The brain-weight of man exceeds that of all animals except the elephant (4500 gr.) and the larger Cetaceæ (2500 gr.). The brain-weight of the largest apes is hardly a third of man's. Prof. Bischoff has worked with a considerable amount of material; his data comprise the weights of brain of 559 men and 347 women.

PHYSICAL NOTES

EXPERIMENTS have been made by Herr Glan (*Wied. Ann.* No. 11) as to the action of gases and vapours on the optical properties of reflecting surfaces. No such influence (expressed in alteration of phases in reflection) is found to exist if the gases and vapours do not act chemically on the surfaces, or are not precipitated in visible quantity (as when the temperature is below the dew point).

DR. FUCHS describes a new interference photometer (*Wied. Ann.* No. 11) in which no polarisation of the rays at right angles to each other is required. It consists simply of two similar isosceles glass prisms joined by their basal surfaces, which enclose an air layer variable in thickness by pressure. A diaphragm reaches out in prolongation of the surface of junction. The observer looks obliquely towards this surface and sees one illuminated surface directly through the double prism, the other by reflection at the air layer. One light-source is fixed, and the other is displaced till the interference bands disappear.

THE polar differences in luminous phenomena of the discharge of electricity through gases were considered by Wiedemann and Rühlmann as possibly due, in part at least, to a gas layer (more or less condensed) on one electrode. Supposing that other kinds of envelopes with like action would essentially affect the phenomena, Herr Holtz has been able (*Wied. Ann.* No. 11), by covering one electrode, *e.g.* with silk, or placing a stretched silk disk before it, to verify this, and almost quite obliterate, in some cases, the polar differences.

IN a recent publication describing electrical researches, by Herr Goldstein, in Berlin, that author investigates the phenomena which occur when, in a space so far evacuated that the green phosphorescent light occurs with the discharge from the cathode, there are, not one, but several cathodes. He has met with a new form of electrical repulsion, not to be classified either with the mechanical repulsion in collision of ponderable masses, or with electrostatic or electrodynamic repulsion. (An abstract of the memoir appears in *Wiedemann's Beiblätter*, No. 11.)

APPLYING his theory of the potential energy of liquid surfaces to great cycle-operations in nature, M. van der Mensbrugghe (*Bulletin* of Belg. Acad., 9 and 10) has lately calculated that if evaporation subdivides the liquid of seas into spherules of *e.g.* 1-10,000th mm. diameter, each kilogramme of water presents a collection of spherules whose total potential energy is equivalent to 450 kilogrammetres, *i.e.* more than a million times that of a sphere of compact water also weighing 1 kilogramme. This shows what prodigious quantities of work-units are carried virtually into the atmosphere by water vapour, and there is to be added the potential energy acquired by this vapour in virtue of its weight. The author applies his theory to the effects of condensation, to glazed frost, to phenomena of rivers and waterfalls, &c. He anticipates important verifications of it from the examination of the Gulf Stream in the Gulf of Mexico projected by the United States, and recent soundings have tended to confirm it.

M. MONTIGNY (*Bull.* Belg. Acad. 9 and 10) has lately studied the effects of making bells vibrate with liquids in them (water, ether, alcohol, sulphide of carbon), or when wholly immersed in liquids. He found that (1) the sound produced was always more grave than the natural sound; (2) that the lowering of tone was more marked in both cases the more dense the liquid (thus it is less with ether than with sulphide of carbon); (3) that with all the liquids tried the alteration in sound of a given bell was much more marked when the bell was wholly immersed than when merely filled with the liquid; and (4) that in both cases the lowering of tone was more marked for grave than for acute notes. The general inference is that the rapidity of vibrations of a sounding body is considerably diminished by a liquid with which its walls are in contact, and that this diminution is more sensible when the contact is established on both sides of the vibrating body than when only on one side. The mode of action is related not only to the density, but to the compressibility of the liquid. The lowering of sound is more sensible with water than with alcohol and ether; the latter being less dense and more compressible liquids. The form of the bell and the nature of its substance (that is its special elasticity and its density) are shown also to affect considerably the pitch of the sound produced in contact with liquids. M. Montigny is investigating whether air is a medium of too little density and too great compressibility to modify sensibly the duration of vibrations of sonorous bodies.

AT a recent meeting of the Franklin Institute (*Journal* for December), Mr. Griscom described his new electric motor, which, weighing about 2½ pounds, compares favourably with those of the old forms of fifteen times its weight. Its most essential advantage is in the field magnets; the shape of which is such that all the magnetic lines of force, including those nearest the neutral line, are brought into the best possible position for effecting the revolution of the armature. If a bar of soft iron is pivoted at one end to move in a horizontal plane, and a semicircular magnet is placed concentrically with the circle the bar can describe, then a given force is exerted on the bar at a much greater distance from the poles when the latter is within the semicircle than when it is without. Herein (it is stated) is the secret of the power of Mr. Griscom's motor. The battery is inclosed in a strong waterproof box, gives no odour, and very little trouble in renewing. It is calculated that it will suffice for the sewing of a small family for one year; a professional seamstress would exhaust it more rapidly, but always in proportion to the exact amount of work done.

A NEW microphone, made by M. Boudet in Paris (*La Nature*, No. 394), has the general shape of a telephone on a support. It comprises a mouthpiece, in which is an ebonite plate 1 mm. thick, with a short bar of copper penetrating from its middle a short way into a glass tube in which are six little balls of retort carbon in a row; a second mass of copper following the last, and resting on a small spiral spring in a case. The pressure can be varied by means of a screw. The instrument is worked with six Gaiffe elements (peroxide of manganese and chloride of zinc) mounted in tension, and a Bell telephone. It is said to transmit the voice very distinctly without altering its timbre and without disturbing sounds being produced.

IN a note to the Vienna Academy (*Anz.* December 16) Prof. Stefan describes experiments on the influence of terrestrial induction in development of an electric current, and the excitement of the telephone by currents from a rotating coil. The coil used was 56 mm. in external diameter, and 11 mm. in width. The earth's influence is best shown by so connecting the apparatus with a galvanometer that the circuit is closed during one half of the coil's rotation, and broken during the other half; if the completion of the circuit correspond to the positive maximum of the electromotive force of the earth's magnetism, and the interruption to the negative, the galvanometer is positively deflected. The deflection may be reduced to zero by displacing the contact, and from the displacement and the number of rotations the potential may be inferred in absolute measure. Next the telephone was so connected with the coil that the full alternately opposite currents went uninterruptedly through the circuit. This gave a simple tone. With 100 rotations per second the horizontal component of the earth's magnetism did not suffice to excite an ordinary telephone, but it excited one having a horse-shoe magnet. (When the intensity of the field was doubled the ordinary telephone was also excited.) The tone corresponds to the number of rotations. When the coil was rotated 220 times in a second the ordinary telephone sounded. The telephone was shown to be less sensitive to currents whose intensity periodically changes than to interrupted currents (an ordinary telephone sounded with 100 rotations or fewer, when the circuit was closed only during a short time of each rotation).

GEOGRAPHICAL NOTES

AT the meeting of the Geographical Society on Monday evening a paper was read on the discoveries made by Mr. Leigh Smith last year on the coast of Franz Josef Land, including also a general sketch of the rest of his voyage in the *Eira*. Mr. Smith appears to have reached the southern shores of Franz Josef Land with comparative ease about the middle of August, and to have examined it and several islands along a coast-line of over 100 miles of previously unexplored ground. The new continent, as some would fain believe it to be, does not present an attractive appearance, for the coast-line is described as consisting

of glaciers with dark frowning and flat-topped cliffs, here and there reaching to a height of 1200 feet. It was after passing Barents' Hook that new ground was actually broken, and the exploration was continued westwards until Mr. Smith succeeded in rounding the western headland. The farthest point actually reached by the *Eira* was in N. lat. 82° 20′, E. long. 45°, and thence the land could be seen trending away to the north-west. During the voyage a meteorological record was kept, photographs taken, and various collections made, chiefly of botanical and geological specimens.

THE January number of *Petermann's Mittheilungen* contains an account of a journey from Dufilé to Lur, on the west shore of Lake Mwutan-Nzige, by Dr. Emin Bey, in the last months of 1879. Herr Clemens Denhardt brings together much valuable information on the East African region between Mombasa and the Victoria Nyanza, with special reference to the trade-routes, accompanied by an excellent map. An article of special scientific interest is contributed by Dr. H. Hoffmann on the Comparative Phænology of Central Europe. In a series of tables and in a map the average time of bloom is shown for a very large number of places, with reference to Giessen as a standard. There is a very interesting account by Baron Nordenskjöld of his visit to Behring Island, followed by some critical remarks on the vegetative region of the Serra da Estrella, by Dr. O. Drude.

Bulletin, No. 5, 1879, of the American Geographical Society contains a paper by General R. E. Colston on "Life in the Egyptian Deserts," and an amusing lecture by Lord Dunraven on "Moose and Cariboo Hunting."

THE French station of the African Association has been established by M. Savorgnan de Brazza at Nghimi, on the route from Machogo to Levumba, in the region of the sources of the Ogové, in 1° 30′ S., and about 11° E. from Paris.

THE publication in which the results of the determination of the South American longitudes by electricity have been tabulated by American observers has just arrived in Paris. All the positions determined by M. Mouchez on the Brazilian coast have proved correct within a difference of 1½ second of time. These determinations were taken by Admiral Mouchez when a subordinate officer in the French service twenty years ago, by lunar distances, occultations, and eclipses.

THE author of the summary of Geographical Discovery in *Whitaker's Almanac* writes to us in reference to the notice on p. 232, that it is not stated that Mr. Leigh Sr. ith's voyage is "the most remarkable geographical event of the year," to the depreciation of Mr. Thomson's African journey; "but that, in spite of the success of the latter, Mr. Smith's voyage would probably be considered by many as the most remarkable geographical event of 1880." We doubt if "many" would hold such an opinion, merely for the reason assigned in the *Almanac*. "May I be allowed to point out," he adds, "that the word 'research' means careful search or investigation? and that mere searching for the North Pole is not the sole object of Arctic voyages?" We are glad the writer is of this opinion, though we doubt if Mr. Leigh Smith's voyage has much bearing on Polar "research."

CHESAPEAKE ZOOLOGICAL LABORATORY

A REPORT of the third year's work at the Chesapeake Zoological Laboratory of the Johns Hopkins University has been addressed to the President of the University by Mr. W. K. Brooks, Director of the Laboratory. An advance copy of this has been sent us, from which we make some valuable extracts.

The laboratory was opened at Beaufort, North Carolina, on April 23, 1880, and closed on September 30, after a session of twenty-three weeks. It was supplied with working accommodations for six investigators, and the facilities which it afforded were used by the following six persons:—W. K. Brooks, Ph.D., Director; K. Mitsukuri, Ph.B., Fellow in Biology; E. B. Wilson, Ph.B., Fellow in Biology; F. W. King, A.M., Professor of Natural Science, Wisconsin State Normal School; H. C. Evarts, M.D., Academy of Natural Sciences, Philadelphia; H. F. Osborne, Ph.D., Fellow of the College of New Jersey.

Beaufort was selected for the third season's work because it is the nearest accessible town south of Baltimore which is favourably situated for zoological study. The scientific advantages of Beaufort are very great; the most important is the great difference between its fauna and that of the northern Atlantic coast.

"The configuration of our coastline," the Report goes on, "is such that Cape Hatteras, the most projecting point south of New York, deflects the warm water of the Gulf Stream away from the coast, and thus forms an abrupt barrier between a cold northern coast and a warm southern one. The fauna north of this barrier passes gradually into that of southern New England, while the fauna south of the barrier passes without any abrupt change into that of Florida, but the northern fauna is sharply separated by Cape Hatteras from the southern. As the laboratory of the U.S. Fish Commission and Mr. Agassiz's laboratory at Newport afford opportunities for work upon the northern fauna, it seemed best for us to select a point south of Cape Hatteras in order to study the southern fauna with the same advantages, and as Beaufort is the only town near the Cape which can be reached without difficulty, it was chosen as the best place for the laboratory. The situation of this town is exceptionally favourable for zoological work, for the surrounding waters present such a diversity of conditions that the fauna is unusually rich and varied."

After describing in detail the special characteristics of the locality Mr. Brooks goes on to say:

"The zoological resources of Beaufort have not escaped the attention of American naturalists, and there are few places upon our coast, outside of New England, where more zoological work has been done. In 1860 Drs. Stimpson and Gill spent a season in dredging and collecting in the vicinity of Beaufort, Cape Lookout, and Cape Hatteras, and an account of their work was published in the *American Journal of Science*. Dr. Coues, who was stationed at Fort Macon during the war, occupied himself for two years in collecting the animals which are found here, and he published a series of papers on the 'Natural History of Fort Macon and Vicinity' in the *Proceedings* of the Academy of Natural Sciences of Philadelphia. These papers, which were continued by Dr. Yarrow, contain copious and valuable notes on the habits and distribution of the animals which were observed, and we found them a great help to us. These two naturalists found 480 species of animals in the vicinity of Beaufort. Of these 480, 298 are vertebrates, and 182 are invertebrates. Of the vertebrates 24 are mammals, 133 are birds, 27 are reptiles, 6 batrachians, 97 fishes, and 11 selachians. Of the invertebrates 147 are mollusks, 21 are crustaceans. The list of vertebrates is very nearly exhaustive, and we made no additions to it; but the list of invertebrates is obviously very imperfect, and although we made no attempt to tabulate the species which we observed, there would be no difficulty in enlarging the list twenty or thirty fold.

"Among other naturalists who have spent more or less time at Beaufort I may mention Prof. L. Agassiz, Prof. E. S. Morse, Dr. A. S. Packard, Prof. Webster, and Prof. D. S. Jordan. Prof. Morse procured most of the material for his well-known paper on the Systematic Position of the Brachiopoda on the Sand-bars in Beaufort Inlet.

"I will now attempt to give a very short statement of some of the leading points in our own summer's work. Much of our time was spent in studying the development of the Crustacea, since this is one of the most important fields for original work upon our southern coast. The supply of material is almost inexhaustible, and would employ a number of students for many years. The life-history of the Crustacea is of great interest in itself, and the recent species are so numerous and diversified that there is no group of animals better adapted for studying the general laws of embryonic development in their relation to the evolution of the group. These considerations have led us to devote especial attention to this group during this and the preceding seasons. One of the published results of the first season's work was an illustrated account of the metamorphosis of Squilla, a representative of a somewhat aberrant group of Crustacea. During the second season a member of our party, Prof. Birge, made a very thorough study of the development of Panopæus, one of our crabs, and the account of his observations, with drawings, was ready for publication several months ago. At Beaufort we spent most of our time upon this subject, and figured more than 800 points in the development of various Crustacea.

"Among these I wish to call especial attention to our observations upon the development of the Sergestidæ; the least specialised of the stalk-eyed Crustacea. This very peculiar group was not known to occur upon our coast until we found a few