present in large numbers in the mouth and all along the intestinal tract of man. Cow's milk contains them, and they are not destroyed even when the latter is vigorously boiled. The most favourable temperature for the growth of these thermophilic bacilli lies between 60° and 70° C., but they may be induced to grow also between 34° and 44° C. It would be interesting to learn what part is played by these bacteria in nature, and it is to be hoped that Dr. Rabinowitsch will continue these investigations, and instruct us as to these functions of thermophilic bacteria.

DR. J. HANN has sent us a copy of his paper on the conditions of atmospheric electricity on the summit of the Sonnblick mountain, deduced from the records of an improved registering hair hygrometer by Richard, which had been adjusted and tested at the Central Meteorological Office in Vienna. The discussion is one of much importance, and the subject is treated by Dr. Hann in a very thorough manner; but the space at our disposal will only allow us to notice briefly some of the general results. The yearly range of relative humidity on the mountain is the reverse of what it is over the plains; the minimum, or greatest dryness, occurs in winter, and the maximum in spring and summer. This much was known from observations at Alpine stations, but at these the uncertainty of the behaviour of the hygrometers in low temperatures made the results doubtful. Temperature and vapour pressure on the Sonnblick run in nearly parallel curves, each degree of difference of temperature corresponds to a change of tension of vapour in the same direction. With regard to the daily range, it is found that in all, except the three winter months, there is low relative humidity in the morning and a great humidity during the evening and night. In winter, however, the case is very different; from about 6h. p.m. to 7h. a.m. the relative humidity remains below the mean, and from 9h. a.m. to 5h. p.m. it is above the mean. The daily range of absolute humidity (vapour tension) is nearly the same in all seasons of the year; the minimum occurs early in the morning, and the maximum in the afternoon. The most remarkable feature in the daily range of relative humidity is that on very clear and warm days, long before the rise of the sun has any effect, the humidity falls below the mean value on the Sonnblick, and by about 6h. in the morning, it has fallen nearly 7 per cent. below the daily mean. This important fact seems to show that the relative dryness of the forenoon on mountains is due to a descending movement of the atmosphere, caused by the winds blowing from the mountains to the valleys during night-time, and thus cooling the sides of the mountains.

THE July *Journal* of the Chemical Society contains the paper on "Helium, a Constituent of certain Minerals," by Prof. W. Ramsay, Dr. J. Norman Collie, and Mr. M. Travers, read before the Society at the last meeting. There are also fifteen other papers read before the Society, and 138 pages of abstracts of chemical papers published in other journals.

WITH the current number, the *Medical Magazine* enters upon its fourth year of issue. The magazine is always readable, not only by members of the medical profession, but by the laity, and the papers which it publishes on medical history and literature are invariably of general, as well as technical, interest. We notice among the articles in the number before us, one on "Mountain Sickness," by Dr. H. Kronecker; and another on "Immunity," by Dr. J. G. Sinclair Coghill.

UNDER the title *Beiträge zur wissenschaftlichen Botanik* a new contribution to general botanical literature is announced, to be edited by Dr. M. Fünfstück, and published by Nägele, of Stuttgart. The first number, which is already published, contains papers on the physiology of woody plants, by Lutz; on the action of "Bordeaux-brühe" and its constituents on *Spirogyra longata* and on the uredespores of *Puccinia coronata*; and on the oily excretions of calcareous lichens, by the editor.

THE report for 1894 of the American Museum of Natural History shows that a number of valuable specimens were added to the collections last year. The new wing, for the building and equipment of which 550,000 dollars (£110,000) were voted in 1893 and 1894, is approaching completion, and is expected to be opened to the public in the autumn. Since the preparation of the report, the Legislature has given power to the authorities of New York City to appropriate £100,000 for a further enlargement of the museum, and for an increased grant of £4000 annually, for maintenance. The erection and equipment of another wing to the museum will provide the facilities for carrying out the plans of the Trustees for the establishment of a great department of Anthropology.

THE report of the Trustees of the South African Museum, for the year 1894, has been received. As the staff of the museum does not include collectors, it is gratifying to learn that nearly seven thousand specimens were presented by private collectors during last year. That the museum is appreciated is evidenced by the fact that the number of visitors in 1894 was nearly twenty-six thousand. The Curator, Mr. R. Trimen, has completed the manuscript of descriptions of new Lepidoptera from Mashonaland, which will be published at the beginning of the year. He has also begun the incorporation of the tropical African insects of this order in the South African collection, adopting the 16° of latitude S. as the South African limit. The staff has been increased by the appointment of Dr. G. S. Corstorphine as assistant in the department of geology and mineralogy. A report by him, on the existing collection of that department as at present exhibited, is appended to the report of the Trustees.

THE additions to the Zoological Society's Gardens during the past week include a Campbelli Monkey (*Cercopithecus campbelli*) from West Africa, presented by Miss C. Thompson; a Yellow-billed Sheathbill (*Chionis alba*), captured at sea, presented by Captain Plunket; four Common Chameleons (*Chamæleon vulgaris*) from Egypt, presented by Mr. J. C. Mitchell; a Sharp-nosed Crocodile (*Crocodilus acutus*) from Columbia, presented by Mr. James G. Green; a Royal Python (*Python regius*) from West Africa, presented by Colonel Frederick Cardew; an Alexandra Parrakeet (*Polytelis alexandræ*) from Australia, six Grey Francolins (*Francolinus ponticerianus*) from Mombassa, a Black Tortoise (*Testudo carbonaria*) from South America, deposited; five Fennec Foxes (*Canis cerdo*), two Variegated Jackals (*Canis variegatus*), two Libyan Zorillas (*Ictonyx lybica*), two Egyptian Cats (*Felis chaus*), three Dorcas Gazelles (*Gazella Dorcas*), four White Pelicans (*Pelecanus onocrotalus*), a Grey Monitor (*Varanus griseus*), from Cairo, received in exchange; a Wapiti Deer (*Cervus canadensis*), two Short-headed Phalangers (*Belideus breviceps*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

THE NEW MADRAS OBSERVATORY.—Prof. Michie Smith, the successor of Mr. Pogson at Madras, has lately made known a few particulars relating to the new Solar Physics Observatory which is to be erected in India. The funds have been voted by the Indian Government, and the site selected is in the Palani Hills at Kodaikanal, 300 miles south of Madras. The daily work of photographing the sun, which is now carried on for the Solar Physics Committee at Dehra Dûn by the officers of the Indian Trigonometrical Survey, will form part of the routine work of the new observatory. It is also proposed to undertake a systematic spectroscopic examination of the sun, but the details of this portion of the programme have not yet been finally determined upon. The climate of Kodaikanal seems to be almost all that can be desired for astronomical purposes. The mean daily temperature varies from 54°·1 C. in December to 62°·2 C. in May, while the rainfall is about 47½ inches. From March to December in the year in which observations were

specially made, the bright sunshine amounted to 1634 hours; the morning is usually bright until about eleven o'clock, then clouds come up and continue until about four o'clock; by six o'clock the sky is generally cloudless. Except during the north-east monsoon, a night which is wholly cloudy is almost unknown. Under these highly advantageous conditions, there is every prospect that the establishment of this observatory will result in a great gain to astronomy, especially in the department of solar physics.

STAR CATALOGUES.—An admirable *résumé* of the history of star cataloguing, from the pen of Mdlle. Klumpke, the gifted directress of the *Bureau des Mésures* of the Paris Observatory, appears in the current number of the *Bulletin* of the Astronomical Society of France. From an instrumental point of view three great epochs may be recognised, each marked by some important discovery. The first epoch is that in which the line of vision is defined by hollow cylinders or by an alidade, and extends from the time of Hipparchus to that of Hevelius; it comprises the catalogues of Hipparchus, Ptolemy, Ulugh-Beigh, and Tycho Brahe. The catalogue of Hevelius, though drawn up from observations with the naked eye, marks a transition period, as he took advantage of the application of the pendulum to the regulation of clocks.

The second epoch is marked by the application of the telescope for accurate sighting of the heavenly bodies, and the employment of the sidereal clock. This period commenced with Flamsteed, and extends even to the present time. In the third epoch the photographic plate replaces the eye. Enthusiasm for this method of cataloguing the stars commenced with the fine results obtained by the Henrys, but it should not be forgotten that as far back as 1865, Rutherford obtained photographs of stars down to the ninth magnitude, and that he clearly foresaw the advantages to be derived from the photographic method. All the world knows now that a great photographic chart of the heavens, initiated by the late Admiral Mouchez, is in course of construction, eighteen observatories participating in the gigantic undertaking. Mdlle. Klumpke estimates that this international catalogue will contain upwards of three millions of stars.

The photographic method, however, does not yet appear to be without imperfections, as the impressions on the negatives are not certainly permanent. In a communication to the editor of the *Observatory*, Dr. Isaac Roberts gives some figures relating to the disappearance of the smaller images in the course of years; in one negative no less than 130 out of 364 star images had disappeared in nine and a quarter years. Hence it is important that as short a time as possible should elapse between the taking of a photograph and its reduction, or, better still, its manifolding by some carbon process.

THE PLACE OF ARGON AMONG THE ELEMENTS.

THE position of argon in a classification of the elements depending on atomic weights has been recently defined by C. J. Reed (*Journal of the Franklin Institute*, July). The elements are assigned positions on a plane determined by abscissæ proportional to their atomic weights and ordinates proportional to their valency. Oxygen is assumed to have an electronegative valency 2, and the valency of other elements is referred to this as standard; electro-positive valency is measured upwards, electro-negative downwards from the zero-axis. Under these conditions most of the elements fall on a peculiar series of double, equi-distant, parallel straight lines, connecting elements in order of their atomic weights and separated alternately by distances corresponding to one and sixteen units of atomic weight respectively.

If the plane be now folded into a cylinder with axis parallel to the abscissæ and a circumference of eight units of valency, it is found that the upper and lower parts of the connecting lines coincide; the whole of these lines then form a parallel pair of spirals on the surface of the cylinder, and valency in angular measure becomes directly proportional to atomic weight.

The regularity with which the elements of lower atomic weight fall alternately on each of the parallel spirals is very striking, but this regularity is not maintained among elements of high atomic weight, notable deviations occurring with most of the elements of which the atomic weight ranges from 100 to 130. The axis of atomic weights represents the valency + 0 or + 8 and is cut by the double spiral in fifteen points. There should then be a group of fifteen elements having a valency of zero or eight, and their atomic weights should be, respectively, 4, 20, 36, 52, 68, 84, 100, 116, 132, 148, 164, 180, 196, 212, and 228. All the known elements appear to be grouped together on certain regions of the surface of the cylinder, other parts remaining comparatively bare. The only members of this family to be expected to occur in terrestrial matter will be those in the inhabited regions of the cylinder surface. The hypothetical elements having atomic weights 20, 36, 84, and 132 are the most necessary from this point of view.

It seems reasonable to suppose from the peculiar position of these elements on the border-line between electro-negative and electro-positive valencies, that they should be more strongly electro-negative than the corresponding members of the sulphur group, and should nevertheless be without valency (or octads). They should, in general, be more volatile than the corresponding members of the sulphur group. As electro-negative valency diminishes in any group with increase of atomic weight, the element 196, if it exists, cannot be expected to be electro-negative. This element should be a volatile metal, heavier and scarcer than gold, and capable of easier reduction to the metallic state; it should be capable of forming an oxide RO_4 or a salt K_2RO_5. The volatile metal osmium agrees with the requirements of this element very closely. Similarly, ruthenium may possibly be the element 100.

Finally, argon falls naturally into the place of element 20, and possesses, so far as is known, the properties to be expected of this element in position 20 in the new group. Argon and element 36 should be comparatively abundant in nature, while 84 and 132 should be scarce, but not more rare than selenium and tellurium.

On Mr. Reed's system, argon should be element 36 if it be monatomic as now believed, and not 20 as he assumes; the actual atomic weight found, 39·9, would then indicate the possibility of the presence in argon of some small quantity of element 84 or element 132. It is remarkable also that, if helium has the atomic weight 4, it falls naturally in this group, and that its atomic weight deduced from the observed density is somewhat greater than this number. If this difference should be due to the presence of some small quantity of element 84, then the spectroscopic evidence leading to the conclusion that argon and helium contain a common constituent would be explained.

POCKET GOPHERS OF THE UNITED STATES.

IN *Bulletin* No. 5 of the U.S. Department of Agriculture, Mr. Vernon Bailey gives an account of the habits and life-history of the Pocket Gophers of the United States, which contains a number of interesting facts and observations derived from various sources. These curious little rodents live underground in burrows which they tunnel in the soil. When working their way through the earth, they use the upper incisors as a pick to loosen the ground, while the fore-feet are armed with strong curved claws for digging. When a sufficient quantity of soil has accumulated behind an animal, he turns in the burrow and pushes it out in front until an opening in the tunnel is reached; the earth is here discharged, and forms a hillock similar to the hills thrown up by moles. Gopher burrows are extended and added to year by year, and the course is marked by the hills of soil brought up to the surface. Gophers do not hibernate, as has been commonly supposed, but work steadily throughout the winter. They do a great deal of good in mixing the soil, and in this way are probably most useful on poor or uncultivated ground. But, on the other hand, in agricultural districts the animals are highly injurious; they devour potatoes and other tubers and roots in large quantities, as well as corn, wheat, and other farm crops; and they destroy great numbers of fruit trees by gnawing off the roots. Gopher burrows also often do a great deal of damage in meadows or on the banks of artificial water-courses. So great is the harm done by Gophers, that in many districts bounties have been offered for their capture. One of the most striking features of Pocket Gophers is their possession of cheek pouches opening outside the mouth. It is commonly supposed that these pouches are used for carrying earth out of the burrows; but Mr. Bailey's investigations lead him unhesitatingly to the conclusion that this view is erroneous; they are used only for carrying food—pieces of