

THE difficulties of the old Paris Municipal Council with the gas company were not adjusted before its dissolution. We believe that the new Municipal Council is sure to accept all the proposals coming from any gas company which has proved practically by some previous experiments the value of their system, and are willing to accept a remuneration proportional to the quantity of light produced on a scale similar to the Lontin agreement, viz. 10 deniers for each 120 or 130 sperm candles.

THE French Government has appointed an engineer of the Ponts et Chaussées, M. de Villier du Terroge, to report on the possibility of establishing in Paris underground railways. The difficulty is in the length of the tunnels to be excavated, which will be greater than on the Metropolitan Railway, and the necessity of procuring smoke-consuming engines.

ON the 7th inst. a silver tea and coffee service was presented by the Mayor of Liverpool, in the name of a large number of subscribers, to Mr. A. Norman Tate for his disinterested efforts to promote scientific education in that city.

A GENERAL Horticultural Exhibition will be held at Frankfort-on-Main from May 1 to October 1 this year. Particulars may be obtained by applying to "Die Gartenbau-Gesellschaft" at Frankfort-on-Main.

THE Electric Railway, constructed by Siemens and Halske, between the Anhalter Station, in Berlin, and the suburban village of Lichtenfeld, has been satisfactorily completed, and will be opened to public traffic on the 1st of next month.

A NEW electric lamp has been brought out in Paris; it is a combination of the Werdermann with a perforated carbon filled by an insulating medium. It is said to work well.

AT a meeting of the Council of the Epping Forest Naturalists' Field Club, held on Saturday evening, January 8, the following resolution was passed on the motion of Mr. Francis George Heath, seconded by Mr. N. F. Roberts, F.G.S.—"That the Council of this Society, on behalf of the large section of the population of London interested in the pursuit of Natural History, desires to record an emphatic protest against the proposal of the Great Eastern Railway Company to carry a line across Epping Forest, believing that it is wholly unnecessary for the Railway to take the route projected, and that it would not fail to prejudicially affect the advantages secured by the Epping Forest Act, which directs that the forest is to be preserved as far as possible in its natural aspect."

OUR ASTRONOMICAL COLUMN

JANSON'S STAR OF 1600.—The so called *Nova* of 1600, which is 34 Cygni of Flamsteed and P Cygni of Schönfeld's catalogues of variable stars, was discovered by Wilhelm Janson, a pupil of Tycho Brahe's, and entered upon his globe in that year. It has been erroneously stated in some astronomical works (as in Cassini's "Elements d'Astronomie") that Kepler was a co-discoverer of this star, of which he himself informs us to the contrary in his treatise, "De stella tertii honoris in Cygno, quæ ad annum MDC fuit incognita necdum extinguitur, Narratio astronomica"; this is appended to his well-known work, "De stella nova in pede Serpentarii," published at Prague in 1606. At p. 154 we read, "Cum mense Mayo anni 1602 primum literis moneret de novo Cygni phænomeno," &c., while at p. 164 Kepler says distinctly that Janson was the discoverer, "Primum est Gulielmus Jansonius, qui hanc novam a se primum anno 1600, conspectam profertur inscriptum in globum caelestem anno 1600 editum factâ." Kepler gave the position of the star for the end of 1600 in R.A. $300^{\circ} 46'$, Decl. $+ 36^{\circ} 52'$. He observed it during nineteen years, it became fainter in 1619, and disappeared in 1621, though Fortuni Liceti dates a reappearance in the same year. In 1655 Dominique Cassini observed it again; it increased during five years, until it attained the third magnitude, and afterwards diminished. On the testimony of Hevelius, it reappeared in November, 1665, it was again faint in the following

year, but subsequently brightened without reaching the third magnitude, in 1677 and 1682, it was only of the sixth magnitude. Cassini says on June 24, 1715, a star of this magnitude was seen in the position of P (Bayer) equal to the three which are near that marked δ in Cygnus by Bayer.

Edward Pigott was at some pains to elucidate the history of this star in a communication presented to the Royal Society in 1786 (*Philos. Trans.* vol. lxxvi, p. 189). He says he had minutely examined the observations made in the previous century with the following results as to the star's fluctuations:—

1. Continues at its full brightness for about five years.
2. Decreases rapidly during two years.
3. Invisible to the naked eye for four years.
4. Increases slowly during seven years.
5. All these changes, or its period, are completed in eighteen years.
6. It was at its *minimum* at the end of the year 1663.

It does not always increase to the same degree of brightness, being sometimes of the third, and at other times only of the sixth magnitude. He adds that he was entirely ignorant whether it were subject to the same changes since the beginning of the eighteenth century, as he had not met with any series of observations upon it.

It cannot be said that Pigott's conclusions (which Schönfeld appears to think are only indifferently supported by the observations upon which they are stated to be founded) have received any confirmation since his time. If in the absence of systematic series of observations we consult the catalogues of the present century, we have the following estimate of magnitude amongst others:—Piazzi, 5.6; Bessel, 6.7 (on September 14, 1825); Argelander's *Uranometria*, 5; and *Durchmusterung*, 5.3; Yarnall, 5.2; Radcliffe observations, 1870, 5.8. But in view of the undoubted variation in the brightness of this star in past times, more regular observation seems desirable. Has it ever been carefully examined under the spectroscope? Its light has a strong yellow cast. Mädler found no appreciable proper motion. The star occurs in the second Radcliffe catalogue, and in the Greenwich catalogue of 1864. The position carried back to Kepler's epoch from these authorities is in close accordance with that given in his treatise.

THE NEW CAPE CATALOGUE.—At the meeting of the Royal Astronomical Society on the 14th inst. the Radcliffe observer, Mr. E. J. Stone, laid upon the table the complete sheets of his great Catalogue of Southern Stars, observed during his superintendence of the Royal Observatory, Cape of Good Hope, which has been printed since his return to England. This very important work contains the places of between twelve and thirteen thousand stars, including, in addition to the stars observed by Lacaille, a considerable number of stars falling within similar limits of magnitude. "A stereographic projection, showing the distribution of the stars contained in the Cape Catalogue, 1880, between 110° and 180° N.P.D." has been lithographed by Mr. Stone. We believe a number of suspected cases of large proper motion amongst the southern stars disappear under the new determination of their positions at the Cape.

BIOLOGICAL NOTES

ARCHÆOPTERYX MACRURA.—A very able article on this strange-feathered animal by Prof. Carl Vogt was read before the Saint Gall Meeting of the Congress of Swiss Naturalists, and was published in the *Revue Scientifique* for September, 1879. This has been translated in the recently-published number of *Ibis*, with a photograph of Herr Häberlein's specimen. H. von Meyer, in 1861, described this species (under the specific name lithographica) from the impression of a "bird's" feather in the Solenhofen slate. Prof. Owen, on the discovery by Dr. Häberlein of a specimen (imperfect) described it "as he alone knows how to do." The head of this specimen was wanting. Dr. Häberlein's son, about 1875, succeeded in splitting a slab so skilfully as to have on one of its halves the whole animal, and on the other its impression. This specimen Herr Häberlein is anxious to dispose of, and it is the one described by Carl Vogt. The animal preserved in the slab is of the size of a ringdove. The remains described by Prof. Owen belong to the same species, but to an example greater by a fifth. It is entire; the head, neck, trunk, and hind-quarters are placed in profile, the head is bent backwards, so that its top nearly touches the back. The wings, united at the shoulder girdle, are

spread as if for flight. The head is small, pyramidal, nearly flat. The orbit is large, with the nostril in front of it. By means of a lens two little conical and sharp teeth are perceived at the end, planted in the upper jaw. On the lower surface there is a forked bone to be seen, but Prof. Vogt dare not say whether this is the lower jaw or a tongue bone; the bones of the head show clearly that it is a true reptile's head. Its shoulder-girdle proves also to be that of a reptile. In fact the head, the neck, the thorax, with the ribs, the tail, the shoulder-girdle, and the whole fore-limb, are plainly constructed as in reptiles. The pelvis has probably more agreement with that of reptiles than with that of birds. The hind-foot is that of a bird, therefore reptilian affinities prevail in the skeleton over all others. The feathers are those of a bird. The remiges of the wings are fixed to the ulnar edge of the arm and to the hand; they are covered for nearly half their length with a fine filiform down; none of them project beyond the others. It is possible that at the base of the neck there was a ruff like that of the condor. The tibia was clothed with feathers for the whole of its length. Archæopteryx thus wore breeches, as do our falcons. All the other parts of the body were evidently naked. It would thus seem to take its rank neither among birds nor reptiles. It forms an intermediate type of the most marked kind, and confirms in a brilliant way the views of Prof. Huxley, who has united birds and reptiles—to form of them under the name of Suuropsids, a single great section of Vertebrates.

EUROPEAN AND NORTH AMERICAN BIRDS.—The occurrence of North American birds in Europe has always been a subject of interest to ornithologists. In the April number (1880) of the *Proceedings* of the Royal Dublin Society there is a paper by Percy Evans Freke giving a comparative catalogue of the birds found in Europe and North America, in which the species of North American birds are arranged in columns side by side with the same species found at times in Europe. The geographical distribution of these species is also given, and the residents, which are probably breeders, are distinguished. This list seems worked out with a great deal of care. A paper on the same subject by Mr. J. J. Dalgleish appears also in the April number (1880) of the *Bulletin* of the Nuttall Ornithological Club, with a table giving a "List of Occurrences of North American Birds in Europe." Great care has evidently been taken in this memoir also to secure correctness. On comparison of the lists it would seem as if Evans had overlooked Gätke's paper on Heligoland Birds.

A GNAT WITH TWO KINDS OF WIVES.—Dr. Fritz Müller describes in a late number of *Kosmos* (October) a very remarkable two-winged insect which he calls *Paltostoma torrentium*, and which he found at Itajah. The larvæ were found by him under stones and rocks in the little streams with which this province abounds. These larvæ were carefully watched and reared, and the perfect insects on their appearance were found to be males and females, but the latter of two well-marked and very different types. In the male gnat the eyes occupy nearly the whole side of the head, and leave not even room for the three ocelli, which are thus forced to the top of a peculiar stalk-like body. In one of the two forms of the female the eyes occupy the whole length of the head, but leave between them a broad belt, which in the second form of female is not half so wide or long. In the large-eyed females the parts of the mouth are formed after the type of those to be met with in the blood-sucking females of the mosquito or horse-fly. But in the small-eyed females and in the males this formidable development of the parts of the mouth, which enables the large eyed females to feed on blood, is wanting, and the former are honey-suckers, obtaining this food from the nectaries of several flowers. Along with this remarkable difference in the parts of the mouth there is a notable difference in the foot-joints, the honey-sucking wives having slender feet, with smaller claws than their honey-sucking husbands; while the blood-sucking wives have the last foot-joint short and wide, furnished on its under-surface with a thick pad, from which arise strong curved hairs; the claws are also much longer. Thus the small-eyed honey-loving form has the more simple structure of foot, whereas the blood-seeker has not only the more complicated form of foot, but great eager eyes looking about for what they can get to devour.

THE FUNCTION OF ASPARAGINE.—Boussingault's researches seemed to show that asparagine was a substance comparable to urea, the result, like it, of a transformation of albuminous matters, and that this substance made its appearance only in seeds during their germination; but from the discovery of this

substance not only in bitter almonds when the embryo is not yet visible; in the same seeds when completely ripe; in the young seeds of the apricot, plum, and cherry, and even in the unopened inflorescences of the pear, M. L. Portes sees reason to doubt the propriety of ascribing to it this function. If, he says, Boussingault's experiments show the existence in leguminous plants of an asparagine concomitant with the act of germination—which might be called blastemic asparagine—there also exists in the almond tribe and pear-buds, another form apparently not having any physiological connection with the other, which may be referred to as ablasmic. In both cases the asparagine is a secondary product; its formation is in intimate connection with the production of new cells. Sweet and bitter almonds gathered in March in the middle of France were proved to contain neither sugar nor starch, but dextrine was present. Previous analysis allows one to affirm that neither sugar nor starch ever existed in them, nor as yet were they in the flowering stalk. May it not be admitted that the dextrine and glucose which speedily appear have at least in part an albuminoid origin? since the seed does not contain, nor will it for a long time contain, starch; since the young seed shows no sugar; and lastly, since there is a product of excretion representing the azote of the transformed protoplasmic matter. (*Revue Internationale des Sciences biologiques*, October 15.)

A CAUSE OF THE MOTION OF DIATOMS.—According to one view diatoms move by means of strong osmotic processes, which, being more intense in one direction, cause impulsion in the other. Some observations by Herr Mereschkowsky supporting the latter view are described by him in the *Botanische Zeitung* (1880, p. 529). He examined two species of *Navicula* and one of *Stauridium* in sea-water containing many very small micrococci, which, near the diatoms, vibrated greatly, but at a distance were quite still. It was first evident that the movements of the diatoms consisted of a straightforward motion, then a backward, with a pause between, or of a turning round the axis. Then it was noticed that so long as the diatom remained still, all the actively vibrating micrococci were uniformly distributed, whereas, when the diatom moved, the micrococci vibrated with excessive activity at the hinder end, as if a strong water current entered behind the alga. At the fore end there was only a very slight motion of micrococci. When the still state was reached the vibration became again equally distributed, and on commencement of the backward motion a reverse distribution of the vibration was observed. These phenomena (observed also in rotation of diatoms) can only be explained, the author considers, by the hypothesis above stated.

FUNGAL GROWTHS IN THE ANIMAL BODY.—By experiments on animals, Herr Grawitz (*Virchow's Archiv*, B. 81, p. 355), has recently proved the following:—1. The well-known mould-fungi *Eurotium* (*Aspergillus*), and *Penicillium* occur in two varieties, which are quite alike in form, but quite different physiologically; the one proving wholly indifferent in the blood-system of the higher animals, while the other has all the malignity of the worst pathogenic fungi known. 2. From any original form both varieties can be obtained by continued cultivation, and similarly from either of the two varieties the other may be got, in twelve to twenty generations, by systematic cultivation. 3. The principle of the cultivation is to habituate the fungi which live on solid, weakly acid, nutritive substances at a temperature of about 8° to 20° C., through a series of generations, to liquid alkaline albumen solutions, and a heat of 38° to 40° C. 4. The malignity of the pathogenic mould-fungi consists, in acute cases, in their spores, which on reaching the circulation of the higher mammals, there germinate, and passing into different parts of the body, multiply, and cause local neuroses, and death in about three days. In the subacute and chronic cases a reactive inflammation occurs in each of the numerous fungus-centres, which may cause the death of the hypæ and lead to cure. 5. Most of the small mould-accumulations easily seen with the naked eye in the kidneys, liver, muscles, and retina, are microscopically distinguishable neither by size nor by histological characters from fungi of the same species, which have grown on their favourite substrata, except that they have only rudimentary fruit-stalks, and never attain to the separation of spores.

BRAIN-WEIGHT.—The weight of the human brain, according to a recently-published work by the eminent Munich anatomist Prof. Bischoff, is on an average 1362 grammes for man and 1219 gr. for woman. The difference between the average brain-weight of man and woman thus amounts to 143 gr., or 10.50 per cent.

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 Mensbrugge (*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 semi-circular 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 (*Ann.* 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