

Research Items.

RACIAL PSYCHOLOGY IN THE UNITED STATES.—The population problem and, in particular, the colour question in the United States, which has produced much dogmatic but unsubstantiated assertion, has had a beneficial effect in leading to an examination of records for exact data which may bear upon the question of mental racial differences. In the *Scientific Monthly* for March, Dr. Bertha M. Luckey of Cleveland, Ohio, a city which contains a large percentage of foreign-born adults, has analysed the results of tests of school children for intelligence. As the data were obtained from the clinic, the majority of the children were super- or subnormal. Figures are shown for ten nationalities. The highest percentage of subnormal children is shown by the Negro and Polish groups (65 per cent.), and the lowest by the Jewish (29 per cent.), the intermediate order being Slavish, Slovenian, Italian, Hungarian, German, Bohemian, and American (30 per cent.). The largest percentage of bright or unusually bright occurred among the Jewish (24 per cent.), the remaining groups being in the following order: American, German, Bohemian, Slovenian, Hungarian, Slavish, then Polish, and Negro, each 1 per cent., and Italian, 0.5 per cent. Yet in the class "imbecile" the Jewish and American groups had more than the Negro and Slovenian groups. Another paper in the same issue, by the Rev. J. E. Gregg, compares the academic results of students admitted to the Hamilton Institute over a number of years, beginning in 1901. Seven grades of colour, ranging from black to "no trace of colour," have been recorded, but the scholastic results show little difference between the colour groups. Of the twenty-one best scholars of the graduating classes in eleven years (1914-24), the percentages are as follows: Dark brown, 28.5; brown, 28.5; light brown, 28.5; light, 14.2. Of the entrants in 1901-10, the three groups dark brown, brown, and light brown formed 82.3 per cent.

THE COUSIN IN VEDIC RITUAL.—In the *Indian Antiquary* for January, Mr. A. M. Hocart has an interesting suggestion to offer as to the interpretation of the word *Bhratravya*, which occurs in a formula indicating that the Vedic sacrifice was a victory over evil powers opposed to the sacrificer. The formula is translated "slaying his wicked spiteful enemy." The word *Bhratravya*, "enemy," is doubtful, but appears to indicate relationship, possibly "cousin." It is suggested that it may bear the meaning more specifically of mother's brother's son, i.e. cross cousin. It would then be a case of the ceremonial hostility of cross cousins. There is no direct evidence which supports the suggested meaning of the word; but it is possible that the Vedic relationship system was classificatory and would therefore as elsewhere give rise to cross-cousin hostility. Further, from both Fiji and South Africa there is evidence that the cross cousin in the cases of ceremonial hostility is a representative of the gods. The hostility is not real or infused with hatred. The cross cousin may be identified with the demons through some conception such as is indicated in the story that Namuci, the demon, stole Indra's vigour, the essence of his food. The cross cousin may therefore eat the sacrifice, or part of it, taking upon himself the evil and acting as scape-goat; as such he is reviled and despised, and in Fiji and South Africa, driven away.

POLYEMBRYONY IN PLATYGASTER.—The remarkable phenomenon of polyembryony is now known to be a constant feature in the development of certain minute

species of parasitic Hymenoptera. In the *Journal of Agricultural Research*, vol. 28, No. 8, 1924, Messrs. R. W. Leiby and C. C. Hill describe the polyembryonic development of *Platygaster vernalis* in the larva of the Hessian fly. The egg of the *Platygaster* is so placed in the egg of the Hessian fly that it is eventually found in the mid-intestine of the host embryo or young larva, with unfailing regularity. Each egg of the parasite gives rise to about eight embryos, all of which it is believed are of the same sex. In the course of maturation two polar bodies are formed, which become the original paranuclear masses, while the cleavage nucleus becomes the progenitor of the embryos. The latter are surrounded by a membrane, or trophamnion, which is formed from the paranuclear masses, and when the larvæ are ready to issue, they rupture the trophamnion, thus becoming liberated into the host's intestine. The larvæ eventually consume the whole of the contents of the Hessian fly larva, leaving only the cuticula. Each parasite constructs a cocoon within which it transforms into a pupa and later into an imago. Although the parasites which issue from one host are usually of the same sex, it is believed that the occasional mixed broods that are met with originate from a fertilised and an unfertilised egg deposited in the same individual egg of the host.

PLEISTOCENE FOSSILS FROM SAN PEDRO, CALIFORNIA.

—From a cutting through Nob Hill, at San Pedro, California, exposing beds of the Lower San Pedro Series of the Pleistocene, Mr. T. S. Oldroyd obtained from the deposit some 242 species of Mollusca (Proc. U.S. Nat. Mus., 65, art. 22). At the close of this period when the climate of California began to get warmer, the majority of these molluscs migrated north, some 115 being found to-day in Puget Sound; or they sought the cold waters of a greater depth, for there seems to be a trail of the northern molluscs in about 100 fath. all along the coast as far as Lower California; whilst a few accustomed themselves to the change and are found living now near San Pedro. With the exception of two land and two freshwater snails, doubtless washed down into the deposit, the mollusca are all marine, and the author is able to append to his list the descriptions and figures of 20 new species and two new subspecies, mostly small forms. Some crab remains were identified by Miss Rathbun, and the list of these and a few other invertebrates is included in the paper.

ICE IN THE ARCTIC SEAS IN 1924.—The annual report of the Danish Meteorological Institute (Isforholdene i de Arktiske Have, 1924) is fuller than usual, especially as regards the Kara and Barents Seas and the east coast of Greenland, but, owing to lack of information, is very meagre concerning the Beaufort Sea and coasts of eastern Siberia. In European Arctic regions the year on the whole was marked by less ice than is the rule during spring and summer. In August and September the Kara Sea was exceptionally free from ice. The White Sea was clear in June and in the autumn froze much later than usual. In the north-eastern part of the Barents Sea there was more open water than usual; in August, the only month for which there are data, it came very near to Franz Josef Land. During April and May very heavy pack extended to the south-west of Spitsbergen so far south as Bear Island, but the northern part of the west coast, as usual, was clear. In June conditions changed completely, resulting in a summer with exceptionally little ice

in Spitsbergen waters. A Norwegian sloop circum-navigated North-East Land during August. On the east coast of Greenland the few observations suggest a narrower belt of close pack-ice than usual. Iceland was touched by pack-ice only during February. The Newfoundland Banks had little ice and few icebergs, and Davis Strait was fairly clear. The report is illustrated with several maps.

ISOSTASY AND GEOLOGY.—A valuable paper on "The Geological Implications of the Doctrine of Isostasy," by A. C. Lawson, appears as Bulletin No. 46 of the National Research Council (Washington, June 1924). It is pointed out that in considering the transfer of matter from one portion of the earth's surface to another, it is often necessary to recognise that the newly loaded area may be widely separated from the source of the load. In such a case the loaded region and the surrounding territory cannot be balanced with the rest of the earth's crust by merely local flow; a general plastic deformation of the geoid then appears to be necessary to establish isostatic equilibrium. Continental glaciers, epicontinental seas, and large deltas are discussed as examples in which local deep-seated compensation fails to restore a world-wide balance. In the case of plateau lavas, it is not clear to what extent there is a real transfer in the horizontal as opposed to the vertical sense. Mountain ranges are considered both with and without a downward protuberance, and the discussion clearly supports the view that ranges are supported by flotation due to a downward concentration of lighter rock immersed in heavier rock. It is suggested that oceanic deeps may be due to a stretching and thinning of the lighter upper part of the crust accompanied by an upward sag of the heavier sub-crustal matter. The process recalls the mechanism of Wegener's displacement hypothesis, and like it involves great tensional stresses due to the flowing of the crust down a low gradient. As Lambert and Jeffreys have independently shown, no adequate cause for such a process can be imagined in harmony with our observational knowledge of the strength of known rocks.

NATURAL GAS IN ALBERTA.—The Canadian natural gas industry is second only to that of the United States, the annual production in the former country amounting to some 20,000,000,000 cubic feet, valued at five million dollars. The bulk of this gas comes from the provinces of Alberta and Ontario, but there are already signs of exhaustion in the eastern fields, and steps are being taken to conserve the remaining resources and to regulate the supply. In Alberta the position is different, since several large flows have recently been struck, and there are also many potentially favourable areas which have not been explored. Much of the Alberta natural gas is apparently a dry gas, so that gasoline extraction has not on the whole assumed the importance in the Canadian gas industry that it has done in the United States; one area, however, that of Turner Valley, yields a wet gas capable of giving from 0.2 to 0.7 gallons of gasoline per 1000 cubic feet of gas, which compares favourably with some of the results achieved in the Mid-Continent region of America; the gasoline-yielding gas shows on analysis, as might be expected, a much higher proportion of ethane than the dry gas, with a corresponding decrease in the nitrogen content, a point of importance in connexion with helium recovery. It seems unthinkable that helium should be allowed to go to waste in view of its enormous value for aircraft purposes, but such is largely the case in Canada at the present time. Mr. R. T.

Elworthy, in his report on the "Natural Gas in Alberta" (Canada, Department of Mines, 1924 for 1923), states that from two fields, Bow Island and Foremost, some ten to fifteen million cubic feet of helium per year might be obtained at a cost of between 50 to 100 dollars per thousand cubic feet, if an efficient process were developed to treat low helium-bearing gases. He rightly points out that no private corporation can be expected to experiment on these lines; the work or research necessary well warrants State enterprise and, we may add, an Imperial backing. There is also a possibility of establishing a carbon black industry in Alberta, and the author thinks that a ready market could be found for this product providing it were sold at competitive prices with those current in Louisiana, the home of that industry.

DEPTH OF SEISMIC FOCI.—An important paper on this subject by Dr. S. K. Banerji, director of the Bombay and Alibag observatories, is published in the *Phil. Mag.* (vol. 49, pp. 65-80). The method adopted is to estimate the effects of the depth of the focus on the amplitudes of the different phases of the seismogram, assuming that the corresponding waves have the same amplitude at unit distance from the source. Taking the earth to be an infinite solid bounded by a plane, it is shown that, while the effect of the depth of the focus on the amplitudes of the primary and secondary waves at great epicentral distances is almost negligible, the amplitudes of the long-wave phase undergo a rapid decrease with increasing depth of focus. If the depth were so great as 1000 km., the amplitude of the primary and secondary waves at the antipodes should be about 2.7×10^{37} times as great as that of the long waves. If the depth were 200 km., the amplitude of the former would be about 400 times as great as that of the latter. If it were 100 km., the amplitude of the long waves would be about 55 times as great as that of the primary or secondary waves. Roughly speaking, therefore, about 100 km. or less is a possible depth for the seismic focus, while a depth of from 200 to 1000 km. is probably much too great. Taking the earth to be a spherical body, it is found that the depth is probably less than 100 km.

SPECTRAL FREQUENCIES IN THE REGION BETWEEN LIGHT AND X-RAYS.—Two papers are contributed by M. F. Holweck to the *C.R. Acad. Sci.*, Paris, of January 26 and March 2, in which a method of investigation is described, using very soft X-rays produced by bombarding a molybdenum anticathode with slow electrons, the velocity of which corresponds to a small potential difference V . Only the electrons from the first atomic levels are expelled, and the X-radiation forms a continuous spectrum without characteristic lines. The radiation is filtered through several sheets of celluloid, which has no discontinuity of absorption in the region investigated. The ionisation produced in argon and hydrogen chloride, sulphide, phosphide, and silicide has been examined, the ionisation current being observed for different values of V , so as to obtain the curves showing the relation $i = f(V)$ for the different gases. These have singular points at the critical potentials, and the following values have been found for Bohr's L III, L II levels, including a determination for aluminium by another method:

Ar	Cl	S	P	Si	Al
246.5 ± 1	203 ± 1	163 ± 1	128 ± 2	98 ± 2	68 ± 2

These figures are compared with those of other observers, and are found to lie well on a Moseley

diagram. The figure for argon, after certain small corrections, gives for the wave-length $50.1 \pm 0.2 \text{ \AA. U.}$

QUANTITATIVE ANALYSIS WITH THE X-RAY SPECTROSCOPE.—Messrs. R. Glocker and W. Frohnmeyer show, in the *Annalen der Physik* for February, that analysis by means of the bright line X-ray spectra of the elements does not always give satisfactory results, and they suggest a number of reasons for this. They have developed a method in which the intensities in the absorption X-ray spectrum are measured, the substance to be investigated being placed between the crystal of the spectrometer and the photographic plate in the form of fine powder, a solution, a metal foil, or a plate. Measurements of the intensity are made photometrically on the record, just outside and just inside the absorption band of the element dealt with; if λ_a is the wave-length at the band head, I_1 the intensity for $\lambda > \lambda_a$, I_2 the intensity for $\lambda < \lambda_a$, p the mass of the element in the path of the rays in grams per sq. cm., and c a characteristic constant for the element, $I_2/I_1 = I^{-cp}$. The characteristic constants have been determined for elements with atomic numbers from 42 to 90 for the K absorption band, and from 90 to 92 for the L_1 absorption band. The effect of mixing other substances with the element to be determined has also been investigated. The jump at the band head of an element is smaller when the absorption due to impurities increases. If two elements with high and low atomic numbers are mixed the amount of the first can be determined with an accuracy of about ± 5 per cent. Examples are given of the use of the method in determining the amount of barium in glass, of hafnium in minerals, and of the constituents of mixtures of salts.

COLOUR PHOTOGRAPHY.—The "Jos-Pe" process of natural colour photography on paper is described in the April colour supplement of the *British Journal of Photography*. The usual three negatives are made, and from these, prints are obtained by projection of any required size on plates coated with a gelatin-bromide emulsion containing very little of the silver salt. The exposure of these plates is made through the glass, and they are developed in a pyrocatechin developer which contains no sulphite and has the property of locally hardening the gelatin in proportion to the amount of silver reduced. After fixing, the unhardened gelatin is dissolved away in hot water, and there results a gelatin relief image slightly darkened by the reduced silver. To prepare a print, each plate is soaked in its proper dye solution, rinsed to remove the dye solution from the surface, and the gelatin coated transfer-paper is squeezed into contact with it. In a few minutes the transfer-paper has absorbed sufficient dye, and it is removed and squeezed in turn on to the other two plates. The images on the printing-plates are so transparent that the registration offers no difficulty. If necessary a second application on either of the printing-plates may be made, and local corrections may be made by applying more colour with a brush.

BERTHELOT'S BOMB.—In a communication to the *Comptes rendus* of the Paris Academy of Sciences of February 23, Prof. C. Moureu describes the destruction of the original bomb calorimeter of Berthelot. This historic instrument was being used during the War in experiments with reactions of an explosive nature and burst on December 16, 1918, fortunately without causing any personal injury, although Prof. Moureu mentions that some minutes earlier he had the bomb in his hands. The head of the bomb lodged in the ceiling of the laboratory, 16 feet above the working

bench. This bomb had been in use for 30 years for the determination of heats of combustion, and, in spite of this long period of hard wear, was in perfect condition when it burst. The question of its replacement was a difficult one on account of the present price of platinum. The original Berthelot bomb contained about 1300 grams of platinum, and at the time the instrument was built, this cost less than the same weight of gold. The present price renders an exact reproduction impossible, and in collaboration with M. P. Landrieu, a new design of bomb has been worked out. The complete inner lining of platinum has been retained, but the amount required has been reduced to 128 grams, partly by changing the form from a cylinder to a bottle with large neck, and partly by the use of a laminated sheet of platinum (0.2 mm.), gold (0.4 mm.), and copper (0.4 mm.), the whole being worked as one sheet. The new pattern instrument has been at work in the laboratory of the Collège de France, and has proved satisfactory. At the same time other changes have been made with the view of reducing the magnitude of the cooling constant, and calorimetric determinations can now be carried out with an accuracy of 1 in 1000.

CONSUMPTION OF POWER IN COAL MINING.—The University of Illinois has recently published a Bulletin (No. 144) entitled "Power Studies in Illinois Coal Mining," by Prof. A. J. Hoskin and T. Fraser, which consists of a careful study of the manner in which power is utilised in the various operations of coal mining in the State of Illinois. As in all other countries, these collieries have of late years been resorting more and more to mechanical means of performing the various operations, and this has mainly made itself evident in an increased employment of electrical power. Here, as elsewhere, colliery companies commenced by themselves generating the power which they needed in their mines, but of late years there has been an increasing tendency towards purchasing current from the electric supply companies, or, as the Americans call them, "utility companies," and it is pointed out that in some cases such companies are in a position to supply current at a lower cost than that at which the colliery companies themselves can generate it. The net result of the increased use of power has been to diminish costs, but "some of the improvements have lowered costs of coal production per ton by merely increasing production rates, whilst other mechanical innovations have lessened costs by minimising labour." In order to determine the distribution of power consumption in the collieries, data were obtained from 50 representative mines, ranging from the smallest to the largest, from a daily output of 650 tons up to one of 5200 tons. Excluding manual or animal power, it would appear that steam performs 42 per cent. of the mechanical duties about these mines, and that 58 per cent. of the energy employed is electric. The average distribution of energy in all these coal mines is classified as follows: Hoisting, 17.2 per cent.; ventilation, 22.2 per cent.; pumping, 5 per cent.; mining, 22.1 per cent.; haulage, 23 per cent.; miscellaneous, 10.5 per cent. Quite naturally, however, these averages vary between exceedingly wide limits: thus the percentage of the total energy consumption used for hoisting ranges from 1.4 per cent. to 50.8 per cent.; for ventilation, from 2.2 per cent. to 55.9 per cent.; for pumping, from 0.1 per cent. to 35.9 per cent.; for mining, from 0 (where all the coal is cut by hand) to 45.7 per cent.; for haulage, from 0 (where only mule haulage is employed) up to 51 per cent.; whilst miscellaneous services absorb from 3.6 per cent. to 23.9 per cent.