has for its contents the first part of a memoir by Dr. Max Thiesen, entitled "Kilogrammes Prototypes." The paper contains the results of comparisons of the weights of forty-two standard kilograms, designated *Prototypes nationaux*, made by Dr. Thiesen between 1886 and 1888. Of the 251 comparisons made, 230 were executed according to the scheme adopted by the International Committee of Weights and Measures in 1886; the remaining 20 had for their object the determination of the influence of transport on the prototypes. The plan of observation and all the elements used in the reduction of the observations are included in the present paper; but the details of the investigation, and the discussion of the results, are reserved for a future volume.

THE astronomical observations made by Tobias Mayer, at Göttingen, from 1756 to 1761, were published in 1826 by the Commissioners of Longitude. Five years later, Baily's memoir on Mayer's catalogue appeared, together with a comparison of the places of most of the stars with those given by Bradley. The celebrated "Sternvergeichniss" has again been discussed, this time by Dr. A. Auwers, with the assistance of other astronomers, and the results are given in a volume published by Engelmann, of Leipzig. The catalogue thus produced contains the places of 1027 stars computed for the epoch 1755.0. The volume also includes a discussion of Mayer's positions with those given by Bradley and others for the same epoch, a good series of proper motions being obtained by the comparison.

IN these democratic days, very few journals affect to ignore the requirements of that undefinable quantity—the general public. This is what *Science Progress* does, however, in its first number, a copy of which has been sent to us. All the articles in this new publication are what our friends across the Channel term *articles de poids*—solid dissertations on the present state of knowledge of various subjects. Prof. Fitzgerald contributes a suggestive article on physical science and its connections, and Mr. J. W. Rodger describes the new theory of solutions founded by van't Hoff. Insular floras are passed in review by Mr. W. B. Hemsley, and the importance of the study of fossil plants is made out by Mr. A. C. Seward. The origin and nature of certain bacterial poisons forms the subject of an article by Dr. G. A. Buckmaster; the present outlook of vertebrate morphology is discussed by Prof. G. B. Howes, and a summary of the most important papers recently published in chemical physiology, or physiological chemistry, is given by Prof. W. D. Halliburton. Such are the subjects dealt with in the new magazine. References lie on the pages as thickly as leaves in Vallambrosa, and show the immense amount of work that has been done. The new venture appears to stand in the same relation to the majority of scientific journals as the heavy monthlies do to weekly newspapers. We hope that it will meet with a large measure of success.

IN a recent number of *Électricité* (Paris), M. G. Claude gives an account of some experiments he has made on the electric arc in an alternating circuit. The phenomena produced by the disruptive discharge, in spite of the numerous experiments made with a view to elucidate them, are still far from completely elucidated. Thus, for example, it is well known what lengthy discussions have taken place over the question whether the electric arc, either with a continuous or alternating current, is the seat of a back electromotive force, or whether it behaves simply as an ordinary metallic resistance; yet it would be hardly true to say that this point has been definitely settled. In one of his experiments M. Claude joins two points, between which there is an alternating difference of potential of 2400 volts (frequency about 80 per second), by about 12 incandescent lamps (16 candle-power, 100 volt), a condenser of 0·1 microfarad capacity, and a make and break key all placed in series. When the key is closed, the circuit is traversed by the charge and discharge currents of the condenser, the magnitude of which can easily be calculated, and which suffices to make the filaments of the incandescent lamps just glow. If now the key is opened so that there exists a small spark gap in the circuit (about 1 mm.), an arc will be struck at this point. Now this arc is certainly an additional resistance in the circuit, small it may be, since it is formed between metal points, but which certainly cannot be less than that which existed when the metal points were in contact. It is now found that the lamps show an increased brilliancy, and this brilliancy increases as the arc is made longer. This increase is such that, for the longest arc obtainable (a little over 1 mm.), the difference in potential between the terminals of each lamp rises from 30 volts to 90 volts, while the difference of potential between the terminals of the key is found to be about 1200 volts. The author gives the following explanation of this experiment:—The arc is a discontinuous phenomenon, and requires a certain minimum value to start, and thus, while the E.M.F. is below this value, no current passes, and the condenser remains uncharged. When the limiting E.M.F. is reached, the arc is struck, and the condenser is charged suddenly at a high potential. This charging of the condenser is limited to a fraction of the complete period, so that the charge current lasts a shorter time, and is of greater intensity than when no arc exists in the circuit. The absorption of energy in the lamps being proportional to the square of the current is increased, for the mean square of the current in the circuit is increased when the arc is present. The material forming the points between which the arc is struck, exerts an important influence on the facility with which the arc is maintained when the difference of potential diminishes, so that, although a much longer arc can be obtained by using carbon terminals, the above effect is not nearly so well marked as with terminals of iron or copper. It is of course necessary to have a condenser placed in the circuit to obtain the increased brilliancy of the lamps, for otherwise during the time the spark is unable to pass no current passes, while when the current does pass it has the same value it would have at the same part of the cycle if the spark gap were closed. On performing the experiment, M. Claude finds that when there is no condenser in circuit the luminosity of the lamps is slightly reduced when the arc is formed.

MR. A. GIBB MAITLAND, of the Queensland Geological Survey, points out that the sentences after that beginning "For a general colony map," in NATURE, vol. xlix. p. 109 (November 30, 1893), refer to the work being carried out by the staff on the Charters Towers Gold-field, and not to the whole colony.

THE additions to the Zoological Society's Gardens during the past week include an Indian Kite (*Milvus govinda*) from India, a Common Kestrel (*Tinnunculus alandarius*), a Golden Eagle (*Aquila chrysætus*), a Barn Owl (*Strix flammea*), a Tawny Owl (*Syrnium aluco*) British, a Great Eagle Owl (*Bubo maximus*) European, a Spotted Eagle Owl (*Bubo maculosa*) from South Africa, presented by the Crystal Palace Company; two Levaillant's Francolins (*Francolinus levaillanti*), two Barn Owls (*Strix flammea*) from Port Elizabeth, South Africa, presented by Mr. B. Matcham; a Bar-tailed Godwit (*Limosa lapponica*), a Grey Plover (*Squatarola helvetica*), a Dunlin (*Tringa alpina*) British, two Ceylonese Hanging Parrakeets (*Loriculus asiaticus*) from Ceylon, purchased; and Eland (*Oreas canna*, ♀) born in the Gardens.

OUR ASTRONOMICAL COLUMN.

THE AURORA OF FEBRUARY 28.—A fine auroral display was observed in various parts of England on the evening of Wednesday, February 28. Several letters describing the phenomenon have been received, and the following from Mr. C. Thwaites gives a clear account of the general appearance at Norwich:—

"At a few minutes past seven o'clock a bright cone of light was seen springing up from the horizon at about east by north, this was followed by detached cloud-like streamers, which gradually joined into one vast, wide arch of brilliant light, extending, for a short time, completely across the heavens, slightly to the south of the zenith, to the south-west by south horizon. Other luminous patches also appeared on either side of this arch, one covered the space around Jupiter, others the constellations of Orion, Ursa Major, and Leo. Sometimes the rays or streamers gradually brightened, at other times they suddenly flashed into brightness; the effect of this pulsating light was very beautiful. The light was white, fading away at the edges of the rays, and was very similar to a strong, distant light seen through a haze or fog, which diffused the light, and softened its outlines. At half-past eight o'clock the rays had disappeared, and were followed by an arch of glowing light, which was centred at about the north-north-west, rising about fifty degrees towards the zenith."

Mr. Fowler, and other observers at the Astrophysical Laboratory, South Kensington, noticed a number of peculiarly bright clouds, flashing out chiefly in the west and south-west, between 7 and 8 p.m. He says: "From 8 p.m. to a little after 9 the phenomena observed were confined to the north, and took the form of a fine display of the aurora borealis. Streamers were comparatively rare, but at half-past eight there was a brilliant arc, reaching some ten degrees above the horizon at the highest point, which was in or very near to the magnetic meridian. Spectroscopic observations of the luminous clouds showed that the light consisted mainly of that which is characteristic of the aurora, being almost perfectly monochromatic and near wave-length 557. No clouds were seen when the aurora was brightest. During the maximum display of the aurora the characteristic bright line of the spectrum was seen in nearly every part of the sky, even where there was no visible haze or cloud." At the time of observation Mr. Fowler thought that the clouds did not owe their brightness simply to reflected aurora light, but as the observations towards the north were vitiated by the glare of the light of the Imperial Institute, he thinks that he may have been misled.

Rear-Admiral J. P. Maclear observed the aurora at Cranleigh, Surrey. The following is an extract from his description of the appearance presented:—"After sunset two white luminous clouds, like bright fog clouds, became apparent in a west north-west direction, and as darkness came on the northern horizon was lighted with a pale green light. At 8h. 45m. there was a rose-tinted patch like a cloud near the tail of the Great Bear, at the same time the low arch of light to the northward was bordered with a very faint rose tinge. At 9h. the light gradually faded away."

MIRA CETI.—Observations of this variable star have shown that it has continued to brighten since the predicted date of maximum (February 17). At the present time (March 4) it is a trifle brighter than δ Ceti, a star of magnitude 4·2, and is quite a conspicuous naked-eye star for a little while after darkness sets in. There are no indications that it has even yet reached the maximum. On some previous occasions it has reached the second magnitude. The predicted date of maximum was no doubt calculated on the basis of the period of 333 days, deduced by Argelander, but it is well known that the period, like the maximum brightness, is not always the same. There is evidence of a regular irregularity to the extent of twenty-five days. The present apparition is anything but favourable, owing to the proximity of the star to the sun.

According to the meteoritic hypothesis, the general light changes in such a variable as Mira are produced by the revolution of a subsidiary swarm of meteorites round a larger central one, the maximum luminosity occurring at periastron, when the collisions are most numerous. A perfectly constant period, however, can only occur in the case where the central swarm has a regular figure and density. In swarms such as we see in the spiral nebulæ, taking rotation into account, it is evident that the secondary swarm might reach periastron under very different conditions in successive revolutions, and the maximum luminosity might either precede or follow the periastron passage.

HALLEY'S COMET.—Prof. Glasenapp announces that the computing bureau established by the Russian Astronomical Society has undertaken the calculation of the true path of Halley's Comet with a view to predicting the exact date of the next return. He hopes that astronomers acquainted with unpublished observations of the comet will communicate the information to the Society.

IODINE AS A BASE FORMING ELEMENT.

AN important memoir is contributed to the current issue of the *Berichte* of the German Chemical Society, by Prof. Victor Meyer and Dr. Hartmann. A new substance of a somewhat surprising nature, the first member in all probability of an extensive series, has been prepared by them in the Heidelberg laboratory. We have been so impressed with the strongly-marked negative or acid-forming character usually exhibited by the halogen elements, that it is more or less astonishing to learn that a compound has been obtained containing iodine as the central, predominating, or grouping element, which not only contains that element acting in a tri-valent capacity exactly like nitrogen in ammonia, but which is a powerful *base*, combining with acids to form well-defined salts with elimination of water precisely as when a caustic alkali is neutralised by an acid. This remarkable new iodine compound is derived from an as yet unisolated base $I\begin{cases}H\\H\\OH\end{cases}$, similarly constituted to hydroxylamine $N\begin{cases}H\\H\\OH\end{cases}$. The substance itself is represented by the formula $I\begin{cases}C_6H_5\\C_6H_4I\\OH\end{cases}$, and just before transmitting the manuscript for publication, the information was appended that the pure diphenyl derivative $I\begin{cases}C_6H_5\\C_6H_5\\OH\end{cases}$ had likewise been isolated, but further particulars of it were reserved for a subsequent communication.

Prof. Meyer was led to suspect the possibility of the existence of such a compound from the fact that the oxy-iodine derivative of benzoic acid, the so-called iodoso-benzoic acid,

$$C_6H_4\,(IO)\,(COOH),$$

exhibits a very much feebler acid character than ordinary iodobenzoic acid, $C_6H_4I\,.\,COOH$, and partakes indeed more of the character of a phenol, indicating that the group $.\,I:O$ is endowed with basic instead of acid properties. This supposition, moreover, is confirmed by the remarkable observation of Willgerodt, who has shown that the analogous derivative of the hydrocarbon benzene itself, iodoso-benzene $C_6H_5\,.\,IO$, forms a series of well-defined salts with acids. Hence it would appear that the as yet unisolated compound $H\,.\,I:O$ cannot be called hypo-iodous acid, for it is apparently a basic substance, and not an acid at all. An attempt was therefore made to saponify iodosobenzene by boiling it with dilute sulphuric acid, in order to convert it, if possible, into phenol and the sulphate of the supposed base. Dilute sulphuric acid readily dissolves iodosobenzene with formation of a sulphate, as shown by Willgerodt, but on mere boiling it still exhibits the reactions of iodosobenzene. Upon evaporation of the solution, and warming for several hours over the water-bath, however, it loses its capability of liberating iodine from potassium iodide, and a sulphate of a basic substance is indeed found to have been produced. As a method of preparation, however, the following is a much more convenient process:—

The iodosobenzene is placed directly in the calculated quantity of strongly cooled concentrated sulphuric acid. The solution becomes coloured brown, and contains no trace of the original iodosobenzene, as evidenced by its inability to liberate iodine; it consists almost entirely of the sulphate of the new base. The liquid is diluted by adding pieces of ice to prevent loss by rise of temperature, and the solution is most advantageously used to prepare the insoluble halogen salts, which much resemble those of silver, lead, and thallium, by adding a solution of potassium or sodium chloride, bromide, or iodide.

The free base is best obtained from the precipitated iodide by agitation with moist silver oxide. It may also be obtained directly from the sulphate by addition of baryta water; the solution thus obtained, however, is much more dilute. The aqueous solution of the base reacts very strongly alkaline. It cannot be readily obtained in the anhydrous condition, as it concentrates to a thick gum. Analyses of the iodide indicate that the empirical formula of the salt is C_4H_3I. Upon dry distillation the iodide decomposes completely to mono- and di-iodobenzene; hence its molecular formula must be three times the empirical, or $C_{12}H_9I_3$.

$$C_{12}H_9I_3 = C_6H_5I + C_6H_4I_2.$$