

submitted them to very complete discussion, the results of which he has just made known. His inferences are generally opposed to those drawn by Klinkerfues and Oppöler. With one of the systems of elements given by the latter, he calculates the apparent path of the comet from Nov. 30 to Dec. 8, finding, as was to be expected, a good agreement with Pogson's observations, and with the rate of motion in R.A. given by his comparisons on the first morning, that of Dec. 3, but the ephemeris does not agree with the rate of motion on the following morning, which, Pogson's differences are sufficient to prove, had not diminished. And it should here be observed that the differences of R.A. were evidently obtained with considerable precision, as might be looked for from so practised an observer as Mr. Pogson. The orbit here referred to is as follows:—Mean anomaly, Dec. 3^o Berlin time, $-5^{\circ}6'8''$; longitude of perihelion, $141^{\circ}9'$; ascending node, $244^{\circ}34'$; inclination, $10^{\circ}28'$; angle of excentricity, $54^{\circ}17'$, the semi-axis major being that assigned by Michez for Biela's Comet, and corresponding to a mean daily motion of $530''.1$. Again, Bruhns observes that it speaks further against the identity, that by all the ephemerides, at least from Nov. 23 to Dec. 3, the first days in the northern and later in the southern hemisphere the comet should have been more conspicuous than at the time of Pogson's observations, and it is unlikely that it would have escaped notice, particularly in the northern hemisphere. He so far agrees with Oppöler, that no assumed date for perihelion passage will bring about an agreement of places calculated from the elements of Biela, with those observed; and that an extension of the comet's period of revolution to 2528 days, without a near approach to the planet Jupiter, is most improbable. In Oppöler's orbit given above, the inclination is $10^{\circ}28'$, while that deduced by Michez is $12^{\circ}22'$; and to prove that such diminution is not to be accounted for by perturbation during the assumed near approach of Biela to the earth about the time of the meteor-shower, he has calculated the effect of the earth upon the elements of Biela, with the perihelion passage fixed to Dec. 27⁷⁵, the epoch which would occasion the nearest approach of the two bodies. The inclination of the orbit to the ecliptic is found to be increased $1'6''$ only, the node is advanced $0'4''$, the perihelion longitude $7'3''$, and the angle of excentricity is diminished $1'6''$. The earth's perturbations during such a near approach as is possible in the orbit of Biela (for 1866) would not therefore account for a change of elements sufficient to represent the places of Pogson's Comet. Bruhns then makes two assumptions with regard to the ratio of the curtate distances of the comet from the earth at the times of the Madras observations on Dec. 3 and 4, and in both cases arrives at *retrograde* orbits: the motion of Biela's Comet is *direct*. The first of these orbits from which he computes an ephemeris is as follows (we adapt the longitude of perihelion and the inclination to the catalogue form of expressing them):—Perihelion passage 1872, Dec. 15³⁷⁶³ Greenwich time; longitude of perihelion, $332^{\circ}28'$; ascending node, $33^{\circ}11'$; inclination, $31^{\circ}13'$; perihelion distance, 0.035205 . Hence the track of the comet would be—

zh.	R.A.		Decl.	DISTANCE FROM	
	h.	m.		Sun.	Earth.
Nov. 5	11	10 ³	20 13 S.	1 ²⁵ 1	1 ⁶⁰ 6
" 13	11	37 ³	23 42	1 ⁰⁷ 3	1 ³⁵ 9
" 21	12	18 ¹	28 10	0 ⁸⁷ 9	1 ¹¹ 8
" 29	13	27 ⁸	33 14	0 ⁶⁶ 3	0 ⁹⁰ 6
Dec. 3	14	21 ⁵	35 4	0 ⁵⁴ 1	0 ⁸² 8
" 7	15	30 ⁰	34 50 S.	0 ⁴⁰ 5	0 ⁷⁸ 7

We believe there is little doubt that, so far as can be ascertained from Pogson's two days' positions and the rate of motion indicated by his comparisons, the orbit of the comet observed by him was *retrograde*, and therefore agree with the inference of Prof. Bruhns that it had no relation to Biela's Comet, or, we may add, to the magni-

ficient meteoric display of 1872, Nov. 27, notwithstanding the singularity of its discovery by Pogson, in consequence of the telegram sent to him by Klinkerfues, which was grounded on the opposite opinion.

LECTURES AT THE ZOOLOGICAL GARDENS*

IV.

May 13.—Mr. Garrod on Antelopes and their Allies

THE true Ruminant Animals characterised among Artiodactylate Ungulata by the absence of incisor teeth in the upper jaw, as well as by the possession of a stomach in which three separate compartments, named paunch, honeycomb bag, and reed, are always present,† naturally fall into three different families, the Chevrotains, the Deer, and the Antelopes. The first and last of these remain for consideration.

In the Antilopine, or Cavicorn section, as the latter name implies, the horns are hollow organs. They are epidemic in structure, being composed of hairs agglutinated together to form tubes, which are moulded and fixed upon osseous protuberances of the frontal bones. These "horn cores" are quite different in their nature from the antlers of the deer tribe, as they persist throughout the life of the individual, and are perfectly continuous in their structure with the bones from which they spring. The horns themselves bear much the same relation to the thin layer of vascular membrane which covers the "cores" that the nails on the fingers do to the subjacent soft parts; in the Rhinoceros the horn or horns, though similar in structure, are solid throughout. In many species the horns are present in both sexes, and in one genus (*Tetraceros*) there are two pairs, one attached near the anterior and the other near the posterior margin of the frontal bones.

Many attempts have been made to classify these animals by means of the peculiar structures which are found in some species and not in others. Among the most important of these are the condition of the muffle, or tip of the nose, which is moist in some, as in the ox, and hairy in others, as the sheep. The gland below the eye is also a varying feature, being largely developed in the Indian Antelope, for example, and absent in the Eland. In most species there are two small "false hoofs," remnants of the second and fifth digits, behind the true foot. These, however, are absent in the Royal Antelope and the Pallah. Whether the horns are cylindrical, as in the Chamois, or grooved, as in the Koodoo; straight, as in the Oryx, arched, as in the Ibex, or spiral, as in the Markhour; smooth, as in the ox, or transversely ringed as in most, are also tangible characters, by the combination of which with others of less significance various endeavours have been made to arrange the family. These, nevertheless, are none of them satisfactory, on account of the large number of the possible combinations which are to be actually found, at the same time that the relative importance of the different included characters is scarcely capable of being estimated.

There are two animals, the Giraffe of Africa and the Pronghorn, or Cabrit, of the western regions of North America, which are evidently closely allied to the Antelopes, and are probably nothing more than extreme modifications of them. In both, the horn processes or horns are developed in both sexes, at the same time that neither possess false hoofs. The abnormal feature in the Giraffe is found in the horn-like developments, which are pedestals of bone, covered with the ordinary skin of the body, and capped with a tuft of hair. These pedestals, however, differ very materially from those in the Muntjac among the Deer, and from the horn-cores of the typical

* Continued from p. 28.

† A fourth, the manyplies, is found in all but the Chevrotains.

Cavicornia, in being independent ossifications, situated, on the suture between the frontal and parietal bones instead of simple outgrowths from the frontal only. A median excrescence on the forehead, in front of the above-mentioned processes, is the result of a protrusion upwards of the bones in the part.

The Pronghorn (*Antilocapra*) has well-developed horns. They are attached to ordinary bony cores, exactly similar to those of the Antelopes. They are, however, unique of their kind in that they are branched or bifurcate at their tips, a second smaller point springing from the anterior margin of the flattened stem, and running forward with a gentle curve, convex upwards. In another respect these horns are even more peculiar. Mr. Bartlett, the Superintendent of the Society's Gardens, was the first to show, from a specimen living in the Gardens, that the Pronghorn is in the habit of annually shedding its horns from off their cores. This surprising discovery has since been fully confirmed; at the end of each season the core being found covered with a skin from which the fresh horn is developed.

Respecting the geographical distribution of the Cavicornia, none are to be found in Australasia or in South America. Very few inhabit North America; the Bighorn Sheep, one of the Bisons, the Musk Ox, the Mountain Goat, and the Pronghorn embracing them all. Africa is the head-quarters of the sub-order, and specially of the Antilopine family. In Europe the Bison is a native of Poland, the Chamois and the Ibex of the Alps; whilst the peculiar Saïga reaches our side of the Caspian Sea. Among the best known Indian Antelopes are the Sasin or Antelope *par excellence*, and the Nilghau.

The Chevrotains, or Tragulidæ, form a group of small, deer-like animals, without horns, which were formerly associated with the Musk Deer. The investigations of Prof. Flower have, more than any others, proved the independent nature of the group, which approach in their internal anatomy to the Pigs. The third stomach of other Ruminants—the Psalterium—is wanting. In the axis vertebra, the odontoid process, instead of being scooped into a spout, as in the Deer and Antelopes, is peg-like, as in the Swine. The second and fifth metacarpal bones are completely developed from end to end, and the lateral marginal intervals of the upper jaw between the canine and molar teeth are not cut away, as they are in other Ruminants. These and other peculiarities in the teeth, &c., are quite sufficient to divide off the sub-order as an independent one, ranking with the others previously described. The number of genera and species are very inconsiderable, there being two of the former (*Hyomochus* and *Tragulus*), and not half a dozen of the latter. *Hyomochus* inhabits Western Africa, occupying much the same ground as does the Chimpanzee. In it the metacarpal bones remain separate during the life of the animal, as in the Swine, and not in the other Ruminants. The fur is spotted like that of most young deer, throughout life. *Tragulus* is found, two species—*T. meminna* and *T. stanleyanus*—in India, the Napu (*T. javanicus*) and one or two others making Java and Sumatra their abode.

(To be continued.)

RARE ANIMAL AT THE MANCHESTER AQUARIUM

AMONG the numerous new accessions brought together to swell the list of special attractions for the throngs of Whit-week visitors at the Manchester Aquarium, one of the latest arrivals is especially deserving of notice in these columns. This is an example of the so-called "Congo Snake" (*Muraenopsis tridactyla*), from the neighbourhood of New Orleans, a singular eel or snake-like animal, belonging, nevertheless, to neither of

the classes represented by those two types, but rather to the true Amphibia. Judging from its shape, proportions, and colour, the uninitiated would certainly pass it as an ordinary eel, from which, on closer examination, it will be found to differ in possessing no fins, small bead-like eyes a mere puncture in the place of the ordinary gill-operculum, though more especially in having stationed at each extremity of the attenuated body a pair of feeble little legs, and each leg furnished with three slender toes. These legs may be described as almost rudimentary, but they are at the same time used by the animal, and with more marked effect than might be presupposed, when crawling over the ground at the bottom of its tank. Rising into the midst of the water, it can further swim with great rapidity, progressing then by rapid undulations of its body from side to side, after the manner of a true snake. The length of this specimen is about two feet six inches; greatest diameter, in the centre of the body, one inch and a half, tapering off from the posterior pair of legs into an attenuate and slightly compressed tail. The colour closely resembles that of an ordinary eel, being slate-grey on the dorsal surface and sides down to the lateral line, and below this, ash colour. Along the lateral line is a double row of minute punctures, the orifices, no doubt, of mucous glands similar to those obtaining in true fishes. The animal has to repair to the surface of the water to breathe, but this is at distant intervals, a large quantity of air being drawn through the nostrils into the lung-pouch by a singular inflation of the throat, repeated several times in succession. This specimen is exhibited in one of the octagon table tanks in the centre of the saloon, eighteen inches in depth, so that when taking in its supply of air it does not altogether leave the ground, but raises itself in a semi-erect position until the head touches the surface of the water. With the head just an inch or two below the surface, and standing, as it were, upon its posterior legs, with the anterior pair held out helplessly in the water, is a very favourite attitude with this creature, though at the same time an essentially grotesque one, reminding the observer of the somewhat similar attitude and general appearance, on a colossal scale, of the larva of *Ouraapteryx* or other of the Geometria moths. In its native swamps the "Congo Snake" is reputed by the black population to be highly venomous, an injustice to the poor creature as great as when applied by our own benighted countrymen to the harmless Newt or Triton of English ponds and streams, and of which it is merely a highly interesting and most extraordinary exotic type.

We are indebted for this rare and, indeed, at present, we believe, in this country, unique example of this species to Capt. A. H. Mellon, of the Dominion and Mississippi Steamship Company, to whose influential and friendly assistance we are also under further obligations for a fine young alligator some two feet long, the trophy of a preceding voyage.

W. SAVILLE-KENT

THE PROGRESS OF THE TELEGRAPH *

VI.

IT has already been observed that from the limited speed on the wire, the development of any extended system of telegraphic communication between the centres of commerce in a country where great distances have to be reached, involves a vast outlay in the duplication of the circuits necessary to afford the requisite transmitting powers, and that by the adoption of the automatic process, in addition to the accuracy of its performance, the greater speed obtained upon long circuits enabled the telegraphic service to be conducted by a much smaller number of wires, thus reducing in a most important degree the outlay of capital expended on con-

* Continued from p. 32.