

tion due to gravitation to the amount of $1/30,000$ th of the total force.

THE last number of the *Izvestia* of the Russian Geographical Society contains a very interesting account of Baron Toll's expedition to Arctic Siberia and the New Siberia Islands. Baron Toll was sent out by the Academy of Sciences to examine the body of a mammoth which was said to have been discovered on the banks of the Balakhna, a tributary of the Khatanga Bay, and altogether to continue the work which had been entrusted to Chersky, but was interrupted by his death. Lieut. Shileiko undertook the surveys, as well as the astronomical and magnetical observations. After a three months' journey the two explorers reached the village Kazachiye, at the mouth of the Yana, in 71° north latitude. A visit to the mammoth soon proved that there was nothing left but a few pieces of skin with its hair clothing, parts of the extremities, and a broken skull of a young mammoth. A number of remarkable explorations and surveys, astronomical and magnetical observations, and geological explorations were, however, carried out. The chief geological result is the settling of the real positions of the layers which contain relics of the mammoth. They are undoubtedly Post-Glacial, as they overlie the masses of underground ice which form the chief rock of the great Lyakhoff Island, and which, as Baron Toll's observations now prove, are remains of the great ice-sheet which formerly covered both the islands and the mainland, and whose moraines have now been discovered on the mainland. Moreover, these ice masses have the typical granulated structure of the glacier ice, which proves that they have originated from the snow-cover, and could not have originated from any sort of running water. As to the Post-Glacial layers which overlie the above, they contain, besides shells of *Cyclas* and *Valvata* and well-preserved insects, full trees of *Alnus fruticosa*, willows, and birch, fifteen feet high, and bearing perfectly well-preserved leaves and cones. The northern limit of tree vegetation thus spread during the Mammoth period full three degrees of latitude higher than it spreads now, *i.e.* up to the 74^{th} degree, and the mammoths and rhinoceroses of the time lived upon the patches of meadow clothed with the above bushes. It is worthy of note, that the masses of underground ice are not found in the lower parts of the Arctic coast which are known to have been covered by the Post-Pliocene sea, and that they only occur where the land rises a few hundred feet above the present level of the sea—that is, above the level of the Post-Pliocene ocean.

AFTER considerable delay, Murray's "Handbook for Hertfordshire, Bedfordshire, and Huntingdonshire" has been published. Brief notes on the geology, botany, and antiquities of these counties are given in an introduction.

THE Matriculation Directory (No. xvii.) of the University Correspondence College has just been received. It contains the examination papers (together with solutions) set at the recent matriculation examination, and also articles on the special subjects for next June, and for January 1896.

THE additions to the Zoological Society's Gardens during the past week include a Macaque Monkey (*Macacus cynomolgus*, ♀) from India, presented by Miss Teresa M. L. Monteath; two Little Auks (*Mergulus alle*) from Norfolk, presented respectively by Mr. Hamon Le Strange and Colonel Feilden; a Cardinal Grosbeak (*Cardinalis virginianus*) from North America, presented by Mr. F. Beresford Wright; two Leopard Tortoises (*Testudo pardalis*), a Cape Bucephalus (*Bucephalus capensis*) from South Africa, presented by Mr. J. E. Matcham; two Mantells Apteryx (*Apteryx mantelli*) from New Zealand, a Black Iguana (*Melopoceros cornutus*) from San Domingo, deposited; a Hog Deer (*Cervus porcinus*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

THE NATAL OBSERVATORY.—Mr. Nevill's report upon the work of the Natal Observatory, during the fiscal year ending last June, has been issued. The staff of the Observatory consists of an astronomical assistant, a meteorological assistant, and a computer, all of them ladies. In spite of such limited assistance, much important work has been accomplished. The observations of Mars during the opposition of 1892 have been completely reduced; and as soon as the corresponding observations made at the northern observatories have been reduced and published, it is proposed to compare the two series, and obtain from them a new determination of the distance of the sun. A contribution to the knowledge of the variation of latitude is included in the report. Since 1884 a number of observations have been made, by Talcott's method, to determine the latitude of the observatory. The observations invite consideration, on account of the fact that they were made and reduced before any special attention had been directed to the variation, arising from the suspected periodical inequality, in the direction of the polar axis of the earth. The mean latitude, deduced from the 1023 observations made during the six years 1884-1890, was $29^{\circ} 51' 46''\cdot68$. The results obtained, from the separate observations of each year, show a steady gradual decrease since 1885. The observed latitude of the Observatory seems to have reached a maximum in that year, and to have steadily decreased since, at a nearly uniform rate of $0''\cdot27$ per annum. The rate of decrease up to 1890, however, appears to have quickly diminished, indicating a periodical irregularity in the apparent value of the latitude of the Observatory. Mr. Nevill remarks that a great deal of important work has accumulated at the Observatory, but the Government of Natal will not afford the necessary facilities for printing and publishing it.

THE NEW DUDLEY OBSERVATORY.—The disadvantages of the old situation of the Dudley Observatory had long been recognised, but it was not until 1892 that the generosity of Miss Bruce and other "friends and neighbours of the observatory," permitted the removal of the observatory to its present more favourable site. From an account given by the Director, Mr. Lewis Boss, in the *Astronomical Journal* No. 334, we learn that the observatory grounds consist of six acres, situated in an area of about forty acres, designed to form part of the park system of the City of Albany. The buildings appear to be all that can be desired, and many advantages will no doubt be derived from the provision of dwelling accommodation for the observers. The Transit Circle provided in 1857 has been re-erected with some slight additions, and it is satisfactory to learn that its large aperture of 0.203 m. and focal length of 3 metres, is no detriment to its excellence. A new equatorial, denominated the Pruyne, having an aperture of 31 centimetres, has been presented by the sons of a former President of the Board of Trustees. In this instrument, a photographic combination is obtained by replacing the flint glass of the visual telescope with a second one, and it is believed that this arrangement will be a complete success.

No elaborate programme of work is promised, but "the logic of events and inclination invites the observatory to undertake the comprehensive observation and discussion of stars known to have sensible proper motions." The Transit Circle will accordingly be devoted to this work, and the equatorial will take a subordinate place, "though it is expected that the zealous young assistants will continue to give a good account of themselves in work with this instrument, so far as circumstances permit."

THE MILKY WAY.—Returning to the subject of the distribution of stars in the celestial sphere, C. Easton (*Ast. Nach.* 3270) has derived some results of considerable interest by limiting his attention to two comparatively small regions of the Milky Way, one in Aquila, and another in Cygnus, the latter embracing a specially dark as well as a notably bright region. For each of these regions he finds that the general luminosity of the Milky Way corresponds very much more closely with Argelander's stars of magnitudes $9\cdot1-9\cdot5$, than with the stars of greater brightness. A diagram in which all the stars of the Bonn maps have been reduced to the corresponding number of stars of mag. $9\cdot5$, shows very little similarity with the features of the Milky Way. Extending his inquiries to the photographs taken by Dr. Max Wolf, showing stars down to mag. 15, he shows that the very feeble stars followed the same law of distribution

as those of mags. 9.1-9.5. This correlation appears to indicate that the faintest stars and those of the 9th or 10th mag. probably form part of one system, and are at nearly the same distance from us. At the same time, some stars brighter than 9th mag. seem to be intimately associated with the Milky Way.

The hypothesis of an annular system, relatively isolated from the central part of the great galactic system, is regarded as not incompatible with the distribution of stars which he has found. For if, at nearly the same distance from us, stars vary so much in size or intrinsic brightness as to give magnitudes ranging from 9 to 15, there seems no reason why some should not be of greater brightness than 9th mag.

There is nothing to prove, however that the various parts of the Milky Way are at an equal distance from us, nor even that it may be an enclosed ring. It does not appear improbable that subsequent researches may show the existence of one or several spirals emanating from a central accumulation, and recurring so as to form a nearly annular system, or one consisting of nearly concentric rings. However it may be, Mr. Easton's results seem to indicate that the portion of the Milky Way accessible to our means of observation, has but little thickness in relation to the diameter.

In a paper on the same subject (*Knowledge*, February), Mr. Maunder finds it difficult to resist the conclusion that the "dark lanes" of the Milky Way are really regions of barrenness, and regards these features as indications of a process of condensation going on in the stellar as well as in the nebulous matter.

THE SYSTEM OF ALGOL.—Quite recently (*NATURE*, vol. xiv. p. 446) Mr. Chandler credited Algol with an obscure companion in addition to that which was recognised by Goodricke, and the existence of which has been fully confirmed by the investigations of Pickering and Vogel. Mr. Chandler's conclusions were based on a discussion of the systematic irregularities of the epochs of minima, and were apparently confirmed by a later discussion of the proper motion of Algol itself (*NATURE*, vol. xlix. p. 349). The evidence of irregular proper motion, however, is not regarded as conclusive by some authorities, and M. Tisserand, the Director of the Paris Observatory, is apparently one of the unconvinced. He has therefore attempted to find some other explanation of the phase variations (*Comptes-Rendus*, January 21, 1895), and the result is to show that they can be simply and sufficiently explained by supposing a single dark companion moving in an elliptic, instead of a circular, orbit; and, in addition, that the bright star exhibits a sensible polar compression. The result of this departure from the spherical form would be a movement of the periastron point, and this would explain the apparent irregularities.

Assuming that the plane of the orbit is coincident with the equator of Algol, its eccentricity is found to be 0.132, and the polar diameter is shorter than the equatorial by $\frac{1}{100}$.

The consequences of these conditions would be a very slight variation of minimum brightness in the long period of 140 years, and an entirely negligible difference in the time of passage to minimum and recovery of normal brightness. The total duration of the eclipse, however, will vary very considerably. Taking the mean epochs 1800 and 1884 for the observations of Wurm and Schonfeld respectively, M. Tisserand finds that the duration would be increased in this time by 1.63 hours. Since the times given by these observers are 6.5h. and 9.0h. respectively, M. Tisserand is entitled to regard this as confirmation of his hypothesis. He points out the importance of spectroscopic observations at short intervals from minimum, in connection with his explanation.

The irregularities in U Ophiuchi and U Cephei are probably to be explained in the same way.

THE EXPLOSIVE NATURE OF THE SODIUM AND POTASSIUM DERIVATIVES OF NITROMETHANE.

SOME additional information of an interesting character concerning the extremely explosive sodium and potassium compounds of nitromethane, is contributed to the current *Berichte* of the German Chemical Society by Prof. Zelinsky of Moscow. A short time ago Prof. Victor Meyer described (*Berichte*, 27, 1601) a mode of preparing the sodium compound CH_2NaNO_2 in a state of purity. The process consists in diluting a quantity of nitromethane, CH_3NO_2 , with ether and treating the liquid with a solution of sodium in alcohol, when the sodium compound is precipitated. The precipitate requires to be washed with ether, and is then dried over oil of vitriol; the

dry compound thus obtained affords numbers on analysis agreeing with the anhydrous formula above given. In a former method of preparation described by Prof. Meyer, alcoholic soda was employed as precipitant, but the sodium nitromethane obtained invariably contained either water or alcohol; the use of sodium ethylate affords it anhydrous. Even the hydrated compound first isolated proved to be explosive; but upon placing a small quantity of it upon a watch-glass, and warming over a water-bath, in a short time it became suddenly converted into the anhydrous compound which immediately exploded with great violence. When a small quantity of the anhydrous compound prepared by use of sodium ethylate was placed in a test-tube, gently compressed, and then warmed, an explosion of so violent a nature occurred that the test-tube was completely pulverised.

Prof. Zelinsky has recently had occasion to prepare considerable quantities of sodium and potassium nitromethane, and has had the opportunity of testing and observing their explosive power upon a larger scale. He appears to have adopted essentially the same process for the preparation of sodium nitromethane as that described by Prof. Meyer, employing an alcoholic solution of sodium ethylate as precipitating reagent. Being desirous of obtaining the sodium compound perfectly anhydrous, an attempt was made to achieve this object by use of the water bath, but for the sake of precaution only about a gram of the substance was employed as a preliminary test of the efficacy of this method of dehydration. It was fortunate that such was the case, for within five minutes an explosion of so violent a nature occurred, that the watch-glass upon which the compound was supported was reduced to powder, and the water-bath considerably injured. In order to demonstrate the explosive nature of this compound without danger upon the lecture table, Prof. Zelinsky recommends the following experiment:—A thick clock-glass, or better a stout metal plate, is sprinkled with small drops of water, and a very small piece of sodium nitromethane dropped upon it. After a few seconds, provided the amount of water has not been excessive, a deafening detonation occurs, with production of flame and projection of a thick cloud of smoke. The experiment may be varied by placing the substance upon the perfectly dry plate, and invoking its explosion by means of a smart blow with a hard object.

M. Nef has previously (*Ann. der Chemie*, 280, 273) described several of the metallic derivatives of the nitroparaffins, and has referred to the instability of the sodium compound, and the possibility of occasional explosions. Prof. Zelinsky now supplements this statement by remarking that an explosion always results from the contact of the dry sodium compound with a minute quantity of water. One of his assistants upon one occasion incautiously placed about five grams of sodium nitromethane in a glass vessel whose surface happened to be moist, with the result that a terrific explosion instantly occurred, which shattered every piece of apparatus upon the table, and the atmospheric wave produced occasioned the sudden extinction of the whole of the gas flames in the laboratory. The assistant fortunately escaped more than trifling injury, but a second such occurrence might have a very different result. This incident will doubtless serve to emphasise the great precaution which is necessary in handling these compounds.

The potassium compound, CH_2KNO_2 , has been prepared in a similar manner, and found to be even more unstable than the sodium compound, exploding at the ordinary temperature shortly after its isolation. It separates upon the addition of the potassium ethylate in well defined crystals. The crystalline form, however, soon disappears, and upon rapidly transferring to a filter, an explosion invariably occurs as soon as the compound becomes drained free of most of the mother liquor. The instability of the potassium compound at the ordinary temperature may also be readily demonstrated upon the lecture table. It is, of course, necessary to prepare it freshly on the spot, because of the impossibility of preserving it for any length of time. An ethereal solution of nitromethane is mixed with a solution of potassium ethylate in alcohol, the supernatant liquid rapidly decanted from the precipitate produced, the latter dried as quickly as possible between filter-paper, and left quietly resting upon the paper. After a few minutes the substance explodes with a loud detonation.

These experiments will serve to indicate the extreme instability of the alkali-metal derivatives of nitromethane, and the violence of the explosions produced by their disruption.

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