

ally as human varieties, that is, by their characteristic structures, that the volume has a direct relation to the form, in other words, many forms have limited and definite capacities, while other forms have sub-varieties differing in capacity. Such varieties are analogous to the stature of the large and small varieties of animals. The cranial capacity, therefore, while it is one of the integral characteristics of the cranium in regard to its classification, is also the indication of different varieties according to size. I discovered this fact when I classified for the first time the crania of Melanesia, and subsequently I defined it more accurately when I examined and classified thousands of other human crania.

This fact points to a correction of the value of cranial capacity and, therefore, of the weight of the brain, until now calculated by the average without distinction among different varieties. The cranial capacity of man varies from 1000 cc. to about 2000 cc. in the masculine sex; this enormous difference is admitted as individual variation, and it is thus conceded that there may be a least limit of normality possible which can be ascribed to the function of the brain, crania which descend to 1150 cc. being considered as pathological microcephali, according to Broca, and more or less according to other anthropologists; giving, on the other hand, a great value to a large capacity. Both conclusions are contrary to the real significance of the facts. I have found normal masculine capacities of 1000 cc. and a little greater, representing small human varieties, not being sporadic and individual phenomena; and, on the other hand, anthropologists have registered for eminent men, like Dante, Gauss, and others, very mediocre capacities, even very low, while for ordinary men they have recorded a much higher capacity. I have found in Melanesia normally constituted heads absolutely microcephalic, together with megaloccephalic heads, belonging to varieties which have the same social value; they are both inferior, some anthropophagous, and live mixed together as one people. That which I have asserted concerning Melanesia may be said of the ancient and modern populations of the Mediterranean, among which are the Sicilians, the Sardinians, and the inhabitants of Central and Southern Italy; and I do not believe it can be said that there are no signs of human superiority in those regions. There are not, therefore, individual differences so great as from 1000 to 1500 cc., and from 1500 to 2000 cc., but characteristic differences of variety in human forms. The general average I therefore maintain is inexact and also arbitrary, because it is the average of incommensurate quantities. The exact average is that between individuals of the same variety, and the difference is the true individual variation.

But there is another error to correct, due to the signification which I am able to give to varieties distinguished by means of my method. It is considered by some a demonstrated fact that the cranial capacity has been increased in the course of social evolution from prehistoric epochs to historic times. Eminent men have affirmed it, but I have already placed their conclusions in doubt, because the facts do not appear to me evident and affirmative. I wrote some years ago: "The most important physical evolution of man would be that which related to the organ of the mental functions, the brain. But the facts are still very doubtful and very obscure which relate to the weight and volume of the brain, and consequently to the cranial capacity. In a recent work of Prof. Schmidt, I find that the cranial capacity of the ancient pure Egyptians is 1394 cc. in the masculine, and 1257 in the feminine sex; in the pure modern Egyptians it is 1421 in the males, 1206 in the females. According to these figures there would be an increase of the cranial capacity of the modern over the ancient males, but a decrease in the females. The reverse would be true of the Egyptian-Nubian cranium, which is 1335 in the modern males, and 1205.8 in the females. Broca found that the Egyptians of the IV. Dynasty had, males 1534, females 1397 cc.; those of the XI., males 1443, females 1328; and, finally, those of the XXIII., the most recent, males 1464, females 1322. There would be in such a case no increase, but decrease, but that is not possible; the cause of these facts lies in the mixtures of races at different times and in different proportions."

Now I conclude from my recent studies upon the Egyptians of different dynasties, from the most ancient to the present, that according to my method of classification there are capacities of 1260 cc., of 1390, of 1480, of 1550, of 1710, and still other capacities differing according to the varieties determined.² As

is easily understood, a general average necessarily alters the facts, according to the number of varieties which enter as components of the average in the different series in anthropological museums; hence the curious results above indicated.

Another important point is as follows:

"But the fact which surprises us is the high figure of the capacity given by prehistoric crania. The masculine crania of Lozère have given 1606 cc., the feminine 1507; also of Lozère, masculine 1578, feminine 1473; crania from the *pietra levigata*, masculine 1531, feminine 1320; the contemporaneous Parisians, masculine 1559, feminine 1337. The approximate average of crania from the *pietra levigata* is 1560, equal to that of modern Europeans, as is related by Topinard."¹

In another of my recent works, I have demonstrated that of the crania of the neolithic age² the *Isobathypatycephalus* has a capacity from 1230 to 1405 in the feminine, and the *Eucampylos* varies from 1470 to 1564 in the masculine. The two varieties, still persistent in Sicily, do not vary in capacity in the modern series, and at the same time show that in the neolithic epochs, as among modern populations, large and small varieties are found, just as the same types are now found through persistence of forms.

From this it is evident how much there is to reform in anthropology when we study by natural methods facts until the present misinterpreted, respecting the classification as well as the physical and psychological characteristics of man in time and space. Perhaps in the future, when we know all cranial forms by natural classification, it will be possible to find a correspondence of psychological characteristics in populations according to the predominance or superiority of types, a fact which has until now escaped research, because the capacity of the cranium in its absolute sense is not in correlation to the development of the mental functions, notwithstanding what is commonly affirmed.

The following are the varieties into which Dr. Sergi classifies the forms of skulls in the *norma verticalis* of Blumenbach:— (1) Ellipsoid (*ellipsoides*); (2) Pentagonoid (*pentagonoides*); (3) Rhomboid (*rhomboides*); (4) Ovoid (*ovoides*); (5) Sphenoid (*sphenoides*); (6) Spheroid (*spheroides*); (7) Byrsoid (*byrsoides*); (8) Parallelepipedoid (*parallelepipedoides*); (9) Cylindroid (*cylindroides*); (10) Cuboid (*cuboides*); (11) Trapezoid (*trapezoides*); (12) Acmonoid (*acmonoides*); (13) Lophocephalic (*lophocephalus*); (14) Chomatocephalus (*chomatocephalus*); (15) Platycephalic (*platycephalus*); (16) Skopeloid (*skopeloides*).

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

WE have received a verbatim report of the interview which a deputation from the Association of Technical Institutions recently had with Mr. Acland. Several suggestions were made, some of which have already received the attention of the Science and Art Department. Prof. Wertheimer pleaded for an advisory voice in the construction of the Department's schemes before they were finally adopted, in a manner similar to that by which the Education Department allowed the managers of public elementary schools to express their views on the Cole under which they had to work before it was finally adopted. Mr. Acland, in the course of his reply, said it was the intention of the Department not to publish near the summer months anything which will be in the nature of an important change. The recent form dealing with organised science schools had been issued early, with a view to embodying it in the Directory next autumn, the Department in the meantime being open to suggestions. During the course of the Vice-President's remarks, the question of the publication of the dates of the May examinations was raised, and, in reply to an inquiry, Sir John Donnelly said he saw no difficulty, if the schools wanted it, in publishing in May the dates of the subsequent May examinations. As to the question of the proper basis for the calculation of the Government grant, Mr. Acland expressed the hope that some day a part of the principle, which is shortly to be applied to organised science schools, will also be applied to evening classes; that is to say, there is every prospect that the grants will in a year or two be awarded more on the Inspector's reports as to the soundness of the teaching than on the results of examination.

THERE are 119 Universities in the world, says the *Oxford University Extension Gazette*. Dr. Kukula in his list names

¹ "Human Evolution." (Review of Scientific Philosophy, 1888, Milan.)

² "Concerning the Primitive Inhabitants of the Mediterranean." (Archives of Anthropology, Florence, 1892, vol. xxii.)

¹ See "Human Evolution."

² "Crania of the Neolithic Age." (Boll. Paletnol. Italiana, Parma, 1892.)

114, but he omits the Universities of London, of Paris, of the State of New York and of Wales, and the New University of Brussels. Excluding the first three, which, being of the Napoleonic type, have no resident students, the undergraduate population of the Universities of the world is estimated by this academic statistician as amounting to 157,513 persons. Berlin is the most populous University, Urbino the smallest. The first has 7771 students, the latter only 74. In point of numbers Oxford comes tenth on the list; Cambridge, twelfth; Victoria, sixty-fourth, and Durham ninety-eighth.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, March 21.—"On the Development of the Branches of the Fifth Cranial Nerve in Man." By A. Francis Dixon.

In this paper "detailed descriptions of the fifth nerve branches are given for five different stages of the human embryo, beginning with an embryo of four weeks, at which time merely the three main divisions of the nerve are represented, and ending with one of the eighth week. The observations on the human embryo have been checked by further observations on rat embryos, and an almost complete correspondence between the two has been made out." In mammals, the three divisions of the fifth nerve are found to rise independently from the Gasserian ganglion, and the nasal nerve is found to be the first representative of the ophthalmic division, the frontal being formed later. In like manner, the inferior dental nerve represents the first formed inferior maxillary nerve, the lingual branch appearing later. No special ganglion is present either for the nasal or for the ophthalmic nerve in mammals in the sense of a ganglion of a posterior nerve root. The ciliary ganglion does not represent such a ganglion, and when first found is more closely connected with the fourth and frontal than with the third and nasal nerves. The fourth and frontal nerves from an early period are closely connected. At the beginning of the sixth week nearly all the named branches of the fifth nerve of the adult are represented in the embryo; also at this time the accessory ganglia of the fifth nerve are recognisable. No evidence was found to show that the cells of these smaller ganglia are derived directly from those of the Gasserian. None of the different nerves which in the adult connect the fifth with the other cranial nerves are to be considered branches of the fifth nerve; thus the chorda tympani and the Vidian are found to be derived from the facial, and the nerve of Jacobson from the Glossopharyngeal.

"On the Conditions affecting Bacterial Life in Thames Water." By Dr. E. Frankland, F.R.S.

Since May, 1892, the author has been making monthly determinations of the number of bacteria capable of development on a peptone-gelatin plate in a given volume of Thames water collected at the intakes of the metropolitan water companies at Hampton. The number of microbes per cubic centimetre of water varied during this time between 631 and 56,630, the highest numbers having, as a rule, been found in winter or when the temperature of the water was low, and the lowest in summer or when the temperature was high.

The complete observations demonstrate that the number of microbes in Thames water depends upon the rate of flow of the river or, in other words, upon the rainfall, and but slightly, if at all, upon either the presence or absence of sunshine or a high or low temperature.

With regard to the effect of sunshine upon bacterial life, the author remarks that the interesting researches of Dr. Marshall Ward leave no doubt that sunlight is a powerful germicide; but it is probable that its potency, in this respect, is greatly diminished, if not entirely annulled, when the solar rays have to pass through a stratum of water even of comparatively small thickness before they reach the living organisms. If this be the case, it is held to be no matter for surprise that the effect of sunshine upon bacterial life in the great mass of Thames water should be nearly, if not quite, imperceptible.

Geological Society, April 3.—Dr. Henry Woodward, F.R.S., President, in the chair.—Dr. K. de Kroutchoff, St. Petersburg, was elected a Foreign Correspondent of the Society.—Physical features and geology of Mauritius, by Major H. de

Haga Haig, R.E. The author gave full details of the physical geography of the island, including the nature and composition of the mountain ranges, the depth of the ravines, the occurrence of caverns in the lavas, and the character of the coral reef surrounding the island. Information was furnished concerning the neighbouring islands, and reference made to the possible former existence of an extensive tract of land at no great distance from Mauritius.—On a comparison of the Permian freshwater Lamellibranchiata from Russia with those from the Karoo formation of Africa, by Dr. Wladimir Amalitsky, Professor of Geology in Warsaw University. The freshwater shells from the Russian Permian deposits belonging to the genus *Palæomutela* are also known from the Karoo beds of South and Central Africa, as pointed out by the author in 1892. He had recently had the opportunity of studying the actual specimens from the Karoo beds, and found in them species of the groups *Palæomutela Inostranzewi*, *P. Keyserlingi*, *P. Verneulii*, and *P. Murchisoni*; also of a new genus, the forms of which he had previously referred to *Naiadites*, Dawson. All these groups are found also in Russia, and a list was given of species found in the upper horizons (A, B, and C) of the Permian beds of Russia and in the Karoo beds. These upper beds of Russia have been determined by the author as the freshwater equivalents of the Zechstein; consequently the Beaufort beds of the Karoo series, if considered as the homotaxial equivalent of the European strata referred to above, should be regarded as Upper Permian. The Upper Permian group of freshwater lamellibranchiata of Russia, which bears traces of genetic relationship with the Carboniferous Anthracosidæ, and which was already well represented in Permo-Carboniferous and Lower Permian times, is, according to the author, much older than the African fauna of the Beaufort beds. These may be concluded to have migrated from Russia, the Gondwana beds of India having probably been the connecting-link between all these deposits. The author gave a description of the fossils of the Karoo series which he had examined, including a diagnosis of the new genus in which he placed the fossils already alluded to as having been previously referred to the genus *Naiadites*.

PARIS.

Academy of Sciences, April 8.—M. Marey in the chair.—On the fluted spectrum, by M. H. Poincaré. A mathematical paper in which it is shown that a complete analysis of the phenomena of Fizeau and Foucault's experiment confirms Fizeau's deduction concerning the permanence of luminous movement during a large number of oscillations.—Official plans and reports relating to the removal of the capital of Brazil to a new site, by M. H. Faye. A series of reports printed in Portuguese and French. The district in which the proposed new site for a Brazilian capital is situated lies between the parallels 15° 40' and 16° 8' and the meridians 3° 18' and 3° 24' at an altitude of above 1000 metres.—Structure of the hymen in a species of *Marasmius*. An abstract of a memoir by M. J. de Seynes.—On substitutions, by M. Zochios. An algebraical paper.—Removal of the Brazilian capital. A letter to M. Faye, by M. Cruls. A short account of the main features of the survey work undertaken on the new site.—On geodetic work in the basin of the Amour, by M. Venukoff.—On the determination of the mass of the cubic decimetre of distilled water at 4°, by M. J. Macé de Lepinay. This datum is yet imperfectly determined. Shuckburg and Kater give 1000.480 grams, whereas Stampfer finds the value 999.653 grams. The author proposes a new method of determination by which he expects to determine this constant within 6 mgm. The proposed method includes (1) the study of the geometrical form and dimensions of a certain solid as related to the standard metre, (2) the measurement of the loss of weight of this solid immersed in pure air-free water at its temperature of maximum density in terms of the standard kilogram. The solid taken is a parallelepipedon formed of transparent quartz. Its thickness in different directions will be examined optically by means of Talbot's fringes.—New apparatus for the measurement of the specific inductive power of solids and liquids, by M. H. Pellat.—On a new form of spectroscope termed the "héma-spectroscope comparateur," by M. M. de Thierry. On a simple experiment demonstrating the presence of argon in atmospheric nitrogen, by M. Guntz. The author obtains argon by replacing magnesium by electrolytic lithium. Owing to the lower temperature at which lithium completely absorbs nitrogen, it is possible to pass atmospheric nitrogen over several heated