES.—In *Verh. No. 8, vol. 1, part 5*, the Royal Magnetic and Meteorological Observatory of Batavia has recently published a discussion of temperature by Dr. C. Braak in continuation of other discussions on the climate of the Netherland Indies. A brief English summary is given as well as the full discussion in Dutch. Recent observations have been mostly used, as the older observations are generally untrustworthy, owing to defective exposure. Temperature is fairly uniform during the whole year, and in addition to the annual variation of winter and summer there is the influence of the monsoon. Whether the wind blows from south or north it brings air of equal temperature. Rain showers may cool the air temporarily, but generally uniformity of temperature is apparent. For daily differences in the dry season, the maximum temperatures are usually higher than in the wet season and the minimum lower, the daily range being greater in the dry season. The time of the maximum varies with the height above sea level, and the maximum occurs relatively early at the high mountain stations, where night frosts are occasionally noted in August and September. Diurnal variation of mean air temperature from observations in the Archipelago and in the adjacent Indian Ocean gives an extreme range of 0.87° C., while for the sea it is 0.75° C. The average air temperature is 26.05° C., the sea 27.10° C., the sea water being thus 1.05° C. warmer than the air. The decrease of temperature with increasing height in the free atmosphere is discussed, and the variation of soil temperature with depth. Monthly series of isotherms of air and sea over the adjacent waters, and

copious tables and diagrams, are given in the original text. The discussion is of the highest value for the advancement of the world's meteorology, dealing with the temperature of the part discussed in the most complete and scientific manner.

THE SURFACE LAYERS OF OCEANIC WATERS.—After studying the records of the *Challenger* soundings and plotting the density and temperature against depth, M. J. Thoulet has found that there is a limited layer, near the surface of the oceans, in which the denser water, due to evaporation at the surface, sinks, and is mixed by wave action with lighter water, containing less salt, produced by the action of rain, the melting of ice and the inflow of rivers (*Comptes rendus* of the Paris Academy of Sciences, May 12). The mean thickness of this layer of mixture, or of rapid diffusion, varies in different parts of the ocean between 600 and 800 metres, being greater in the tropics than near the poles; a layer of minimum density divides it from the lower oceanic water, where there is only slow diffusion. The paper gives an account of the seasonal variations of this upper layer, which cause a movement of water towards the poles in summer, and a reverse movement in winter. The density in the minimum density layer varies from 1.0289 in hot regions to 1.0253 near the poles, with a mean value of about 1.0275. It is particularly regular in the South Atlantic and the Pacific, where it is rarely so high as 1.0280.

THE VACUUM TUBE DISCHARGE.—In the July issue of the *Philosophical Magazine*, Sir J. J. Thomson puts forward a theory of the electric discharge in gases at very low pressures such as are used in the older X-ray tubes, which is in better agreement with the experimental facts than the theory which depends mainly on the collisions between cathode rays or positive ions and the molecules of the residual gas for the source of ionisation. The process which takes place in the tube is rather as follows. The positive ions on striking the cathode emit radiation which, falling on the cathode, causes a photoelectric emission from the cathode. The electrons emitted acquire a high speed, and cause the molecules of the gas to emit a second radiation, which in turn ionises the molecules it encounters. The recombination of the ions so produced constitutes the negative glow. On this theory, the difference of potential between a point in the dark space and the negative glow is proportional to the square of the distance of the point from the inner edge of the glow, which has been found to be the case by Dr. Aston.

ACTION OF A TRANSVERSE MAGNETIC FIELD ON THE CATHODE DARK SPACE.—A communication from the Physikalisches-Technisches Reichsanstalt in the *Zeitschrift für Physik* for May, by Dr. A. Günther Schulze, describes an ingenious device for obtaining a self-adjusting, plane, horizontal cathode, which allows the magnet poles to be brought fairly close together, and at the same time enables the glow discharge to be produced at a distance from the glass walls, so that it is unaffected by them. A glass tube, diameter 4 cm. and length 28 cm., is closed at one end, half filled with mercury, which forms the cathode, closed by a rubber stopper through which pass a glass tube connecting with the air pump and the connecting wires, and is laid horizontally between the magnet poles, so that the lines of force pass across parallel to the surface of the mercury cathode. The anode is near the stopper, and with a fairly high vacuum the glow discharge is deflected in a narrow band towards the sealed end of the tube. The width of the dark space, measured vertically, is obtained by means of a cathetometer; there is a minimum value for this distance d (*Fallraum*), which for all the gases investigated is near 0.70 mm.; for pressures of not less than 20 mm., d is very little greater than this minimum value with zero magnetic

field; but for low pressures it is much larger, and can then be reduced to the minimum value when the field is increased sufficiently.

EXTRA HIGH FREQUENCY γ -RAYS FROM RADIUM.—The secondary β -ray spectrum from lead, excited by the γ -rays of radium and its disintegration products, has been photographed and investigated by M. J. Thibaud (*Comptes rendus* of the Paris Academy of Sciences, May 19). Eight lines have been found, the energy in kilovolts of each being as follows:

1	2	3	4	5	6	7	8
152	203	258	330	516	593	671	1034.

All of these lines correspond with lines in the spectrum of radium and its disintegration products; 1, 2, and 3 are identical with lines found by Ellis to belong to radium-B, 4 has been observed by de Broglie and Cabrera in the spectrum of the same substance, 5 corresponds to a β -ray originating in the K level of radium-C, 6 to one from the L level of the same substance; the difference between the energies of these two lines is 77,000 kilovolts, which agrees with the number, 75,000 kilovolts, calculated from other lines of the radium-C spectrum for these two levels. According to Ellis's theory, these lines may be due to a nuclear γ -ray, with energy 605,000 volts; while line 8 of the lead secondary spectrum, which corresponds to a line from the K level of radium-C, is due to a γ -ray with energy 1,123,000 volts. Lead, which was used as the secondary radiator, is an isotope of radium-B, and the production of lines 1, 2, 3, and 4 in its spectrum is to be expected. That the lines of radium-C are also obtained is regarded as due to the fact that the variation of the energies of the levels of radium-B and C is of the same order as the experimental errors.

SYNTHESIS OF METHANE FROM COAL GAS.—Work on the synthesis of methane from coal gas has been carried out in the laboratories of the South Metropolitan Gas Company, and some results were described at the annual meeting of the Institution of Gas Engineers. The preliminary complete purification of the gas from sulphur compounds necessary to avoid poisoning the catalyst involves the partial elimination of valuable unsaturated hydrocarbons from the gas, and the conversion of part of the carbon monoxide content of the gas to carbon dioxide. The loss resulting from these causes and the heat loss attributable to the exothermicity of the hydrogenation reaction would cause a considerable increase in the cost of the gas produced.

PHOTOGRAPHIC DEVELOPMENT AFTER FIXING.—Messrs. Lumière and Seyewetz have communicated to the Paris Academy of Sciences a method which places development after fixing upon a practical basis, which is recorded in the *British Journal of Photography* of June 27. Hitherto this process has required about ten times the usual exposure, presumably because the substance of the developable image, whatever it may be, is soluble in the "hypo" used for fixing. By adding a little ammonia to the "hypo" and to the wash water, this drawback is overcome. The developer preferred contains sodium sulphite and paraphenylene-diamine in addition to silver nitrate, and yields negatives that recall those on collodion plates in appearance and other characteristics. The developer is exhausted in about an hour, and if more density is required it may then be replaced by a fresh portion, and thus continued up to 10 or 12 hours' duration. By this longer time the particles are about equal in size to those of the original silver bromide of the plate. Photomicrographs are given of the grain produced by development for 1, 3, 7, 24, and 48 hours. Even the coarsest grained plate gives a fine grained image unless development is unduly prolonged or the image is intensified.