author has brought together much curious and useful information on the piscatory, as well as other habits, of our prehistoric ancestors, and with considerable ingenuity applies the method of evolution in tracing the progress and development of "the gentle art."

AT Steeten on the Lahn (near Runkel) interesting discoveries have recently been made in a cave. They consist of seven human prehistoric skeletons and animal remains. The latter must have belonged to the Tertiary period. They were found in such enormous quantities that several generations must be represented. The spot positively teems with remains of the Cave period, so that it is highly desirable that the State should order that more extensive scientific excavations be speedily made.

THE writer of the article on Lieut. Collet's work on the Compass in last week's NATURE, asks us to make the following correction: p. 383, col. 1, line 8 from bottom, delete "only," and in line 7, instead of "whereas it is three times as much in" read "which is about twice as much as in."

THE additions to the Zoological Society's Gardens during the past week include an African Brush-tailed Porcupine (*Atherura africana*) from West Africa, presented by Mr. J. Cheetham; a Black-necked Heron (*Ardea atricollis*) from Cape Colony, presented by the Rev. G. H. R. Fisk, C.M.Z.S.; two Blossom-headed Parrakeets (*Palæornis cyanocephalus*) from India, presented by Mrs. Francis Fox; a Waxwing (*Ampelis garrulus*), European, presented by Mr. W. H. St. Quintin; a Carrion Crow (*Corvus corone*), British, presented by Mr. F. H. Worsley Benison; a Rhesus Monkey (*Macacus erythræus*) from India, a Bonelli's Eagle (*Nisaëtus fasciatus*), European, deposited; two Common Buntings (*Emberiza miliaria*), two Black-headed Gulls (*Larus ridibundus*), a Common Curlew (*Numenius arquata*), a Bar-tailed Godwit (*Limosa lapponica*), two Knots (*Tringa canutus*), British, purchased.

OUR ASTRONOMICAL COLUMN

THE EARLIEST DAY-LIGHT OBSERVATIONS OF STARS.—In No. 2616 of the *Astronomische Nachrichten* Prof. Winnecke has an interesting note on the question, Who first observed stars in full daylight? The credit of the observation has been generally accorded to J. B. Morin in 1635. Arago, for instance, says: "Il est evident que c'est à Morin qu'il faut remonter pour trouver la première observation authentique d'une étoile vue en plein jour;" Zach and many other astronomical writers have held the same opinion. Morin's observations are found in his work, "Longitudinum Terrestrium necnon Cœlestium nova et hactenus optata Scientia," first published, as it appears, in an extended form at Paris in 1638. At the end of March, 1635, he saw Arcturus half an hour after sunrise. This observation of Morin's appears to have been overlooked in France, since in May, 1669, we find Picard expressing his surprise that he had been able to observe the meridian altitude of Regulus thirteen minutes before sunset; his observation is printed in Lemonnier's "Histoire Céleste": "Le 3 mai (1669), hauteur méridienne de Regulus 54° 42′ 50″, cette hauteur méridienne fut prise en *plein jour* à 7h. 5m. du soir, environ 13m. avant le coucher du Soleil, ce qui ne s'étoit encore jamais fait." On July 23 following he observed the meridian-altitude of Arcturus, while the sun was 17° above the horizon, and speaks of the observation as a remarkable one, concluding: "il est maintenant facile de trouver immédiatement les Ascensions droites des Etoiles fixes non seulement par les horloges à pendule, mais aussi par l'observation du vertical du Soleil au même temps qu'on observera la hauteur méridienne d'une etoile fixe."

Prof. Winnecke points out that Morin was preceded in his discovery that the stars may be observed in daylight by more than one person. In a letter written from Amsterdam to Gassendi, by Martinus Hortensius, and dated October 12, 1636, he mentions that observations such as Morin had claimed to be the first to make, were by no means new to him, and from the dates of the publications in which he records his own observations it is clear that his claim of priority to Morin is justified, though when his earliest observation was made cannot, as Prof. Winnecke remarks, be certainly inferred. Schickard, Professor of Hebrew and Mathematics at Tubingen, whose first work, the "Astroscopium," appeared in 1623, and was frequently reprinted, saw Arcturus in broad daylight as early as 1632. In the "Historia Cœlestis, ex observationibus Tychonis Brahe," by Albertus Curtius, at p. 956 we read: "1632 Martii 2. Nota. Cor Scorpii claro die adhuc à me visum per conspicilia tamen cum Saturnus ægre cognosceretur: nec aër fuit omnino purus."

Prof. Winnecke concludes that Schickard, as well as Hortensius, had observed fixed stars in daylight previous to Morin, who, as we have said, has been generally credited with this advance in astronomical observation.

BINARY STARS.—Mr. J. L. Casey, U.S.A., has calculated first approximations to the orbits of ϕ Ursæ Majoris and Σ 1757 (Piazzi xiii. 127). The former is one of O. Struve's discoveries, his first and last published epochs being—

1842·34, Pos. 4°4, Dist. 0″·46.
1875·48, ,, 295°5, certainly oblong.

The apparent motion being direct, or with increasing angles, these indicate a change of 290° in thirty-three years.

Σ 1757 was measured by Struve in 1825. For comparison with his first epoch, we add Prof. Asaph Hall's for 1879—

Struve, 1825·37, Pos. 10°·0, Dist. 1″·60
A. Hall, 1879·40, ,, 68°·9, ,, 2″·34

The elements are as follow:—

	ϕ Ursæ Majoris.	Σ 1757.
Periastron passage	1877·12	1797.42
Node	105° 18′	344° 43′
Node to periastron	72° 7′	315° 28′
Inclination	57°5 7′	29° 32′
Excentricity	0·788	0·5079
Semi-axis major	0″·54	2″·29
Period	115·4 years.	401·0 years.

GEOGRAPHICAL NOTES

AT the meeting of the Geographical Society on Monday last, Major J. E. Sandeman, B.S.C., read a paper on recent explorations of the sources of the Irawaddy. He referred first to Mr. R. Gordon's able report on the hydrology and hydrography of the river, in which the old theory of the Saupo, or great river of Tibet, being the main source of its vast stream, is revived, and then to what has lately been done, showing that the Saupo more probably unites with the Kihong. Major Sandeman next dealt with some endeavours to reach the source of the Irawaddy, more especially that made by a Burman named Alaga, who had been trained by himself. This man started from Bhamo in October 1879, and was absent six months. He brought back a good deal of information respecting the western and eastern branches of the Irawady, but we cannot see how he can be said to have explored their sources. It was somewhat unsatisfactory to learn that "political considerations"—the old Indian bugbear—prevented Major Sandeman from stating why the explorer was compelled to turn back before doing what he was sent to do. Though the geographical results of Alaga's journey are not what might have been expected, he has brought back some very interesting information regarding the domestic habits, religious customs, &c., more particularly of the Kachins, or Kakhyens. In concluding his paper Major Sandeman summed up the various attempts which have been made to reach the sources of the Irawaddy, and to discover the true outlet of the Saupo.

COL. VENIUKOF has informed the French Geographical Society that M. Lessar, a Russian engineer officer, has completed the levelling of the country between Askabad and Sarakhs. This operation has proved the practicability of constructing a railway between these two places, and even for some forty miles beyond Sarakhs, in the valley of the Heri-rud (Tejend). It is estimated that the cost would not exceed 320,000*l*. At the same time M. Gladycheff, the astronomer of the expedition, has determined the geographical position of thirteen points between Askabad, Sarakhs, and Meshed. At Meshed he is said to have purchased the plan of the town which Mr. E. O'Donovan had made, but apparently lost. Perhaps Mr. O'Donovan may enlighten us on this point, when he gives his account of his varied

experiences in the Merv region at the Geographical Society's meeting on March 27.

DR. A. E. REGEL, well-known through his travels, undertook a new journey to Central Asiatic districts which have never been visited by a European before, and has now returned richly laden with scientific treasures. He began his work with an investigation of the Matchi Valley near the Zarawshan glaciers, crossed the mountain passes of Pakchif and Sagridetch, and reached the towns of Kala and Chumba, which stand upon the high plateau of the Amu Daria. Concerning this part he made interesting ethnographical observations. The type of the population of these districts is a mixed one; in Darwas the type of Aryans has remained pure, yet the hair is not always black, lighter shades being frequently met with; sometimes the head is completely shaved. The women do not cover their faces and marry according to their choice; their faces are almost European in appearance, sometimes gipsy like. The language at Darwas varies but little from that spoken at Bokhara and Samarkand. Quite another language is found at Shugnan, which sounds almost like a European language, as do also the national songs of these people.

A RUSSIAN staff-officer, who is said to have followed Col. C. E. Stewart's example by disguising himself as a merchant, and appears to have been recently travelling about in Khorassan, has published in the *Nouveau Temps* some interesting papers on the country and its Kurdish inhabitants.

CAPTAIN VON WOHLGEMUTH, of the Austrian Navy, has been appointed leader of the Austrian Polar expedition to establish an observing station at Jan Mayen. The steamer, which will leave Pola early in April next, is now being fitted out most energetically.

THE Geographical Society of the Pacific, founded at San Francisco last summer, have just issued the first number of their *Proceedings*, which is entirely occupied by a paper prepared for the Society by Capt. Hooper, on the recent cruise of the *Corwin* in the Arctic Sea. In addition to the account of his visit to Wrangel Land, &c., Capt. Hooper gives some details as to the manners and customs of the Chukches. Capt. Hooper proposes to deal with the very important subject of currents in another paper, but he makes a few remarks on the influence of the Kuro-siwo or Japanese warm stream on the waters of Behring Strait, &c.; and he also furnishes a table showing his determination of the magnetic declination and dip in the Arctic regions, from the end of May to the beginning of October, 1881.

THE new number of the American Geographical Society's *Bulletin* contains an account by Commander H. H. Gorringe U.S.N., on a cruise along the northern coast of Africa, and a paper by Mr. Jas. Douglas, jun., on the Geography, People, and Institutions of Chile.

ON THE SENSE OF COLOUR AMONG SOME OF THE LOWER ANIMALS[1]

AS I have already mentioned in a previous communication (*Journ.* Linn. Soc. vol. xv. p. 376 (Part No. 87), M. Paul Bert (*Archiv. de Physiol.* 1869, p. 547) has made some very interesting experiments on a small freshwater crustacean belonging to the genus *Daphnia*, from which he concludes that they perceive all the colours known to us, being, however, especially sensitive to the yellow and green; and that their limits of vision are the same as ours.

Nay, he even goes further than this, and feels justified in concluding, from the experience of two species—Man and *Daphnia*—that the limits of vision would be the same in all cases.

His words are:—

A. "Tous les animaux voient les rayons spectraux que nous voyons."

B. "Ils ne voient aucun de ceux que nous ne voyons pas."

C. "Dans l'étendue de la région visible, les différences entre les pouvoirs éclairants des différents rayons colorés sont les mêmes pour eux et pour nous."

He also adds that, "puisque les limites de visibilité semblent être les mêmes pour les animaux et pour nous, ne trouvons-nous pas là une raison de plus pour supposer que le rôle des milieux de l'œil est tout-à-fait secondaire, et que la visibilité tient à l'impressionnabilité de l'appareil nerveux lui-même."

[1] Paper read at the Linnean Society on November 17, 1881, by Sir John Lubbock, Bart., M.P., F.R.S., President.

These generalisations would seem to rest on a very narrow foundation. I have already attempted to show that the conclusion does not appear to hold good in the case of ants, and I determined therefore to make some experiments myself on Daphnias, the results of which are embodied in the present communication.

Prof. Dewar was kind enough again to arrange for me a spectrum, which, by means of a mirror, was thrown on to the floor. I then placed some Daphnias in a wooden trough 14 inches by 4 inches, and divided by cross partitions of glass into divisions, so that I could isolate the parts illuminated by the different-coloured rays. The two ends of the trough extended somewhat beyond the visible spectrum. I then placed fifty specimens of *Daphnia pulex* in the trough, removing the glass partitions so that they could circulate freely from one end of the trough to the other. Then, after scattering them equally through the water, I exposed them to the light for ten minutes, after which I inserted the glass partitions, and then counted the Daphnias in each division. The results were as follows:—

Number of Daphnias

	Beyond the blue.	In the red and yellow.	In the greenish yellow and green.	In the blue.	In the violet.	Beyond the violet.
Obs. 1. ...	0	20	28	2	0	0
,, 2. ...	1	21	25	3	0	0
,, 3. ...	2	21	24	3	0	0
,, 4. ...	1	19	29	1	0	0
,, 5. ...	0	20	27	3	0	0
	4	101	133	12	0	0

I may add that the blue and violet divisions were naturally longer than the red and green.

May 25.—Tried again the same arrangement, but separating the yellow, and giving the Daphnias the choice between red, yellow, green, blue, violet and dark:—

	Dark.	Violet.	Blue.	Green.	Yellow.	Red.
Exp. 1. ...	0	0	3	39	5	3
,, 2. ...	0	1	2	37	7	3
,, 3. ...	0	0	4	31	10	5
,, 4. ...	0	1	5	30	8	6
,, 5. ...	0	1	4	33	6	6
	0	3	18	170	36	23

Of course it must be remembered that the yellow band is much narrower than the green. I reckoned as yellow a width of $\frac{3}{4}$ inch, and that of the green 2 inches.

Again,

	Dark.	Violet.	Blue.	Green.	Yellow.	Red.
Exp. 1. ...	0	0	4	30	6	10
,, 2. ...	0	1	3	25	8	13
,, 3. ...	0	0	2	24	9	15
,, 4. ...	1	0	3	25	8	13
,, 5. ...	0	1	2	24	7	16
	1	2	14	128	38	67

M. Paul Bert observes (*l. c.*) that in his experiments the Daphnias followed exactly the brilliancy of the light. It will be observed, however, that in my experiments this was not the case; as there were more Daphnias in proportion, as well as absolutely, in the green, although the yellow is the brightest portion of the spectrum.

May 18.—The same arrangement as before. In order to test the limits of vision at the red end of the spectrum, I used the trough so that the extreme division was in the ultra-red and the second in the red. I then placed 60 Daphnias in the ultra-red. After five minutes' exposure I counted them. There were in the

	Red.	Ultra-red.
Exp. 1.	54	5
,, 2.	56	4
	110	9

I now gave them four divisions—dark, red, ultra-red, and dark again. The numbers were:—

	Dark.	Red.	Ultra-red.	Dark.
Exp. 1.	5	47	6	2
,, 2.	9	41	7	3
	14	88	13	5