

PROF. O'REILLY writes from the Royal College of Science for Ireland, Dublin, that there was visible there, on the night of the 16th, between 10 and 11 o'clock p.m., an aurora appearing as a glow, but without any beams when observed. The wind on the 17th was from the south, but the temperature was still relatively low.

THE opening of the proposed International Horticultural Exhibition and Botanical Congress at St. Petersburg has been postponed to May 5, 1884.

THE Council of the Popular Observatory of the Trocadéro has decided to open a series of Sunday lectures, illustrated by experiments, during the whole of the summer season. The Thursday lectures will be devoted to astronomical topics and delivered in the evening, and will be followed by demonstrations on the sky itself, weather permitting.

DR. DOBERCK, whose appointment to Hong Kong we noted last week, has been attached to Markree and not to Dunsink Observatory.

THE additions to the Zoological Society's Gardens during the past week include a Rude Fox (*Canis rudis*) from Demerara, presented by Mr. G. H. Hawtayne, C.M.Z.S.; an Arabian Gazelle (*Gazella arabica* ♀) from Arabia, presented by Mr. J. Sewell; three Weasels (*Mustela vulgaris*), British, presented by Mr. George Lang; a Wood Owl (*Syrnium aluco*), British, presented by Capt. E. Hall; a Lanner Falcon (*Falco lanarius*) from Eastern Europe, presented by Major J. H. Hussey; a Common Raven (*Corvus corax*), British, presented by the Earl of Eldon; five Mississippi Alligators (*Alligator mississippiensis*) from the Mississippi, presented by Mr. Thos. Baring; two Common Snakes (*Tropidonotus natrix*), British, presented by Lord Londesborough, F.Z.S.; two White-fronted Capuchins (*Cebus albifrons* ♂ ♀) from South America, presented by Mr. H. Smith; a Palmated Newt (*Triton palmipes*), British, presented by Mr. J. E. Kelsall; two Amherst's Pheasants (*Thaumalea amherstie* ♂ ♀) from Szechuen, China, deposited; three Lions (*Felis leo* ♂ ♀ ♀) from South Africa, two Reeves's Pheasants (*Phasianus reevesi* ♂ ♀) from China, a Great Black Cockatoo (*Microglossa aterrima*) from New Guinea, a White-backed Piping Crow (*Gymnorhina leuconota*) from Australia, a Common Otter (*Lutra vulgaris*), British, purchased.

OUR ASTRONOMICAL COLUMN

D'ARREST'S COMET.—We last week referred to the discovery of D'Arrest's comet at the Observatory of Strasburg on the 3rd inst., upon the strength of a telegram received at Lord Crawford's observatory from Prof. Krueger, to the following effect:—"Dr. Hartwig discovered on April 3⁶10 G.M.T. D'Arrest's periodical comet in right ascension 13h. 55m. 24s., declination +8° 16'. Daily motion -44s. in R.A., and +9' in declination." This telegram was published in the Dun Echt Circular, No. 76, but in No. 77 issued five days later we read, "Prof. Krueger telegraphs that the object observed by Dr. Hartwig was not D'Arrest's comet but a new nebula." The "daily motion" assigned to the object in the first telegram, notwithstanding its precise accordance in amount and direction with that which the comet would have had in that position, was therefore an illusion. The calculated place of the comet for April 3⁶10 G.M.T. is in R.A. 13h. 55m. 11s., Decl. +8° 23' 6". During the next period of absence of moonlight for which an approximate ephemeris was given in this column last week, the theoretical intensity of light will be nearly one-third greater than on April 3.

THE GREAT COMET OF 1882.—Prof. Riccò sends us the following observation of this comet made with the 10-inch refractor at Palermo:—

	M.T.	App R.A.	App Decl.
	h. m. s.	h. m. s.	° ' "
April 6 at 8	21 29	5 58 5'93	−9 4 49'2

He states that the comet was a very faint nebosity with an

elongated nucleus containing two or more points. At this time the comet was distant from the earth 3'87, and from the sun 3'75.

In *Bulletino della Società di Scienze Naturali di Palermo* for February 8 we find some remarks by Prof. Riccò on the circumstances attending the passage of the comet through perihelion. On studying the appearance of the sun from twelve to fifteen hours afterwards, he found the prominences were by no means unusual either as regards number or dimensions; there were nine with a greater altitude than 30", and about as many smaller ones; the highest was one of 85" on the west-north-west limb, opposite to the part of the disk traversed by the comet, in which no prominences were visible. The comparison of observations made before and after perihelion passage, shows that no very sensible effect was produced upon the motion of the comet in its course through the coronal atmosphere, and Prof Riccò concludes, on the other hand, that his own observations, made a few hours subsequently, "possono servire a constatare che reciprocamente la cometa non disturbò per nulla il corso degli ordinari fenomeni dell'attività solare."

THE BINARY STAR β ERIDANI.—In a communication to the Royal Society of New South Wales in June, 1880, Mr. Russell, the director of the Observatory at Sydney, suggested, from the measures made since 1856, including his own up to 1880, that this object might not be a binary star at all, but merely afforded an instance of one star passing before another by reason of its proper motion. This opinion is repeated in the volume of double-star results obtained at Sydney, published last year. "In fact," observes Mr. Russell, "a straight line accords better with all the observations made subsequent to Herschel's than any ellipse, and it would appear that the changes are due simply to proper motion; of this I think there cannot be any doubt. . . ." The question has just been very fully and carefully considered by Mr. Downing, of the Royal Observatory, Greenwich, who arrives at an opposite conclusion to that of Mr. Russell, and considers "there is not sufficient evidence to justify us in asserting that β Eridani is other than a binary star." We entirely agree with Mr. Downing in his opinion. If we only compare the measures made by Jacob in 1845-46, with those of Russell and Tebbutt, 1878-80, we get the following expressions:—

$$d \cdot \sin \beta = -4'' \cdot 361 - [8 \cdot 3894] (t - 1850 \cdot 0)$$

$$d \cdot \cos \beta = +0'' \cdot 122 - [9 \cdot 1017] (t - 1850 \cdot 0)$$

showing differences from Herschel's mean measures, epoch 1834'996, of -5"·1 in position, and +0"·82 in distance, which are too large to be tolerated.

This star has been occasionally miscalled 6 Eridani, which would imply that it was one of Flamsteed's stars. Flamsteed, it is true, has a star which he calls 6 Eridani, and which is B.A.C. 926; the binary is B.A.C. 521. The letter β was attached to the star by Lacaille in the catalogue at the end of his *Catulum Australe Stelliferum*. The number 6 is merely borrowed from Bode.

GEOGRAPHICAL NOTES

THE Geographical Society of Lisbon has awarded their gold medal for this year to Mr. Carl Bock, the distinguished eastern traveller, who has also been recently elected Corresponding Member of the Italian Anthropological Society.

THE third German Geographentag was held at Frankfort-on-the-Main on March 29 in the presence of 430 men of science. Prof. Rein (Marburg) delivered the inaugural address, and also opened the geographical exhibition, which comprised 1100 objects of interest. Amongst the most successful addresses we mention the following: Dr. Pechuel Loesche (Leipzig), on the mountain districts of the Congo River, in which he described minutely the mountain chains traversed by the Congo, according to the researches of Oscar Lenz and Güsfeldt. Prof. Ratzel (Munich), on the significance of Polar research with regard to geographical science; he proposed a resolution, "That the Geographentag recognises that the resumption of Polar research by the German Government is equally in the interest of geographical science and of the German nation." This resolution was adopted unanimously. Dr. Finger (Frankfort), on topography as an introduction to geography. Herr Mang (Baden Baden), on the method of the tellurium and lunarium. Dr. Breusing (Bremen), on the means for the determination of the position of localities at the time of great discoveries. Dr.

Buchner (Munich), on the tribe of Bantu negroes distributed through the whole of South-west Africa. Prof. Günther (Ansbach), on the latest investigations regarding the exact shape of the earth. Lieut. Wissmann, on his journey across Africa with Dr. Pogge. The oldest among the German African travellers now living, Dr. Rüppel, had come to Frankfort to greet Wissmann upon his return. The fourth Geographentag will be held at Munich.

FROM a paper by M. Smicroff on the climate of the Caucasus (published in the *Caucasian Ivestia*, and based on the researches of Dr. Wild on the temperatures in Russia), it is evident that although enjoying a warm climate, still the climate of the Caucasus, especially in the north, is quite continental. Thus, the average mean temperatures of the year are $5^{\circ}4$ Cels. at Alexandropol, $8^{\circ}5$ at Stavropol, $12^{\circ}6$ at Tiflis, and $14^{\circ}3$ to $14^{\circ}5$ at Bakou, Lenkoran, Kutais, Poti, and Redut-kaleh; but the yearly range of the average diurnal temperatures is still (with the exception of the two last places) as much as 20 to 30 degrees, while in Central and Southern Russia it varies from 22 to 35 degrees. The highest temperatures observed on the Caucasus vary from $38^{\circ}5$ at Tiflis, to $34^{\circ}4$ at Poti; and the lowest from $-25^{\circ}6$ at Stavropol, to $-17^{\circ}3$ at Tiflis, and $-6^{\circ}6$ at Redut-kaleh. It is interesting to compare these temperatures with the $+38^{\circ}8$ and -62° observed at Yakutsk, and $-63^{\circ}2$ at Verkhoyansk. Altogether, it is only in Southern Transcaucasia that localities are found where the temperature does not fall below -10° , and the southern limit of the region beyond which temperatures lower than -20° are no longer found, runs from the Crimea to the Caucasus range, and along the northern slope of this last, towards Khiva, Tashkend, and Peking. The whole range of temperatures observed at Caucasian stations is $60^{\circ}4$ at Stavropol, $55^{\circ}8$ at Tiflis, $45^{\circ}9$ at Bakou, $42^{\circ}1$ at Poti, and $41^{\circ}6$ at Redut-kaleh. Of course it is nothing in comparison with the range at Yakutsk, where the inhabitants must be accustomed to experience differences of temperature ranging a little more than 100° (from -62° to $+38^{\circ}8$). But still it is large enough, especially for the places situated on the plateaux. High-level meteorological stations are established at Goudaur (2156 metres above the sea-level) and Kvi am (2362 metres). Their average yearly temperatures respectively are $4^{\circ}1$ (-8° in February and $14^{\circ}3$ in August) and $1^{\circ}1$ (-14° in January and $12^{\circ}3$ in August).

THE last number of the *Ivestia* of the Russian Geographical Society contains an elaborate paper, by M. Malakhoff, on the anthropology of the Vyatka region; a description of inscriptions on rocks on the Yenisei, with drawings, by M. Schukin; a note on old Russian geography, by M. Arsenieff; an account on M. Balkashin's researches into the Kirghiz, being a most valuable addition to our very imperfect knowledge of them. The author comes to the conclusion that the Kirghiz are not a separate nation, but a federation of several nomad tribes who inhabited Southern Russia, the Gobi, the neighbourhoods of Dalay-nor, the sources of the Black Irtysh, and the shores of the Baikal, who were mingled together by Genghiz Khan and his successors. M. Grigorieff contributes a note in which he shows that Henriette Island, which was discovered by the *Jeannette*, is only the land which was sighted by Hedenström and Sannikoff from New Siberia in 1810, and that Bennett Island was seen by Sannikoff from the northern coast of New Siberia in 1811. There can be no doubt also that the land discovered by Sannikoff to the north-west of the northern extremity of the Kotelnyi Island exists in reality, but is more distant than Sannikoff supposed. This land, which was shown in dotted lines on older maps, but disappeared since Wrangell and Anjou's journeys, ought to be reintroduced on our maps. The same number contains a note on the map of Bokhara of the Greek Vatalis, a necrological notice of M. Tchoupin, several notes, and a new edition of the complete bibliography of the Amoor, by M. Bousse. One of the notes contained new astronomical determinations and hypometrical measurements on the Yu-tschou, by Dr. Fritsche; the Siao-Utai-shan proved to be only 9500 feet high, instead of the 11,452 feet given by Mellendorf.

ACCORDING to intelligence from Tashkend, dated March 31, received by the *Cronstadt Courier*, it is in contemplation to send two Russian Exploring Expeditions into Central Asia during the coming summer. The ostensible object of one is to survey part of the Pamir Steppe and fix certain points astronomically, with the object of connecting the Russian surveys with the

English. The purpose of the other is to determine the astronomical position of places on the Oxus from the points of passage in its upper course down as far as Khiva, in fact the whole course of the river.

FROM M. De Lesseps's examination of the ground through which it is proposed to let the waters of the Mediterranean into the Tunisian and Algerian Chotts, he concludes that the scheme is perfectly practicable, and that there will be no difficulty as to boring and excavating. The size of the proposed inland sea will be fourteen times that of the Lake of Geneva.

THE SOARING OF BIRDS¹

THE circling, soaring flight of birds on stiff, outspread wings appears to me a much more complex problem, and less easy of explanation, than that of motionless hovering (poising). At the same time it has certain definite and characteristic features, which must depend upon and connote certain definite aerial conditions, and which should therefore afford us so many hints toward the solution. The whole phenomenon has been very clearly described in *NATURE* (vol. xxiii, p. 10) by Mr. S. E. Peal, who appears to have had grand opportunities of observing it at Supakati in Assam. [The explanation which he gives is, however, insufficient, because he does not show how the bird in falling with the wind can acquire greater "impetus" relative to the air than it would if the air were still. But such greater "impetus" is necessary if the bird is to rise to a greater height than it would reach in still air.]

The most typical instance that I have observed was on January 8, 1882, near King's Lynn, in Norfolk. The whole country for many miles round is flat, broken only by trees, buildings, and sea walls or river embankments. The wind was strong from the south. The birds (large gulls) were drifting away northwards towards the Wash, circling as they drifted on stiff, outspread wings at a height of 200 or 300 feet, and apparently rising higher. The level nature of the land forbade the notion that the wind had received an upward throw from any fixed obstacle in its path (though I shall show below that there may be upward currents in the air without the presence of a fixed obstacle).

The circling appears to begin about 100 or 200 feet above the ground. A strong wind is a constant and (presumably) necessary condition. The bird descends with the wind, and then circles round to right or left, and rises against the wind to a greater height than it had before. Now if the whole mass of air were moving together horizontally with the same velocity throughout, this action would be wholly inexplicable, for the bird would feel no more wind in one direction than in another, and indeed would have no evidence of the existence of any wind at all except in glancing at objects on the earth. The fact that the earth is slipping away under the air in a certain direction does not affect the bird's relation to the air, and gives no reason why the bird should fall or rise at one phase of its circle more than at another. Still less does it furnish an explanation of the bird's progressive ascent. We may therefore infer as highly probable that the air in which the birds are circling does not move in a mass, but that there is some differential movement in it which makes a great difference to the bird, whether it rises or falls with or against the wind.

I think there are at least two types of differential movement in the upper air which admit of demonstration, and which should be tested in turn to see if either of them can give the meaning of the phenomenon of circling.

(1.) First, there is almost always a greater velocity in the higher strata of the air than in the lower. The lower strata are delayed by friction on the earth's surface, and the higher strata outrun them; just as the water of a brook is delayed by friction against its bank, but flows faster in mid-stream.

(2.) Secondly, where currents override or run past one another there is generally some rolling between them. This may be seen near the edge of any stream of water if the surface is smooth enough to exhibit the little swirls and whirlpools that are formed between the swifter and slower currents. In the air it may be seen on a grand scale on almost any windy day when there are separate floating clouds in the sky. Looking at right angles to the direction of the wind, each cloud is seen to have a

¹ Lord Rayleigh's valuable letter on this subject (*NATURE*, vol. xxvii, p. 534) gives me confidence in offering the following considerations, which I had prepared last February, and have submitted to two or three mathematical friends. I congratulate myself on finding my own views in such close agreement with Lord Rayleigh's.—H. A.