

the area under the rule of the British South Africa Company, north and south of the Zambesi. Among the articles in the present number is a very interesting one on some South African beetles, by the Rev. J. O'Neil, S.J., illustrated by photographs of the chief species described. The magazine can be obtained from the Rev. A. M. Daignault, 114 Mount Street, London, W.

THE annual report (new series, vol. ix.) of the Geological Survey of Canada, referring to the operations of the Survey in 1896, has been received. The volume comprises 816 pages. It is accompanied by five maps and illustrated by twenty plates, besides a number of figures in the text. The several parts composing the volume have been issued separately, and most of them have been referred to in these columns. Dr. George M. Dawson's summary report, occupying 144 pages, shows that the Canadian Survey accomplished work of great economic importance in 1896, and added to scientific knowledge by original observations and deductions, and by exploration of new ground in the field.

A SERIES of monthly star maps has been prepared by Mr. Walter B. Blaikie, and issued by the Scottish Provident Institution in a blotting-book. There are two maps for each month, one showing the aspect of the sky in the latitude of London, at 10 p.m., when looking north, and the other the southern aspect. The stars are printed in gold on a blue ground, and the positions of the chief planets visible are indicated. In addition to the maps, which will enable beginners easily to find their way among the constellations, a number of notes on interesting astronomical objects are given by Mr. Blaikie. The idea of issuing maps of this kind from an assurance office is an excellent one, and it has been well carried out.

WE have received the *Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften*, Vienna, containing papers presented to the section of mathematics and natural sciences during the period from January 1897 to March 1898. The report is divided into four parts, referring to different branches of science, and each part is published in several divisions. The first part contains papers on natural sciences; the second comprises (a) papers on mathematics, astronomy, physics, meteorology, and mechanics, and (b) papers on chemistry; and the third part contains papers on anatomical and physiological subjects, excluding purely medical matters. Many of the papers have already been referred to in these columns, and with the others now before us they make a valuable addition to scientific knowledge.

THE question as to the best means of isolating a freezing mixture is one of considerable practical importance in chemical and physical work. In the current number of the *Berichte*, Prof. W. Hempel describes a series of comparative experiments undertaken by him to settle which substance was most suitable for ordinary work. Starting with a temperature of about -75° to -80° C., produced by solid carbon dioxide and ether, the rate of rise of temperature with time was measured, and, as a result, eiderdown was found to be the best insulator, wool carefully dried at 100° C. being nearly as good, and having the advantage of cheapness. Three samples of vacuum tubes, of the pattern invented by Prof. Dewar, were also tried, and were found to give very varying results amongst themselves, and all being much inferior in insulating power to either eiderdown or cotton wool. Thus with eiderdown a rise of 12° C. occurred in eighty-eight minutes, with dry wool a rise of 20° to 24° C. in the same time, whilst the three vacuum-jacketed tubes gave under the same conditions rises of 65° , 69° , and 39° respectively. The results would seem to show that trustworthy Dewar tubes cannot be bought commercially.

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THE additions to the Zoological Society's Gardens during the past week include a Huanaco (*Lama huanacos*, ♂) from Punta Arenas, presented by Mr. Henry F. Fox; a Crossbill (*Loxia curvirostris*), European, presented by Mr. H. O. Blanford; two Delalande's Geckos (*Tarentola delalandi*) from West Africa, presented respectively by Mr. Percy Leach and Mr. H. Munt; three Grey Squirrels (*Sciurus cinereus*) from North America, two Dorsal Squirrels (*Sciurus hypopyrrhus*) from Central America, three Nose-crested Iguanas (*Iguana tuberculata rhinophthalma*) from Nicaragua, a — Iguana (*Iguana*, sp. inc.) from Tropical America, deposited; a Leopard, Black variety (*Felis pardus*), from Africa, three Brazilian Caracaras (*Polyborus brasiliensis*) from South America, two Warty-faced Honey-eaters (*Xanthonyza phrygia*) from Australia, purchased.

OUR ASTRONOMICAL COLUMN.

COMET CHASE.—This comet, which is a faint object and difficult to observe, has the following ephemeris for the present week:—

Ephemeris for Berlin Midnight.

1899.	R.A. (app.)	Dec. (app.)
	h. m. s.	
Jan. 13 ...	11 8 48 ...	+30 54.6
15 ...	9 15 ...	31 17.9
17 ...	9 35 ...	31 41.2
19 ...	9 48 ...	32 4.6
21 ...	11 9 55 ...	+32 27.7

Its brightness is now about the same as that at the time of its discovery, and is on the decrease.

ARTIFICIAL MOON MARKINGS.—Mr. S. H. R. Salmon has sent to us a series of slides which are of great interest, since they appear to represent portions of lunar landscapes, and are astonishingly like the real photographs of them. In fact, among all artificial methods of trying to produce lunar effects without the intervention of any hand work this is, as far as we know, the most successful. The process Mr. Salmon employs is very simple and can be easily repeated by any one. It is only necessary to smear a little paste on to a glass slide, and gently warm it from below with a spirit-lamp until it is dry. Observing it then with a microscope, we are confronted with this lunar-like appearance. The slides which we have before us represent many variations of lunar formations. In this one we see a small craterlet on the wall of a large crater, while in another we have rills widening now and again into craterlets. In a third slide we have a large crater, very like some on the moon, showing beautifully the gradation of tone on the surrounding wall. All the markings are, as Mr. Salmon states, perfectly accidental, and can be seen with the microscope. The slides before us are the result of a first attempt at micro-photography on the part of Mr. Salmon, and he is to be congratulated on obtaining such excellent results.

A NEW DOME FOR EQUATORIALS.—The natural evolution in the construction of domes under which equatorials are housed is the elimination of the shutter. Shutters, if they are not perfect, are the causes of so many evils in an observatory, for they may leak, jam, break, and in several other ways do indirectly damage to a valuable instrument. There are several ways in which a dome can be erected and found to work satisfactorily without their presence, and one, set up at Greenwich in 1891 for a transit instrument, has met with marked success. In this case the dome consists of two halves, and as the aperture is required only in the meridian, these are made to roll back one east and the other west. More recently the idea has been extended to the new altazimuth, also at Greenwich; but here the halves are mounted on a ring girder, to allow the aperture to take up any required azimuth. In both these cases the openings had parallel sides.

A later modification for equatorials, due to Messrs. T. Cooke and Sons, of York, is described and illustrated in the current number of the *Observatory* (January), and here the opening is wedge-shaped. The arrangement, as described by the makers, is the following.

“Our object was to do away with the usual shutter covering an opening in the dome. To carry this into effect, the dome is

mounted on a horizontal revolving ring or annular frame, provided with rollers at suitable intervals apart, which roll on a fixed circular track or rail firmly secured to the wall of the building. The dome is made in two halves, divided in a vertical plane through the centre, and hinged at one extremity of this division at two of their adjacent corners to a pin fixed to the revolving ring or annular frame above mentioned. At the opposite corners of the two halves of the dome are fixed rollers, one at each corner, and two other rollers are supplied 90° from the first pair, one in each half. These rollers roll on the surface of the revolving ring, or on short races, in such a manner as to support the two halves of the dome on the horizontal revolving ring, and permit of their being opened or closed. The opening is, of course, a wedge-shaped one. The two halves of the dome being mounted on the ring, which is capable of revolving by means of the rollers resting on the circular rail, the wedge-shaped opening in the dome can be brought to face any part of the sky."

It may be mentioned as a further advantage of this arrangement that in the winter season, when the dome may be covered with snow, it does not prevent it being opened, as is so frequently the case with domes with shutters; and, furthermore, it gives facility for any design of dome being used, which a shutter renders impossible.

A NEW ASTRONOMICAL PERIODICAL.—We have received a circular from the Manora Observatory in Lussenpiccolo, informing us that a new illustrated astronomical periodical will be published from that observatory, with Herr Leo Brenner as editor. Ten numbers will be issued during the year, and these altogether will contain 400 pages and over 100 illustrations. The price for the ten numbers is stated to be twelve shillings, post free.

CONFERENCE OF THE INTERNATIONAL GEODETIC ASSOCIATION.¹

THE twelfth general conference of the International Geodetic Association was held at Stuttgart on October 3–12, 1898. Fifteen countries of the nineteen composing the Association were represented. Of the thirty-seven delegates present fifteen came from Germany, five from France, three from Italy, two from Switzerland, two from Japan, and one each from Belgium, England, the Netherlands, Austria-Hungary, Russia, Sweden, Spain, Mexico, and the United States. Besides the delegates, eighteen invited guests appeared, making a total of fifty-five persons present at the meetings. By far the greater part of the time was naturally taken up in reading the regular reports by the delegates on the geodetic work accomplished in their respective countries since the last general conference.

Of special interest was the contribution by Prof. Helmert on the activity of the Central Bureau of the Association at Potsdam. The following work was described: (1) The systematic deviations of the plumb line in connection with the European arc on the 52° of north latitude. (2) The international latitude service. (3) Absolute determinations of gravity. The international latitude service will be inaugurated during the summer of 1899 at four stations under the direct control and at the expense of the Association. Observations at two additional stations will be undertaken, for which the Central Bureau will supply only a part of the funds necessary. Although the mathematical conditions are not essentially changed by the introduction of Cincinnati and Tschardjui, there is great advantage from the fact that any systematic errors in the regular stations will be more readily discovered. It is a fortunate coincidence that the observatory at Cincinnati happens to be precisely on the parallel of latitude chosen for this work, and it is, moreover, a matter for congratulation that Russia is ready and willing to aid in the undertaking, to the extent of establishing and superintending the station at Tschardjui.

The latest results from pendulum observations are with reference to changes of the force of gravity with elevation, and the derivation of a new formula for the length (L) of the seconds pendulum at the sea-level. From a discussion of over 500 stations the conclusion is reached that what is usually known as continental attraction amounts practically to nothing, and that in general the change of the force of gravity at any point

¹ Abridged from an official report by Mr. E. D. Preston to the Superintendent of the Coast and Geodetic Survey, published in *Science*.

on the earth's surface depends purely and simply on the Newtonian law of the inverse square of the distance. The introduction of a spherical function of the third order in the formula for L, alluded to before, foreshadows the determination of a different curvature for the northern and southern hemispheres of the earth; yet the coefficient appears so small that the inequality cannot as yet be safely predicted. The compression given is $1/297$, and the equatorial value of the force of gravity is about $1/13,000$ greater than that now accepted. The investigation of the relation between disturbances in the force of gravity and deviations of the plumb line is one of the most interesting problems of the near future.

Three matters of universal interest were brought before the Association, and suitable action was taken thereon. These were: (1) "The determination of the figure of the earth by the measurement of arcs and the determination of the force of gravity." (2) "The remeasurement of the Peruvian arc." (3) "The redetermination of the difference of longitude between Paris and Greenwich." The first two subjects were introduced as resolutions by the United States delegate, and brought out interesting discussions. The first was proposed for the sake of directing the attention of the Association more specifically to the prime object of its existence. No one doubts the utility or necessity of a complete study of the law governing the changes of latitude, but its ultimate bearing is rather one of astronomy than geodesy. The funds of the Association are now being devoted largely to the latitude question, and the time seemed fitting to suggest work more directly in the line of its avowed purpose—the measurement of the earth. The object of the resolution was, therefore, in the nature of a recall to the original conception of its being, and bespoke in the interest of pure geodesy an application of its resources to a realisation of the idea of its founders.

The remeasurement of the Peruvian arc now appears to be assured. It may be worth while just here to recall the essential features of this work. One hundred and sixty years ago, when it was a disputed question whether the polar or equatorial diameter of the earth was the longer, the French Academy decided to make one supreme effort to settle the point. To this end, two arcs were measured: one on the equator (now known as the Peruvian arc, although it is really in Ecuador); and the other in Lapland, as near the pole as possible. These two arcs, confessedly inaccurate in the light of modern geodesy, have been employed continually in the determination of the earth's figure. Situated as they are, near the extremities of the quadrant, their influence is great on the shape deduced, so that one of the pressing needs of the day in the measurement of the earth is a redetermination of their lengths. It is proposed to make a reconnaissance during the summer of 1899, report the results thereof to the Paris conference of 1900, and then decide definitely on the plans of final measurement. It is universally conceded that France should be given the first chance to act, not alone because the first measure was made by her, but also because the conference of 1889 relinquished in her interest further consideration of the subject.

The Russians and Swedes, in a quiet sort of way, are measuring an arc between the parallels of latitude $77\frac{1}{2}^\circ$ and $81\frac{1}{2}^\circ$ in Spitsbergen. The triangulation will require two summers and part of one winter, and will cost 100,000 kronen (5500*l.*), exclusive of cost of vessels furnished by the governments. The field work will be finished in 1900, and the computations two years later. Fifty stations will be occupied. The sides range in length from ten to one hundred and thirty kilometres, and the bases, of which there will be only two, are to be measured with Jaederin's steel tape line, twenty metres long.

The difference of longitude between Paris and Greenwich came up again for investigation. Nothing seems to remain but to study the conditions of the work of 1888 and 1892, and reconcile, if possible, the outstanding difference. The matter has been referred by the International Geodetic Association to the directors of the two observatories, and a definite result will, doubtless, soon be made known.

The variation of the latitude seems to be at present an absorbing question before the Association; and there results from action taken at the Stuttgart meeting the following status:—Six stations will be established during the summer of 1899 on the parallel of latitude $39^\circ 8'$. These will be distributed in longitude as follows: one each in Japan, Turkestan and Italy, and three in the United States. The American ones will be located at Gaithersburg, Md.; Cincinnati, O.; and Ukiah,