a good species, identifying it with the black variety of the Common Hamster, *Cricetus vulgaris*, Desm., mentioned by several authors, and among them by Pallas, who (Zoogr. R.-As. i. pp. 161, 162) says of Caucasian examples, "corpus subtus sæpe griseo-contaminatum et maculæ laterales ad collum minus evidenter albæ." Upon this, in the following year, Prof. Brandt communicated to the Academy of Sciences of St. Petersburg a fuller description of the animal*, maintaining its specific validity and promising a figure of it, which, though spoken of four years later by Prof. von Nordmann†, was, I suspect, never published. This naturalist adds that the species (the value of which he does not question) lives also "sur les montagnes de l'Awhasie" [Abasia]. About the same time Drs. Keyserling and Blasius included the species in their excellent book‡, but did not increase our knowledge of it. Three years later, Wagner, in the work already mentioned, recognized it without doubt as a good species; and the matter, if even then questionable, must be considered to have been finally set at rest by a subsequent contribution, in 1854, from Prof. Brandt to the St. Petersburg Academy, wherein § he described and showed by figures the cranial and dental differences existing between *C. nigricans* and *C. vulgaris*.

The validity of the species being thus finally established, I think its occurrence so far to the westward of any previously recorded *habitat* may interest some members of the Society. I have only to add that Mr. Buckley informs me that his example was "one of a pair killed on the 27th of April, 1869, in a corn-field (the corn being about four inches high) at Shitangik, a station on the Varna and Rustchuk railway, in Bulgaria," and that "the animals were very slow in their movements."

May 26, 1870.

G. R. Waterhouse, Esq., V.P., in the Chair.

A fourth letter‖ on the ornithology of Buenos Ayres, addressed to the Secretary by Mr. W. H. Hudson, C.M.Z.S., was read:—

"Buenos Ayres,
"March 17, 1870.

"My dear Sir,—On the 9th of this month we were visited by a terrible storm, which lasted three days, a cold and violent south-west wind prevailing. After it had subsided, I could not but notice

* Bull. Acad. Sc. St. Pétersbourg, i. (1836) p. 42.
† Voy. Démidoff, Zoologie, i. p. 42. Paris: 1840.
‡ Wirbelth. Eur. (Braunschweig, 1840), pp. ix, 35.
§ Bull. Phys. Math. Acad. Sc. St. Pétersbourg, xiv. (1854) pp. 182–184.
‖ See *anteà*, p. 158.

the effects it had had on the migration of our summer and winter birds. All the species of Plover had disappeared, with the exception of a few individuals ; and these were so bruised by the wind that they could hardly raise themselves from the ground. Most of the small birds had also disappeared before their usual time of departure ; but of some species the young remained.

"Storms and other sudden changes in the temperature are probably the immediate causes of migration in most of the birds that visit the Pampas. Those that are very regular in their coming and going—such as the Currincha (*Pyrocephalus rubineus*), the Summer Red-breast (*Leistes superciliaris*), the Tijereta (*Milvulus violentus*), one of our Swallows, the Humming-birds, and a few others—are the latest to appear, and the earliest to depart.

"In the others, the irregularity in the time of migration is the greater the longer the species remains with us—it being, perhaps, greatest in the common Blackbird (*Molothrus bonariensis*), which sometimes remains all winter and sometimes leaves us early in autumn. The Asquita (*Centrites niger*) and the *Cinclodes fuscus* are almost the first winter birds to appear ; but I have not yet seen one individual of either of these species, while some usually late comers, such as *Thinocorus rumicivorus* and *Tænioptera variegata*, are plentiful since the storm. The last species has appeared in such numbers that I saw more individuals during an hour's ride a few days ago than I usually see in the course of an entire winter.

"*Tænioptera variegata* is one of the most interesting of the Patagonian birds that visit us in this season, or, indeed, of all the true Pampas birds. The other species of the genus or subgenus to which this bird belongs, the *Tænioptera irrupero, coronata*, and *dominicana*, in every thing closely resemble each other. But *T. variegata*, although, in structure, it has a general resemblance to these, and also possesses their melancholy, whistling note and rapid, graceful flight, in some respects differs from them very materially. It is somewhat larger, has a straighter bill, more pointed wings ; and its prevailing colour is chocolate, instead of white. It does not quietly watch for its food nor hop on the ground like the *T. dominicana*, but, like the Plover, runs rapidly along the ground in search of insects. Unlike the others, this *Tænioptera* is also sociable, quarrelsome, and sportive in its habits, frequently chasing its fellows and pursuing Hawks and other large birds, sometimes with an appearance of great animosity, and often wheeling about them as if in play. I have watched it associating with birds so different in walk and flight that it apparently cost it much trouble to keep their company. It has, when flying, a very pretty appearance, even if it is not what Dr. Burmeister calls it, 'the prettiest bird in this country.' But naturalists, like kings, have their favourites, and this species is evidently his. It is rapid and easy in all its motions and exceedingly active ; it takes to flight very frequently, and occasionally alights for a moment on a thistle-top, but never on reeds and shrubs, the favourite resting-place of the white *Tænioptera*.

"It is remarkable that its note, which always sounds as if proceeding from a great distance, however near, is only heard early on still damp mornings.

"As I have little leisure at present, I will defer speaking of the white *Tæniopteræ* till my next letter.

"Very truly yours,
"W. H. HUDSON."

Prof. Owen read a paper on *Dinornis*, containing notices of some of the internal organs of certain species of this genus, together with a description of the brain and of some nerves and muscles of the head of *Apteryx australis*.

This paper, which forms the 16th part of Prof. Owen's series of Memoirs on the extinct birds of the genus *Dinornis* and their allies, will be published in the Society's 'Transactions.'

Mr. R. B. Sharpe exhibited, on behalf of Lord Lilford, F.Z.S., a specimen of the rare *Podoces panderi* of Fischer. This bird had been first described by Fischer de Waldheim, and was one of the chief zoological results of the journey from Orenburg to Bokhara, details of which were given by Eversmann (Reise von Orenburg nach Buchara) in 1823, and afterwards by Meyendorff (Voyage d'Orenbourg à Boukhara) in 1826. In these works the only specimen procured by the travellers on this expedition was stated to have been obtained in the desert of Kisilkoom.

Mr. Sharpe stated his belief that the bird, on further examination, would prove to be a Desert Starling, allied probably to the genus *Pastor*, or, perhaps more strictly, to the South-African genus *Dilophus*, but it appeared to exhibit characters also pointing towards the genus *Certhilauda*.

The following papers were read :—

1. Notes on the Anatomy of the Prongbuck, *Antilocapra americana*. By JAMES MURIE, M.D., F.L.S., F.G.S., &c., Prosector to the Society.

1. PRELIMINARY NOTE.

It might with some justice be affirmed that, among others, two features specially characterize the present epoch of zoological science.

1. One is an unceasing search for the so-called aberrant, intermediate or passage forms, either between genera, families, or orders, nay even between the supposed firmly established classes* of animals.

* Proc. Roy. Instit. of Gt. Brit. 7th Feb. 1868, "On the Animals which are most nearly intermediate between Birds and Reptiles," by Prof. Huxley—a lecture as remarkable for its scope of generalization as for its terseness of language. Since this note was written other papers tending in the same direction, published by that naturalist, as well as the celebrated American, Prof. Cope, have come under my notice. *Vide* Proc. Acad. Nat. Sci. Philadelphia, Nov. and Dec. 1867; the Proc. Boston Nat. Hist. Soc. June 1869; and, lastly, Quart. Journ. Geol. Soc. Lond. Nov. 10, 1869.

2. The other feature is the constant endeavour to rearrange and place in natural systematic position ill assorted groups.

The recent writings of Darwin and his opponents, doubtless, have stirred up the desire of investigating those seeming barriers of demarcation between forms; while the onward accumulation of material and facts necessitates constant change and intercalation among groups but impartially known.

A very good instance in point is the animal upon the anatomy of which the following notes have been made.

The Cabrit or Pronghorn Antelope of naturalists has passed under several generic names, the most critical account of which is to be found in Dr. Richardson's 'Fauna Boreali-Americana,' p. 261. As my colleague Mr. Bartlett, however, has remarked, "None*, however, appear to have hesitated to place it among the hollow-horned Ruminants," until he himself offered evidence to prove "that the Prongbuck is not a true bovine animal." His reasons for adducing cervine, indeed multiple affinities to the Prongbuck instead of those previously accorded it, are based on the annual deciduous nature of its horns, and the total absence of false hoofs and glands—the former phenomenon having been first lucidly described and published by him in our 'Proceedings' for 1866.

Dr. Gray† has called attention to a statement of Dr. Marsh's‡ as early as 1841, respecting this annual shedding of the horns; and it seems also that Dr. Canfield § informed Dr. Spencer Baird (of the Smithsonian Institution) in 1858 of the phenomenon. The hints given by these observers ||, however, were fruitless and not generally credited by naturalists until Mr. Bartlett led the way to the importance of the facts.

Pondering over the apparent isolation of the characters of the animal in question, Dr. Sclater¶ suggested ranking it as a separate family of the order Ruminantia, under the title of *Antilocapridæ*, equivalent to the *Camelopardalidæ*. About the same time Dr. Gray** made a somewhat similar proposition, and demonstrated with some care his ideas of the difference in nature of the horn of the so-called *Antilocapridæ*, *Giraffidæ*, and *Cervidæ*.

Under these circumstances the anatomical structure possesses some interest—and the more so as, excepting a very imperfect description of the skull by Dr. Richardson††, and short cranial charac-

* Blainville and Rafinesque excepted, who place it under *Cervus*—the former, Nouv. Bull. Soc. Phil. 1816, p. 80.

† Ann. & Mag. Nat. Hist. 1866, vol. xviii. p. 324.

‡ In a letter to Dr. Pickering, see U. S. Exploring Expedition, *Ungulata*, p. 63.

§ Proc. Zool. Soc. 1866, p. 105.

|| As also Weinland (Zool. Garten, 1863, p. 255) and Martin ("Die Hornbildung bei der Mazama Antelope," *ibid.* 1864, p. 254). The former considers the cast horns as abnormal; the latter that the new horn-tip grows downwards. Dr. Günther has drawn my attention to these observations, otherwise unintentionally overlooked by me (*vide* his Record, 1865, p. 45).

¶ Brit. Assoc. Rep. 1866, and abstract Ann. and Mag. Nat. Hist. 1866, p. 401.

** Ann. & Mag. Nat. Hist. 1866, p. 326.

†† *Op. cit.* p. 265.

ters by Turner*, nothing heretofore has been published regarding its osteology and viscera.

With these preliminary remarks I proceed to sum up the general conclusions arrived at by me, leaving the technical description of structures for after consideration. This method of arrangement, though contrary to the general custom, I have deemed preferable in the present instance.

2. Deductions.

The examination of the internal anatomy and osteology of the Prongbuck, although not revealing any passingly strange difference of structural organization from other Ruminantia, yet affords additional evidence to that already known of its exterior—namely, that it does not comport with all those characters considered specially to belong to the family of Antelopes.

The distinctive attribute of Deer undoubtedly is the deciduous nature of their horns; but in the hornless females this diagnostic is oftentimes absent, so that other parts of the organization must be brought to bear in forming a judgment of the creature's relations.

The male and female Prongbuck both possess horns; and, as Bartlett and Canfield have proved, they are annually deciduous. Does this not collate it to the Deer according to the ordinary acceptation, and segregate it from the Antelopes, or, more widely speaking, from the Bovidæ, Ruminants with persistent horns?

Were the systematic place and family relationship of the Prongbuck alone to be decided by the single feature of its horns being shed and renewed periodically, that it is a Deer would be unquestionable.

Considered in a broader phase, by reference to the totality of its structures, the question, Is it a Deer? can best be answered by the verdict, Not proven.

If neither a strict bovine nor cervine form, it is needless to search for nearer affinities; for no other group singly possesses conformation nigher than the said families.

The numerous modifications linking or interblending *Antilocapra* between the hollow- and solid-horned Ruminants, including the Giraffe, certainly stamp it with singularity. Few of the existing mammalian fauna more beautifully show and exemplify by a combination of characters how insensibly gradated are the groups which zoologists so strenuously separate, divide, and subdivide, as if a trifling cordon imposed a sufficient barrier of distinction on what doubtless is a natural series.

My estimable friend Mr. Bartlett judiciously recognized in the Prongbuck affiliation towards the Deer tribe in gait and exterior generally, besides noting that the coat equally pertained to that group as well as to sheep. The soundness of his judgment I have tested in the minute structure of the hair. Weighed in this scale, the balance preponderates in favour of the genus *Ovis*.

In the disposition and possession or in the want of certain cutaneous gland-patches in the Prongbuck, a side light is shed on the

* P. Z. S. 1850, p. 174, *Dicranocerus*.

animal's physiological relations or affinities, which, if not weighty, at all events have their value.

There being neither a suborbital gland (crumen), osseous fossa for the same, nor inguinal sacs and pores, points consequentially to forms exhibiting a kindred build. The total deprivation of the former shows but a remote alliance to the cervine structural peculiarities—though it does not necessarily constitute it an Antelope; for a large section of the Antelopes possess a crumen. But a minor series, chiefly of the Goat-like forms, have it not; and to this group, then, the Prongbuck would be linked—a union which is strengthened by the fact that such Antelopes as are distinguished by the absence of inguinal sacs and pores come under the same group.

Among Ruminants the Chamois is noted as having a glandular sac which opens behind the ear, though some authors indicate *Procapra* as having a postcorneal sinus. In the possession of a subauricular skin-gland *Antilocapra* announces organic relation. Moreover the rank hircine odour from the above, as well as the circumstance of a glandular tail-patch, decidedly point to *Capra*.

In brief, were the place of the Prongbuck to be assigned by the number, situation, and secretion of its skin-glands alone, I should without hesitation rank it among or close to the Goats.

Casting a glance among the viscera and other internal soft structures of *Antilocapra*, the subjoined points demand attention. There being a gall-bladder severs it from the Cervidæ and allies it with the Bovidæ. The stomach having four fully developed cavities, there being no water-chambers in the rumen, and no ileo-cæcal gland exclude it severally from the Tragulidæ, Camelidæ, and Giraffidæ.

The tongue might either belong to a Goat, an Antelope, or a Stag, though probably more like that of the two former than the latter. In the non-development of Cowper's glands, in the manner of the termination of the vasa deferentia, and in the bluntish form of the glans penis, the generative organs denote consanguinity with the Deer, where such structural conditions preponderate in the group. The construction of the larynx has a sort of medium tendency of divergence, the general type being cervine, though the short upper cornua would rather signify kindred with the Chamois and some Antelopes. As to the liver, its having a gall-bladder takes the Prongbuck away from the Cervi, which have no such reservoir.

Regarding dental characters, I can see no obvious distinction between the teeth-pattern of the Cabrit and the family Antilopidæ.

The appendicular skeletal segments show long limbs of a strong but manifestly fine and delicate construction, such alone as belong to the light fleeting Antelope tribe; for in all Deer, Goats, and Sheep of similar size, relatively much stouter leg-bones pervade.

In groups of the Ruminants there is considerable variation in the sternum, according as its component pieces are broad or narrow and the præsternum compressed or flat. As a rule the elementary parts are broader in Deer than in Antelopes; and in this moderate breadth to length the Prongbuck follows the latter. It also agrees with them in the form of its pelvis.

As a whole, it may be said that in its skeleton minus the skull it differs little if at all from most Antilopidæ, and in less or greater degrees is unconformable to the other horned and hornless Ruminantia.

When the cranium is studied and made a subject of analysis as to its taxonomic relations, oddly enough it perplexes, by the conformation of its structure and bearings to different Ruminant groups. The horn-cores in composition and place are those of the tribe Bovidæ—not situated, however, as in the Oxen, the majority of Antelopes, the Sheep, and the true Goats, but after the fashion of the small section of the so-called Caprine Antelopes—that is, erect and supraorbital; but they differ from those of the latter group and closely simulate true Goat's horn-cores in their breadth and compression.

We detect antilopine or caprine formation in the non-depression of the lachrymal bone, in the jutting-out of the orbits, in the contour of the horizontal palatal plate, in the convexity of the glenoid surface, in the rather rudimentary development of the postarticular ridge, and, lastly, in the ensheathment of the styloid process.

To match these, diagnostic points as conspicuously cervine (and partially true bovine) obtain. There are the general flattening of the upper surface of the skull, the bifurcate, pointed, and widely posterior nasals, the great size of the supraorbital fissure, the forking of the subanterior portion of the maxilla, the large supraorbital foramen, the nearly vertical and relatively flat supraoccipital, the differently set and ridged condyle, the broad triangular flattish and small tuberculate basioccipital, and, finally, the moderate-sized triangular auditory bulla.

There is yet to be added to the specialities of this anomalous Ruminant the Giraffe characters of (1) no false hoofs (met with, however, in *Calotragus campestris*), and (2) Deer-pronged and periodically shed horns.

Now, from a review of the foregoing anatomy and externals of the Prongbuck, if I were asked by a single term to denote what the animal is, I should be obliged to Germanize the English phraseology and name it a Giraffe-hoofed, Sheep-haired, Deer-headed, Goat-glanded Antelope — an expression however rugged, yet explicit enough to baffle those who are sceptical of gradational forms.

This much for the first premise from which I started, and which bears out significantly in living forms those tentative remarks concerning the interblending of ruminant types which the excellent M. Albert Gaudry utters in his general considerations of the "Animaux Fossiles de l'Attique" (Paris, 1862, p. 356).

In regard to the second premise, its place—judging from the totality of structure (excluding the brain, not examined), it appears to me that the proposal to rank the Cabrit as a family *per se* (*Antilocapridæ*) merits attention. Notwithstanding what has been said of transitional forms, the present career of biological inquiry has not yet arrived at the stage when limited divisions can be dispensed with, although lines of demarcation are broken apace. Provisionally, therefore, and for aught I can say to the contrary, the single genus and species *Antilocapra americana* may preside as the type of a family. Still I am far from the opinion that it will long remain in solitary grandeur; for I am convinced that its more aberrant features are but bridges, the further connecting end of which temporarily appears hazy to us from our present circumscribed point of view.

I append such characters (see also Gray and Turner) of the limited group in question as at present appear to me reliable from the known data. I coincide with Messrs. Sclater and Gray as to the family value of the periodically deciduous horns, but do not agree with the former authority (A. N. H. p. 403) in recognizing absence of false hoofs as peculiar to the Giraffe and Prongbuck. Dr. Gray explicitly states of the Steinbok, "False hoofs none" (Cat. Mam. Brit. Mus. "Furcipeda," 1852, p. 71); and specimens which I have examined enable me to corroborate this assertion.

Family Antilocapridæ, Sclater.

Horns hollow, forked, and periodically deciduous.

Dentition.—I. $\frac{0-0}{3-3}$. C. $\frac{0-0}{1-1}$. P. M. $\frac{3-3}{3-3}$ (or $\frac{4-4}{4-4}$?). M. $\frac{3-3}{3-3}$= 32 (or 36?).

Genus Antilocapra, Gray.

Horns in ♂ and ♀, supraorbital; core osseous and cancellated; sheath semicorneous, with agglutinated hairs. False hoofs none.

Cutaneous glands caprine; crumen absent. Nose ovine, hairy. Skull cervine in form; no suborbital depression; fissure wide, lengthened; supraorbital foramen large; nasals furcate, widest posteriorly; orbit slightly elevated above face; masseteric ridge low; auditory bullæ moderate, compressed, angular; supraoccipital perpendicular and concave; basioccipital tubercles abortive; styloid ensheathed; glenoideum convex. Mandibular angle widely rounded. Appendicular skeleton relatively slender. A gall-bladder. Larynx without internal pouching; and thyroid cartilages not prominent. Cowper's glands absent; prostate bifid. Incisors subequal, sloping; molars without supplemental lobes.

Hab. California.

3. Observations on Exterior Points.

The outward zoological characters of the Prongbuck have been accurately commented on by C. Hamilton Smith*, Richardson†, Gray‡, Audubon and Bachman§, Cassin‖, and others, and good figures of the animal and of the horns given by several of the above writers. The talented pencil of Mr. Wolf has also delineated the Society's specimen while it lived in the Gardens (see P. Z. S. 1867, pl. xvii.). Stuffed skins of the horned male and female and of the

* Trans. Linn. Soc. vol. xiii. p. 13, tab. 2.

† *Loc. cit.* p. 266, pl. 21.

‡ Knowsley Menagerie, 19.

§ Quadrupeds of N. America, vol. ii. p. 493, pl. lxxvii.

‖ U. S. Explor. Exped. vol. viii. p. 667 (1853–56).

young animal are exhibited in the wall-cabinets of the British Museum; so that little remains to be added on my part.

Much stress has been laid by Mr. Ogilby* on the presence or absence of cutaneous glands as indicative of affinities among the hollow-horned Ruminants. I made a careful search, therefore, for these on the dead body of the Prongbuck; and the subjoined is the result:—

1. No crumen or suborbital sinus was discovered, as all previous writers have averred.

2. There is, however, a cutaneous gland which exudes a yellow glutinous secretion, situated an inch and a half below the ear. Dr. Richardson evidently alludes to this when he says, "there is a dark blackish-brown spot at the angle of each jaw, which exhales a strong hircine odour"†.

3. No inguinal sacs exist, thus verifying Ord‡ and Dr. Gray's§ character of the genus.

4. In a footnote to his paper, Mr. Bartlett|| says, "A gland of considerable size exists in the back of this animal, immediately over the white patch." My examination confirms his observation. Dr. Canfield¶ has even more pointedly referred to this when speaking of the glands as "one over the junction of the sacrum with the spine, 6 or 8 inches anterior to the tail."

5. The last-quoted author, in the living animal, says, furthermore, "the Antelope has a very peculiar odour, strong and (to some persons) offensive. This comes principally from the glands in the white part of the breech. One of these is placed over each prominence of the ischium, below and on each side of the tail;" another, as above referred to, No. 4. This statement was substantiated in the dead body of our animal.

6. On both hind limbs, at the hock, behind the joint, and rather to the outside of the leg, there is another cutaneous secreting-gland.

7. Interdigital sacs exist on all four limbs.

The cutaneous glands of *Antilocapra americana* may be thus expressed:—Present, in pairs, 1 postmandibular or subauricular, 1 ischial, 1 hock, 2 interdigital: total 10 glands. Absent (but occasionally present in other ruminants), suborbital and inguinal.

In a review of the structures of the Saiga I have shown that the hair, among other characters, differentiates it from members of the antilopine group, and, so far as hirsute clothing is concerned, proves it to be a Sheep. When the same test is applied to the Prongbuck, the microscopic texture reveals, of a verity, that its hair also is very unlike that of the Antelopes, say, for instance, Cuvier's Gazelle. In the accompanying woodcut (fig. 1) *A* and *B* delineate the minute textural composition of the hair of *Antilocapra americana* from two regions of the back. Though differing in absolute magnitude, that from the head being the smaller, they yet agree in the delicate nature of the cortical substance and large-sized hexagonal

* Brit. Assoc. Rep. 1833, and Trans. Zool. Soc. vol. iii. p. 60.

† *Op. cit.* p. 267.

‡ Jour. de Phys. 1818.

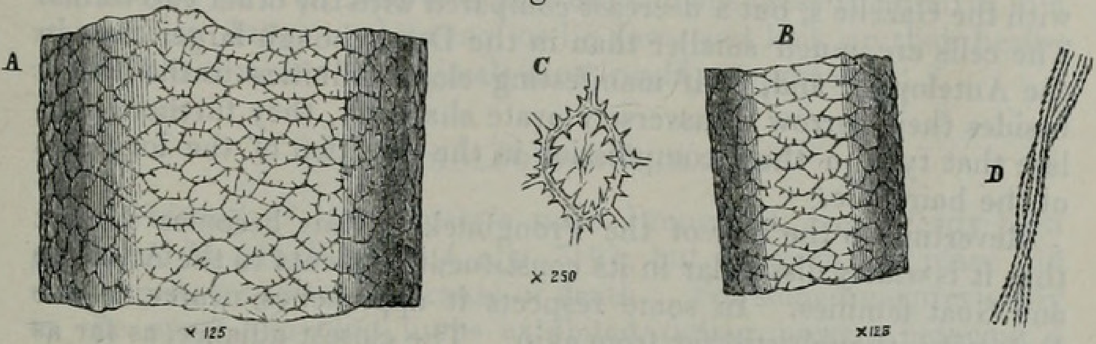
§ Cat. Mam. Brit. Mus.

|| *Loc. cit.* p. p. 721.

¶ *Loc. cit.* p. 106.

cell-structure of the medulla. The cell-walls are serrate; as is shown; but under a higher power, viz. 250 diameters, the transverse section, exhibited in *C*, brings out still further the markedly denticular character of each medullary cell. The finer hairs to which the term wool is applicable are depicted in *D*.

Fig. 1.



Microscopic hair-structure of the Prongbuck.

A. Portion from the crupper, seen lengthwise. *B*. A portion, from the occiput. *C*. Transverse section, cell of the medulla. *D*. Two fibres of the wool.

The measure of modification contradistinguishing the hair of the antilopine, cervine, ovine, and hircine families is as follows. In Cuvier's Gazelle (*Gazella cuvierii*), which, for our comparison, may be taken as a fair type of what zoologists class as an Antelope, each hair has a proportionally thick cortex, and the medullary tissue is composed of minute, rather irregular-outlined, compressed cells, ranged transversely to the long diameter of the hair.

In the Red Deer (*Cervus elaphus*) an equally good example of the cervine type, I find that, relatively to the calibre of the hair, the cortical envelope is only moderately thick, whilst the cellular medulla, in proportion to that of the Gazelle or Antelopes generally, is considerably increased. The medullary cells also have large, regular-sided, roundish or subhexagonal-contoured walls, not so squeezed together as in *Gazella* and its allies. In the Wapiti and other undoubted Deer an identical pattern prevails, the only obvious change being in the size of the cells, which slightly vary in different species.

In all Sheep, with but slight specific modification, the hair shows a vast augmentation as respects medulla to cortex, the latter being very thin contrasted with the former. The cells of the medulla are much larger than in Deer, and preeminently so compared with those of Antelopes. Selecting the fleece of the Argali (*Ovis ammon*), as affording a fair example of the hair of the Sheep kind (and it is by no means an extreme instance), it demonstrates the said relative increment in the size of the cells and corresponding diminution of the wall cortex. In this ovine species the medullary cells, from a pure hexagonal contour, assume a tendency to an elliptical figure.

In the Goats a form of hair-structure is met with intermediate between that of Antelopes and Deer. Exemplifying the hircine family by the Markoor (*Capra megaceros*, Hutton), that noble-looking Himalayan Goat, the elementary composition of the hair under the same microscopic power as the preceding may be thus defined. The entire thickness of the hair is less than in the Red Deer and greater than in Cuvier's Gazelle; the cortical substance is relatively about equal in depth to the last and decidedly greater than in the former or in the Wapiti Deer. The medulla bears an increase of ratio with the Gazelle's, but a decrease compared with the other two forms. The cells are much smaller than in the Deer, though larger than in the Antelopes; and, as if manifesting closer affinities to the latter, besides their narrow transversely ovate character, they further simulate that type in their compression in the direction of the long axis of the hair-tube.

Reverting to the hair of the Prongbuck, it thus becomes evident that it is widely dissimilar in its constituent elements to the Antelope and Goat families. In some respects it approaches nearer to the Deer tribe, though still far from akin. The closest alliance, as far as the hair is concerned, is towards Sheep, though it may be noted that in the marked denticulate condition of the medullary cells it is impressed with a character of its own.

The form of the upper lip in the hollow-horned Ruminants Ogilby has assumed to be a guide of considerable importance, inasmuch as from it we can discriminate affinities of resemblance exercising influence, not only on the animal's habits and economy, but vesting the premaxillaries with special characters. The Prongbuck belongs to his section of browsers in having no mufflle, and a hairy nose of the ovine or antilopine type, as Gray duly appends to its generic characters.

Concerning the horns, or rather the process whereby they are shed, Mr. Bartlett's and Dr. A. Canfield's observations are most satisfactory, and excellently related. I agree, however, with Drs. Gray and Sclater as to the nearer structural resemblance of the horns to those of the Bovidæ than the Cervidæ, notwithstanding their deciduous nature. Indeed, as Buffon* has asserted of the Ox, and Ogilby† of the Oryx, Singsing, and Leucoryx, these ruminants offer an example of corneous exfoliation. The last-mentioned authority expresses himself as having verified Buffon's observations, which the great French naturalist's contemporaries ridiculed. After comparing the structure of the young and mature bovine's horns, Ogilby says, "As in the case of the second dentition, the permanent organ is developed under, or rather within, the other, and, by its growth, gradually carries it upwards, and supports it like a sheath or scabbard. The young horn, thus severed from the vessels which formerly supplied it with nutriment, dries up, bursts, from the expansion of the permanent horn within it, and exfoliates in large irregular stripes, leaving the latter with the finely polished surface and solid, sharp, attenuated points which distinguish them. As far as my observations enable me to judge, this exfoliation takes place only once during the life of the animal, and that at the period of adolescence, immediately before the appearance of the first annulus."

* Hist. Nat. t. iv. p. 459. † Trans. Zool. Soc. vol. iii. p. 53.

Thus the extraordinary phenomenon of deciduous hollow horns in the Prongbuck receives a rootlet of explanation; and turns out to be a remote degree rather than a perfect anomaly of kind as respects the development and succession of the supposed permanent horns of the Bovidæ.

Curiosity, a trait of character manifested in the Goats above all other Ruminants, is a predominant feature in the Prongbuck. Richardson (*l. c.* p. 265) tells how the Indians dress themselves in a white shirt, flutter a white rag, or lie down and kick up their heels; and by these means the animals most readily approach.

4. Pathological Remarks.

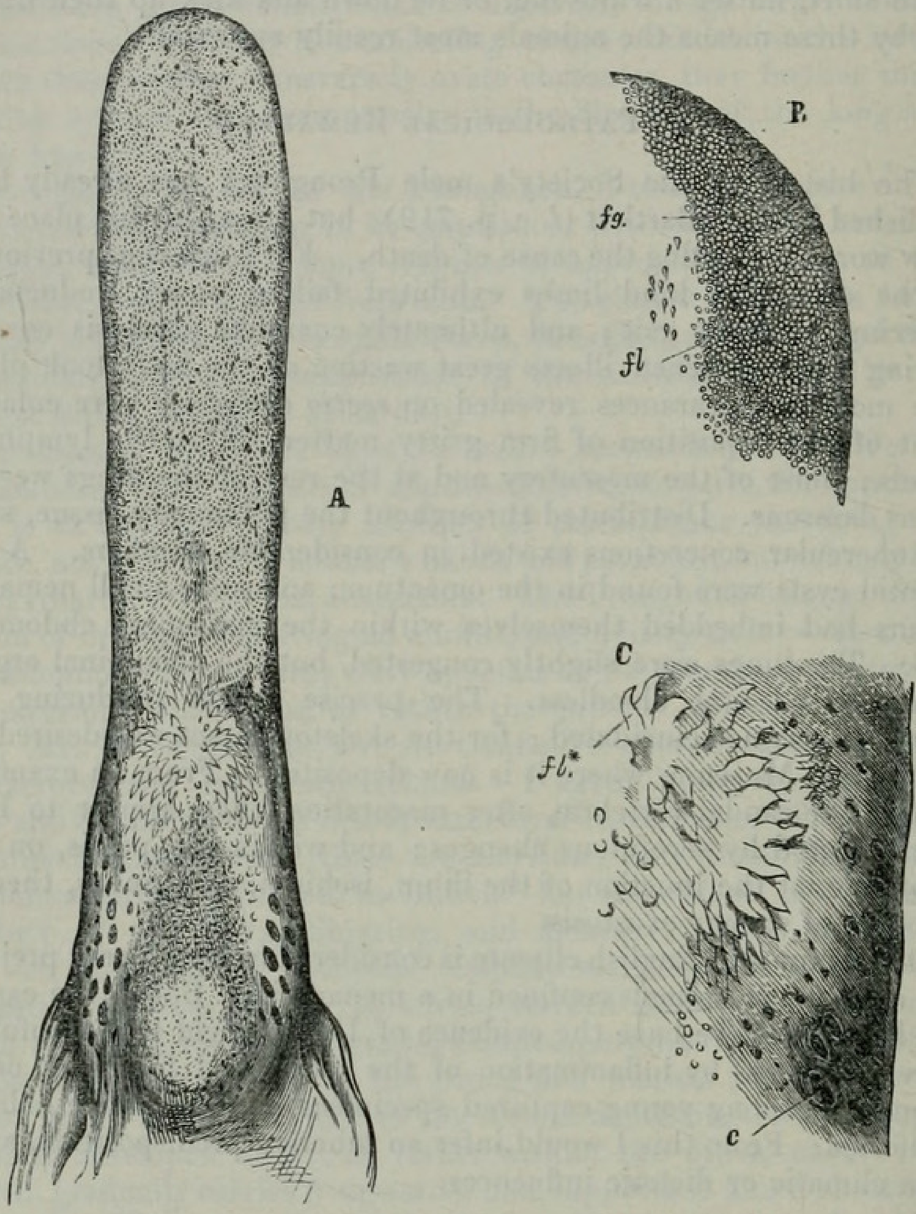
The history of the Society's male Prongbuck has already been published by Mr. Bartlett (*l. c.* p. 719); but I may in this place add a few words respecting the cause of death. For some time previously to the event the hind limbs exhibited failing power, inducing a tottering unsteady gait; and ultimately complete paralysis ensued. During the lengthened illness great wasting of the body took place. The morbid appearances revealed on *sectio cadaveris* were enlargement of and deposition of firm gritty matter within the lymphatic glands; those of the mesentery and at the root of the lungs were as big as damsons. Distributed throughout the pulmonary tissue, similar tubercular concretions existed in considerable numbers. A few hydatid cysts were found in the omentum; and some small nematoid worms had imbedded themselves within the peritoneal abdominal wall. The lungs were slightly congested, but the abdominal organs rather pallid and bloodless. The precise lesion producing the paralysis was not elucidated; for the skeleton intact was desired for the British Museum, where it is now deposited. From an examination of the caudal vertebræ, after maceration, these appear to have been affected by scrofulous changes; and within the pelvis, on the right side, at the junction of the ilium, ischium, and pubes, there is a nodule of spongy exostosis.

Our damp cold English climate is considered to have a very prejudicial effect upon animals confined in a menagerie. But in the case of the Prongbuck we have the evidence of Dr. Canfield that scrofulous disease followed by inflammation of the joints and lameness, occur frequently among young captured specimens in their native habitat, California. From this I would infer an inherent predisposition, apart from climatic or dietetic influences.

5. Oral and Laryngeal Region.

On viewing the soft palate in position from below, together with the teeth and alveoli of the upper jaw, the whole has a remarkably bottle-shaped outline. Posteriorly the wider palatal surface is smooth, or with only dotted glandular puncta. The narrower anterior half of the palate is traversed by a slightly wavy median groove, the surfaces of the lateral ridges sloping gently towards it. There are twenty-two of these slightly raised and irregularly curved transverse ridges on either side of the longitudinal median furrow; and each ridge possesses a finely crenate hinder free margin. The most anterior one and the two posterior denticulated ridges are much shorter than the others. On the left side two at least of the ridges merge into each other inwardly.

Fig. 2.



Tongue of the Prongbuck.

A. Dorsal aspect, half natural dimensions. *B* and *C.* Segments of the tip and dorsum near root, magnified to show papillary structures. *fl* and *fl**, filiform, *f g*, fungiform, and *c*, circumvallate papillæ.

A widish oval-shaped anterior palatine canal is situated in the middle of the smooth front part of the palate; and terminally the free border is slightly incised.

The mouth is sparingly lined with flat moderate-sized papillæ as in the Sheep. The faucial membrane is well supplied with mucus-glands. The tonsils, enclosed in a chamber, are each about the size of a pea, and open, as in the Giraffe, by a single wide fossa in the recess on either side behind the faucial pillars, and very slightly in advance of the tip of the epiglottis.

The uvula descends slightly, and is continuous laterally with a raised musculo-membranous ring guarding the pharyngeal opening; so that when the parts are in natural position an approach is discernible to that remarkable sphincter grasping of the cetacean larynx; only, of course, in the Prongbuck the epiglottis and arytenoids are quite diminutive. The pharyngeal constrictors are of moderate thickness, but nevertheless well marked.

Anteriorly the tongue, more Antelope- or Goat- than Deer-like, has a greyish hue—but beneath is of a dull leaden tinge, darker at the sides of the root or where the whitish papillæ are shortest and sparsest. It is spatular in figure, slightly narrowest about the middle, and thins very much at the broadly rounded apex. Length $6\frac{1}{2}$ inches, and from $1\frac{1}{4}$ to $1\frac{1}{2}$ inch in breadth: the free portion beyond the frænum under ordinary conditions measures 2 inches. Fully more than the anterior half of the dorsum is so crowded with short flattened cuspidate retrocumbent or filiform papillæ (*fl*) as to simulate the pile of velvet; these increase in size in the middle line behind and towards the prominent part of the root, where they form a crescent-shaped patch, the horns directed backwards. Posteriorly the papillæ gradate into flattened elevations. The patch above mentioned forms a prominent feature in the tongue of both the Ox and Sheep.

A long strip of separate papillæ circumvallatæ (*c*), some forty or more in number, are found on each lateral aspect of the dorsum, abreast of the papillary patch already spoken of, and behind to the very root. Each is glandular, of a black colour, depressed centrally, and surrounded by a deep fossa. The representatives of fungiform papillæ (*fg*) appear as black dots scattered over the entire dorsum, with the exception of the root. As Prof. Owen* describes in the Giraffe, these obtuse papillæ appear "somewhat sparingly scattered as coarse grains of gunpowder;" only they are necessarily smaller in the Prongbuck.

The larynx does not present any striking external feature such as the great thyroid enlargement of *Antelope gutturosa*† and *Hyomoschus aquaticus*‡, nor internal peculiarity of the subepiglottidean pouching met with in *Gazella dorcas*§ and *Tarandus rangifer*. Indeed, so far as general construction is concerned, it might equally belong to either the Cervidæ or Bovidæ.

The sketch *C*, fig. 3, enables the upper view of the parts to be understood. The epiglottis (*Ep*) is a broad, almost crescent-shaped leaflet, the apex, however, being slightly acuminate. In natural position

* Trans. Zool. Soc. vol. ii. p. 224.

† *Vid.* Pallas, Spic. Zool. tab. iii. fig. 16.

‡ Flower, P. Z. S. 1867, p. 956.

§ Meckel, Anat. Comp. x. p. 604.

it is 0·8 inch broad and about as much in length or fore and aft diameter; glandular impressions stud its surface. There are well-marked fossæ or upper laryngeal pouches (*l. p*) between it and the thyroid alæ. The superior aperture of the larynx (*a p*) is narrow, and 0·8 inch long. Between it and the aforesaid pouches are two broad roughish prominences, together having a V-shaped outline; these elevations are due to the large arytenoids and cartilages of Santorini or Wrisberg? with superimposed fatty tissue and membrane.

As fig. *A* shows, the thyroid cartilage (*T*) is of moderate height (1·3 inch), breadth 1·5 inch, and obtuse in front, the pomum being bulbous but not very prominent. The upper or anterior cornu is remarkably short, barely projecting above the very shallow concave upper border. The posterior border is more deeply scooped out above, but reversely arched below. The inferior cornu is a cartilaginous rod half an inch long. Excepting a narrow deepish notch close to the inferior cornu, the lower border of the thyroid is straight. The front portion of the cartilage is of much firmer consistence than the lateral plates; the latter are flat and without any marked oblique ridge.

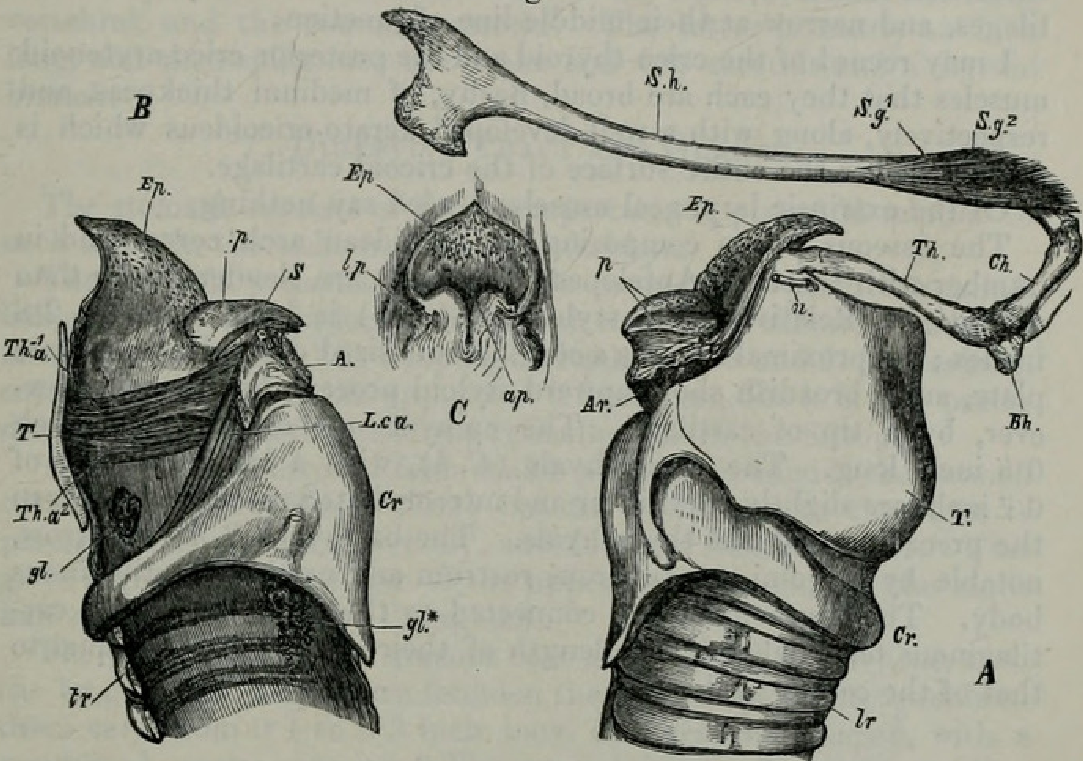
The hinder shield of the cricoid (*Cr*) is slightly more than 1·2 inch in vertical, and exactly that in transverse diameter. The surface is broadly convex in the same directions. The upper and lower margins are each widely rounded, the former being mesially concave, but the latter convex, and without any narrowed elongation. The inferior cornu is articulated a line above the lower lateral and wide-sweeping arciform border. The anterior ring completing the cricoid is some 0·3 inch broad throughout, and very moderately bent downwards or towards the trachea. The cricoid is altogether composed of a thicker substance than is the thyroid cartilage; its antero-posterior diameter is 1·7 inch, the front ring projecting as much as (but no more than), the boss of the pomum Adami.

Each arytenoid (fig. 3 B, *A*) is a solid cartilaginous body of a trihedral figure, and 0·7 inch in extreme diameters. Individually the faces and borders are slightly concave. Upon the summit the cartilage of Santorini (*S*), or (Wrisberg?) projects. This is composed of soft yellow elastic ligament, narrow and falciform in figure, and reaches in a tapering manner 0·3 inch behind the arytenoid cartilage. Its thickish part is close upon an inch long.

There is, however, an apparent continuation of the same yellow elastic substance as a thin band, downwards and forwards, from the anterior apex of the arytenoid to the inner thyroid fossa, and constituting the inferior thyro-arytenoid ligament or true vocal cord. These cords approximate in front, but leave behind them a wide wedge-shaped inferior aperture of the larynx or rima glottidis. The superior thyro-arytenoid ligaments, or false vocal cords, are not well pronounced, but still traceable from the fatty tissue above the cornicula laryngis towards the epiglottis.

The membrane between the false and true vocal cords is smoothish and perfectly free from sinuses or ventricles. I observed, though, on the inner mucous surface of the cricoid, and in part on the wall of the trachea, a few irregular-contoured glandular-like depressions ($gl.$, gl^*); but these I am inclined to consider merely of pathological import.

Fig. 3.



Structure of the larynx of the male Prongbuck.

A. Side view, with attached hyoid bone. *Sh.* Stylo-hyal. *C. h.* Cerato-hyal. *Bh.* Basihyal. *Th.* Thyro-hyal. $S. g^1$. Origin of the stylo-glossus muscle, &c. $S. g^2$. A second, upper portion, which goes to the root and side of tongue. *Ep.* Epiglottis. *p.* Wrisbergian? projections. *Ar.* Arytenoideus muscle. *T.* Thyroid cartilage. *Cr.* Cricoid cartilage. *tr.* Trachea; and * denotes the lateral ridging of the cartilage rings. *u.* Portions of the superior laryngeal nerve.

B. Section of the larynx—half of the thyroid alæ and tracheal rings being sliced through and partially removed to show the interior structure, vocal muscles, arytenoid and other cartilages. *A.* Arytenoid cartilage. *S.* Cartilage of Santorini; and, above this, *p*, fatty Wrisbergian? projection. $Th. a^1$, Lower, and $Th. a^2$, Upper thyro-arytenoid muscles. *L. c a.* Lateral crico-arytenoideus. $gl.$, $gl.^*$ Glandular depressions of pathological origin? The remaining letters apply as in Fig. *A*: a portion of the inferior cornu remains on the cricoid cartilage.

C. Laryngeal aperture, looked at from above and behind. *ap.* Aperture of larynx, with the projections from the Wrisbergian? cartilages. *l. p.* Laryngeal pouch.

There is a double thyro-arytenoid muscle, the lower ($Th. a^1$) being of equivalent volume to the upper ($Th. a^2$); and both are strong muscular bands. The superior partly overlaps the inferior portion posteriorly; and together they occupy the outer surface of the arytenoid cartilage, except so much as is taken up by the under-mentioned muscle.

This, the lateral crico-arytenoid muscle ($L. c. a$), has a longish narrow belly, arising partly tendinous from the upper edge of the side or middle third of the cricoid cartilage, and being inserted into the outer arytenoidal facet.

The fleshy digastric arytenoideus muscle (*Ar*) is of considerable thickness, much expanded at the posterior face of the arytenoid cartilages, and narrow at their middle line of junction.

I may record of the crico-thyroid and the posterior crico-arytenoid muscles that they each are broad, fleshy, of medium thickness, and respectively, along with a well-developed kerato-cricoideus which is present, cover the entire surface of the cricoid cartilage.

Of the extrinsic laryngeal muscles I need say nothing.

The osseous pieces composing the hyoidean arch correspond in number with those of Antelopes; the bones are slender rather than otherwise. Relatively the stylo-hyal (*S. h*) is long, namely, 2·8 inches; its proximal end has a considerable-sized dependent quadrate plate, and a broadish short upward styloid process, lengthened, however, by a tip of cartilage. The epihyals are ossified, and each 0·5 inch long. The cerato-hyals (*C. h*), with a long diameter of 0·7 inch, are slightly curvilinear and intermediate in stoutness between the preceding and the thyro-hyals. The basihyal (*B. h*) is narrow, notable by a prominent tuberous rostrum and partially cartilaginous body. The thyro-hyals are connected to the thyroid alæ by a cartilaginous terminal rod; the length of their ossified part is equal to that of the cerato-hyal.

6. Pulmono-vascular Structures.

The trachea consists of 56 cartilaginous rings counted to the bifurcation, but at the high division of the bronchus 45. In the Sheep there are altogether some 50 in number.

The left lung possesses three lobes, the lowermost, as usual, being the largest. The right lung is divided into five segments, the four upper and smaller ones being long, narrow, and widely separated at their roots. The uppermost one of these receives a separate bronchus at $2\frac{1}{2}$ inches above the ordinary bifurcation.

The heart conforms to the type of ruminants generally. The inferior vena cava enters behind and to the left; the fossa ovalis is closed, and the eustachian valve large. The superior vena cava has a thickish circular muscular layer as it enters the auricle. The auricles are relatively of small size compared with the ventricles. The valves agree with those of the Sheep; but there is a more than ordinary fibrous network crossing between the lower walls of the left ventricle. A firm cartilaginous body (the bone of the heart) 0·3 inch long, lies at the anterior base of the aorta, beneath the tricuspid valves.

The heart has little fat on its surface. It is slightly elongated in form, and fully 4 inches in length from base to apex.

The aorta, after sending off the small cardiac branches, is single for a distance of 1·3 inch, and then bifurcates, the left larger trunk forming the arch and descending aorta. The ductus arteriosus is situated 0·8 inch from the above division. The right trunk, the arteria innominata, proceeds for about a couple of inches, and then sends off a single branch, which immediately separates into the left brachial and vertebral arteries. Half an inch further on, the innominata splits into three branches, viz. the right brachial, the right vertebral, and the common carotid. The latter is nearly an inch long, and then splits into the right and left carotids and a thyroid branch.

7. Digestive Tract and Glands.

The stomach consists of four compartments, placed in relation to each other in the ordinary ruminant fashion.

The paunch presents considerable proportions when distended, being about a foot in longitudinal and transverse diameter; and its lower end is bifid. The œsophagus, itself narrow and 21 inches long, enters the paunch at its upper and left corner; but it is also partly directed into the left end of the reticulum, as in the Sheep.

The internal thickened folds which partially subdivide the paunch correspond with those of *Ovis*; but the lower one to the right is placed rather more transversely, and does not slant upwards. This gives a greater relative size to the upper compartment of the right half of the rumen in the Prongbuck.

The papillæ lining the mucous coat are of two kinds. One sort, the longest and largest, are found in the hollows and corner pouches; these vary from 0·1 to 0·3 inch long, and are club-shaped, with a roughened warty exterior. The second kind are much smaller, shorter, and closely set, and, together, give a granular appearance to the surface; they occupy chiefly the ridges.

Besides these villi or papillæ, I observed a series of glandular-like bodies scattered widely throughout this first cavity. These were subcircular, cauliflower-like elevations, ranging from $0''{\cdot}2'''$ to $0''{\cdot}3'''$ inch in diameter, and 0·1 to 0·15 inch in height. On section they seemed aggregations of papillæ, but with thickened basal submucous tissue. Although describing these last along with the healthy villous structure, I have reason to believe them a morbid product.

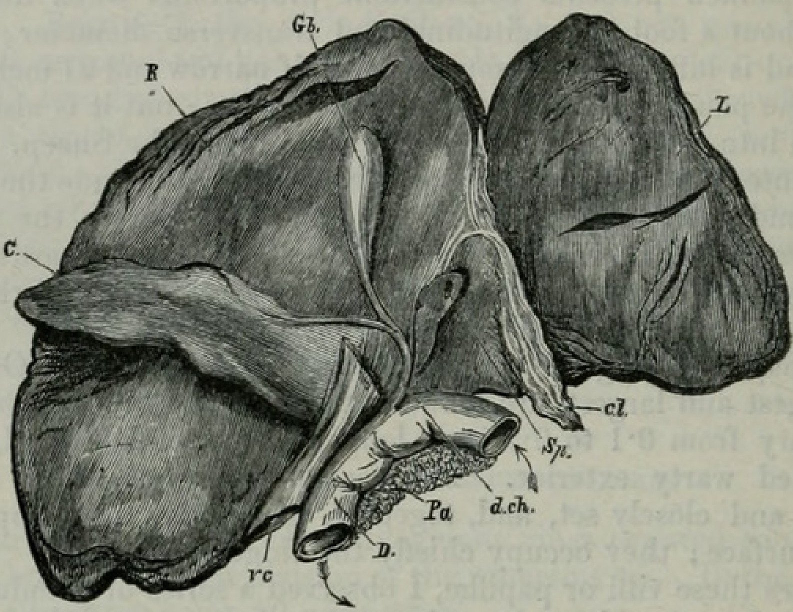
The subglobular reticulum has a less restricted neck than in the Sheep. It is between 6 and 7 inches in its long diameter, and about 4 across. As seen in front, after removal of the stomach from the abdomen, the reticulum partially hides the psalterium; the lower end of the œsophagus and a small portion of the left end of the abomasus also dip behind it. The cells forming the reticulations are rather irregular in size and form, though chiefly hexagonal. They range from 0·2 to 0·3 inch in diameter, and are remarkably shallow. The papillæ are acuminate, the largest being found at the summits of the ridge-like boundaries.

The psalterium is 3 inches long by $1\frac{1}{2}$ inch wide. It has the usual ruminant plications with intervening shorter ones, covered with short, thick-set, mamillary villi.

The fourth cavity, or abomasus, possesses a double curve, and is, as usual, a long cylindrical cavity, narrowing as it approaches the pylorus. The rugæ are fully developed, and longitudinal in direction as far as the first curve, after which they become chiefly transverse, and are much smaller. The pyloric orifice is circular, less than $\frac{1}{2}$ inch in diameter. The fourth stomach is about 15 inches long, and from $1\frac{1}{2}$ to $3\frac{1}{2}$ in diameter.

The total length of the intestinal canal was 68 feet $9\frac{1}{2}$ inches, whereof the small intestines measured 50 feet 5 inches, and the great gut 18 feet $4\frac{1}{2}$ inches. The simple cæcum was 15 inches long, and varied from $1\frac{1}{2}$ inch in diameter to $2\frac{1}{2}$ inches near its termination. No ilio-cæcal gland, as obtains in the Giraffe, was noticed in the Prongbuck.

Fig. 4.



Liver, with portion of the duodenum.

R. right, and *L.* left lobe. *C.* Caudal lobe. *Sp.* Lobus spigelius. *Gb.* Gall-bladder. *d.ch.* Ductus communis choledochus. *C.l.* Coronary ligament. *Vc.* Vena cava. *D.* Duodenum. *Pa.* Portion of the pancreas.

The liver (fig. 4) is only of moderate size and thickness, and is somewhat flattened. It is mainly divided by an anterior marginal fissure into a larger right and smaller left lobe; but there is also present a considerably elongated lobus caudatus and a very diminutive lobus spigelius. The entire organ is remarkably free from notches or emarginations.

The right lobe (*R*), fully 8 inches long by 4 broad, contains the gall-bladder (*Gb.*), and to the right of it the caudate lobe. The latter (*C.*) is irregularly tongue-shaped, flat, $4\frac{1}{2}$ inches long by about 1 inch broad, and lies across the right lobe, its tip overhanging the right free margin of the viscus.

The lobus spigelius (*Sp.*) is represented by a very thin and small lappet or lobulus, placed near the transverse fissure, and immediately to the left of the left hepatic duct.

The left lobe (*L*) occupies the remainder of the organ. Its dimensions are 6 inches long by 4 across.

Agreeing with Antelopes, but differing from Deer, there is in the Prongbuck a small pyriform gall-bladder (*Gb*), which lies upon the surface of the right lobe, rather to the left of its middle, but not reaching the upper margin.

The cystic duct, an inch long, joins the right hepatic; and almost immediately after, these turn off at a right angle, the left hepatic duct joining to form the ductus communis choledochus (*d. ch*), which is fully an inch long, and penetrates the duodenum at 5 inches from the pylorus.

The vena cava (*Vc*), of moderate calibre, passes, as usual, along the inferior or attached margin of the liver.

As compared with *Ovis*, the hepatic structures of *Antilocapra* differ in being relatively thinner and smaller, in the greater length of the caudate lobe (which in the Sheep does not overlap the right margin), in the diminished capacity of the gall-bladder, its median position on the right lobe, and its not reaching the free margin.

The Chamois's liver stands a remove further from the Prongbuck. In it the left lobe, and not the right, has the greatest magnitude. The mesial marginal fissure dividing these is wide and deep; the gall-bladder is very capacious, and reaches considerably beyond the outer border, partially within the fissure; the caudate lobe is short and thick.

8. Parts connected with Generation.

The surface of the kidneys are smooth; their figure bean-shaped, but rather roundish than flattened; length fully $2\frac{1}{2}$ inches. The hilus ends in a deep and long sinus, subdividing into fine calyces. The pyramids of Malphigi are rounded, and half a dozen in number; the cortical substance is 0·2 inch thick.

The ureters (*u*, fig. 5) penetrate the under surface of the wall of the urinary bladder at the commencement of the neck and outside the vasa deferens.

On reaching rather beyond the middle of the base of the bladder, the vasa deferentia (*V.d.*) enlarge, approach, and lie alongside each other in the median line, closely invested by a dense areolar sheath. They proceed, adherent, and like a single flattened tube, on the neck of the bladder, towards and between the lobes of the prostate.

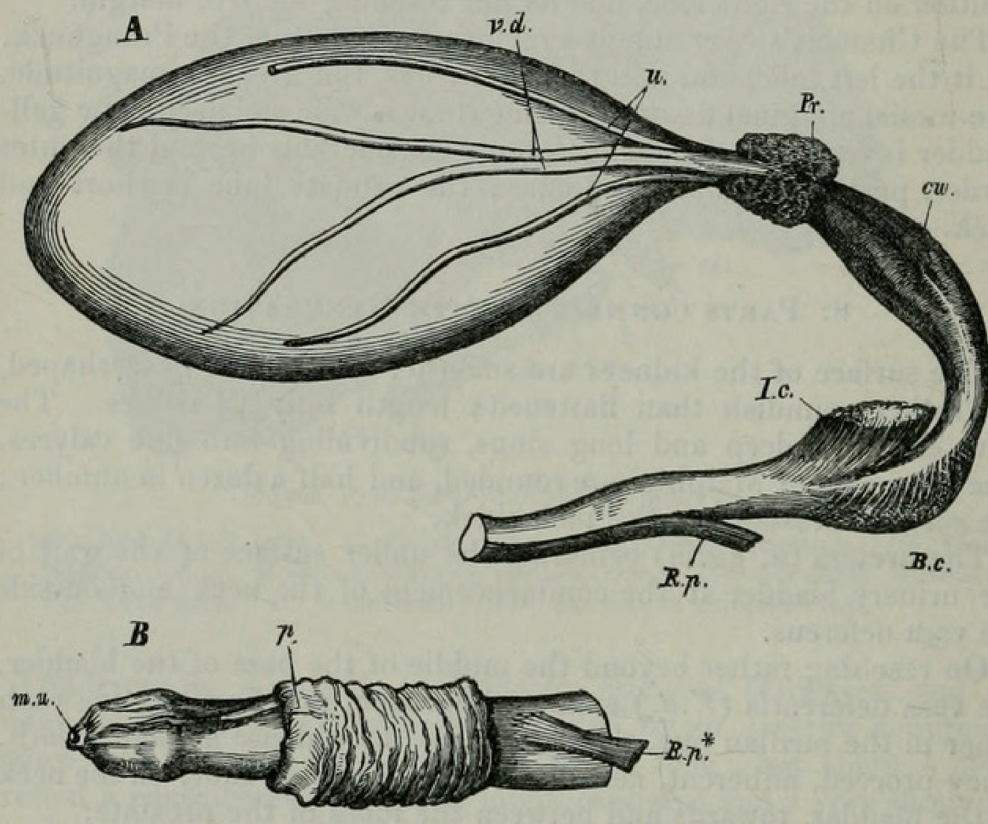
The bilobed prostate gland (*Pr.*) lies on the under surface, and at the proximal end of the membranous portion of the urethra. Each flattish, bean-like lobe is half an inch long; and the two, by their position, form a compressed horseshoe figure, fully half an inch wide, embracing the terminal portion of the vasa deferentia.

I have preferred to term the bodies above described glandulæ prostaticæ, though perfectly aware they have been regarded, by such a competent authority as Rudolph Leuckart, as vesiculæ seminales in other ruminants. Leuckart's very able article, "Vesicula prostatica," in the 'Cyclopædia of Anatomy and Physiology,' vol. iv., is immediately followed by a clearly reasoned paper by my old friend S. R. Pittard, on the "Vesiculæ seminales;" and I abide by his remark regarding the organs in question in Ruminantia, when he says:—"It is far from improbable that they are both the one and the other—prostate and vesiculæ at once."

The terminal enlargement of the vasa deferentia in the Prongbuck may correspond to what Leuckart figures as the Weberian organ, or uterus masculinus, in the Deer; and I ought further to observe that I did not detect that differentiation of the said organ from the vasa differentia which obtains in some he-Goats.

The membranous portion of the urethra, $2\frac{1}{2}$ inches long, tapers at either end, but throughout is broadish, flattened, and possesses a deep longitudinal furrow below. The compressor urethræ muscle (*cu*) is of great thickness, and its transverse fibres constitute a continuous arch, tucked into the under groove, from the neck of the bladder to the urethral bulb.

Fig. 5.



Urino-generative organs of male *Antilocapra*.

A. Reduced side-view of urinary bladder and urethral canal. *u*. Ureters, cut short. *V.d.* Vas deferens. *Pr*. Prostate gland. *C.u.* Compressor urethræ; penis cut short, portion of the retractor muscle, *R.p*, being left. *B.c.* Bulbo-cavernosus, and *I.c.* Ischio-cavernosus muscles.

B. Distal end of penis, about natural size. *p*. Preputium. *m.u.* Meatus urinarius. *R.p.** Insertion of retractor penis.

Cowper's glands appear to be absent; at least I could find no such enlarged prominent bodies as are found in the Chamois, Goat, and some other ruminants. The Prongbuck thus agrees with the Deer, where these glands are wanting. The place of these Cowperian bodies may, however, be supplied by a bilinear, long patch of minute ducts or crypts, which are found on the floor of the urethral cavity, at its anterior half, in the membranous groove between the inferior portions of the compressor muscle (*cu*). The glandular tubes open by separate puncta within the urethra. Where these terminate at the bulb and narrowing of the urethral passage, there is a semilunar free fold of membrane, forming a short *cul-de-sac* 0·2 inch deep.

The bulbo-cavernosus (*B. c*), the ischio-cavernosus (*I. c*), and the retractores penis muscles (*R. p*, *R. p**) are each fairly developed.

The preputium (*p*) is attached by a frænum 0·9 inch from the tip of the penis. The glans is relatively thick posteriorly, but flattened in front; the tip being of an expanded spatular figure, with the corpus spongiosum and meatus urinarius (*m. u*) barely projecting beyond the terminal border, and not forming a long, free, whip-like process, as in some ruminants.

The testes are small, each being under $1\frac{1}{2}$ inch long.

9. Osteology.

Condition of the Bones.—I have strong reasons for suspecting that the unhealthy condition of the body affected the bones; but if not, these are remarkable for their lightness and porosity throughout the whole skeleton; indeed, as Mr. Gerrard, Sen., remarked, no ruminant skeleton of equal size possesses such delicacy of osseous texture. Comparing the other crania of the Prongbuck in the British Museum with our specimen, they did not feel nearly so light, but nevertheless sufficiently attested such absence of solidity that some might infer it as a quality predominant in the bony frame of this creature.

If one were to speculate upon this fact, it might be given as one reason for the extraordinary fleetness of the creature. Their rapidity of speed is related as something marvellous. Travellers agree that they outstrip a swift horse. Audubon's account* is unique; mentioning the several gaits, he concludes, "While so rapidly do their legs perform their graceful movements in propelling their bodies over the ground, that, like the spokes of a fast-turning wheel, we can hardly see them, but instead observe a gauzy or film-like appearance where they should be visible.

A. *The Cranium.*

(*a*) *Skull as a whole.*—In profile (fig. 6, *B*) the cranium is remarkably elongate antero-posteriorly, and shallow vertically. The summit and base run almost in parallel lines, so as to give great flattening or shallowness from above downwards. This is very unlike most of the living Cervidæ and Bovidæ, where the frontal region is lofty and slopes downwards and forwards often sharply. Some of the Bovines (*Bubalus*, for example) have a tendency to upper levelling of the skull; and among Antelopes such genera as *Oreas* and *Alcelaphus* exhibit lowness in the cranial vault; but in all of these the resemblance is

* *Op. cit.* p. 198.

chiefly due to the depressed rearward angle at which the horns come off. Some fossil forms, however, more markedly agree with the Prongbuck in the above respect, the *Antilope palæindica* of Falconer to wit.

The Deer, as a group, may be said to have a depressed skull; in such forms as the Reindeer and the Elk it is very obvious.

The seeming affinity of the Prongbuck to the Giraffe, in their both being deprived of false hoofs, is dispelled, so far as contour of skull is concerned (the former being deficient in the median frontal protuberance so peculiar to the latter), as well as limitation of great frontal sinuses and breadth of cheek to naso-premaxillary region. Apart from these structural considerations, however, there are other cranial characters equally significant, which demonstrate that the family type of their skulls is not so entirely removed from each other as a hasty inspection is apt to infer.

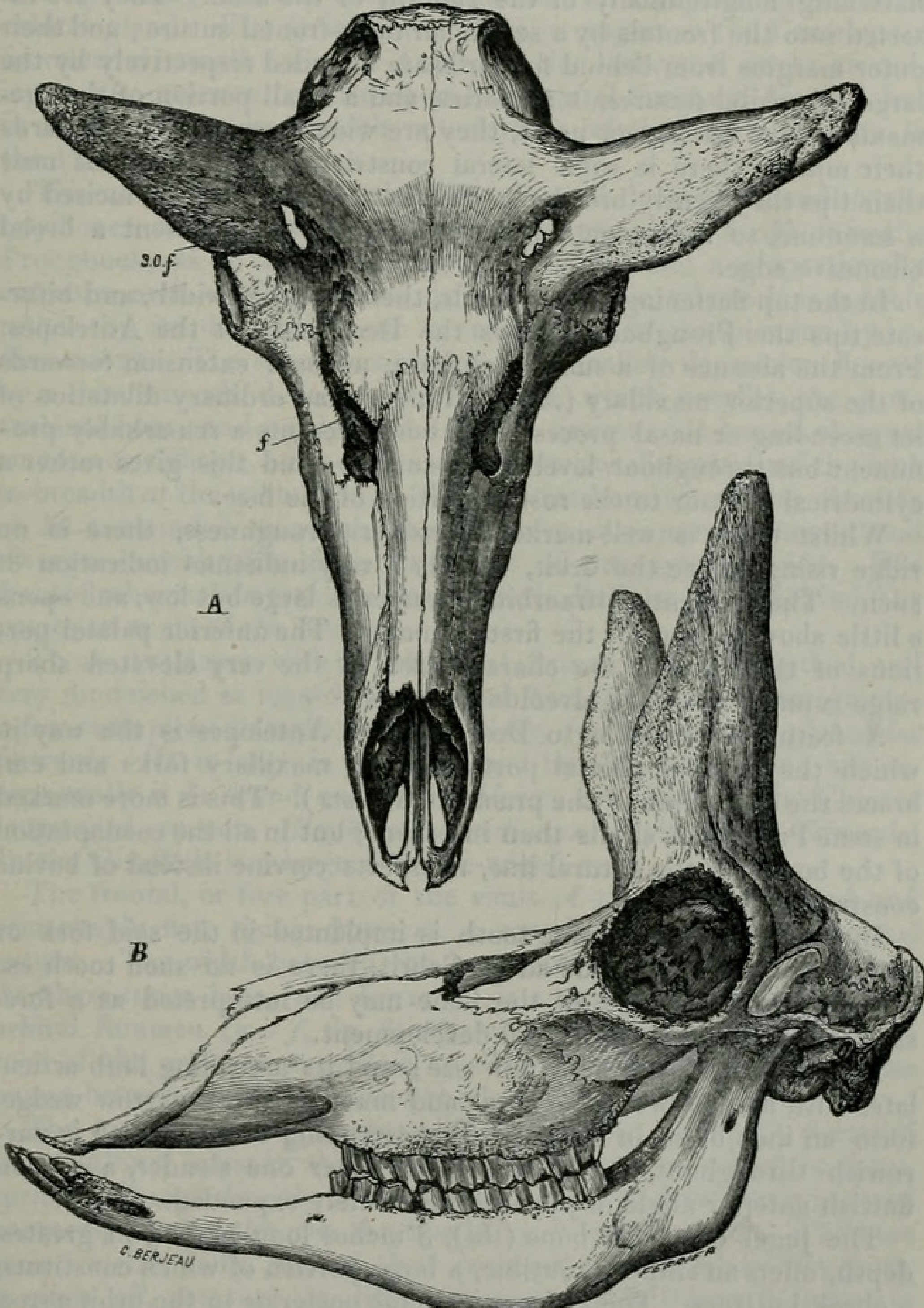
In *Antilocapra*, as in *Oreas* and some other Strepsiceres, the parieto-occipital is short compared with the very lengthened maxillo-premaxillary region. The orbit, subcircular, of fair size, if not large, has its optic axis directed outwards, and but very slightly upwards and forwards. The horn-cores, which stand erect, as in the Chamois, present, in this aspect, a broad dagger-shaped outline, and are implanted directly above the orbit, from its middle to beyond the rear. If the skull in this view be divided into five equivalent perpendicular segments, the occipito-temporal area would occupy one, the orbito-jugal region another, and the anterior three would consist of the lachrymal and naso-maxillary bones.

In the erect-horned *Rupicapra*, where the occiput is short, the front of the orbit comes to about the middle of the skull. In many small Antelopes it reaches little short of this; but in the Strepsicerine group the face is proportionally elongated, as in *Antilocapra*. In Deer, as a rule, the facial lengthening is considerable, as in the Prongbuck; but there is this difference, that the postcranial segment is far greater than in the latter.

From the top (fig. 6, *A*), excepting in the very different disposition of the horn-cores, the outline of the skull approaches less to the Giraffe than to most Cervidæ, whilst it does not partake entirely of the Antelope features—even to the Strepsicerine group, which otherwise, in side view, have some points in common. A close resemblance can be traced, however, in the Sassaby (*Damalis lunatus*, H. Smith), though this Bovine Antelope markedly disagrees in possessing an elevated and not flattened intercorneal ridge.

The individuality of upper contour in the Prongbuck's skull is in some measure owing to the abbreviation of the parietal segment, moderate breadth of the frontals, increased, however, by the outstanding orbits, and by the long steadily continued naso-maxillary rostrum, which in most Antelopes and Deer has a decided wedge shape. The horn-cores, as seen looking down upon them, are broad and pass out far beyond the orbital periphery. The nutritious foramina at their base (*s o f*) are large and allow the light to descend quite through the orbit. The so-called supra- or anteorbital fissures (*f*), as in the Cervidæ and the Giraffe, are of great magnitude, and in the Prongbuck might not inaptly be compared in shape and relative position to the vacuities in the sounding-board of a violin. The anterior nasal opening is as capacious as in the Deer generally, but deviates a little in figure, as it is lower and obviously extends further back.

Fig. 6.



Vertex and profile views, minus the horns, of the skull of the male *Antilocapra* which lived in the Gardens.

s o f. Supraorbital foramen. *f.* Fissure.

A posterior view of the cranium minus the mandible (as fig. 7, *B*, illustrates) brings out very well the odd implantation of the horns, basal width apart, and prominent postfrontal flattening. The orbits outlie squarely; and both the horns and horn-cores (*c*) uprise boldly.

(*b*) *Component parts of the skull.*—The long nasals abut against each other with a considerable convexity, toned down, however, by a flattening longitudinally of the summit of the arch. They are inserted into the frontals by a semilunar naso-frontal suture; and their outer margins from behind forwards are bounded respectively by the large suborbital fissures, maxillaries, and a small portion of the premaxillaries. As Turner notes, they are widest posteriorly; towards their middle there is some lateral constriction, and forwards near their tips they gently broaden. The extremity of each is incised by a semilune, so that together, quite in front, they present a broad biconcave edge.

In the top flattening of the nasals, their posterior width, and bifurcate tips the Prongbuck follows the Deer and not the Antelopes. From the absence of a suborbital fossa, unusual extension forwards of the superior maxillary (*Mx*) and more than ordinary dilatation of its ascending or nasal process, the bone presents a remarkably prominent but throughout level cheek-surface; and this gives rather a cylindrical contour to the rostral portion of the face.

Whilst there is well-marked masseteric roughness, there is no ridge rising before the orbit, or only a very indistinct indication of such. The crescentic infraorbital foramen is large but low, and opens a little above in front of the first premolar. The anterior palatal portions of the maxillæ are characterized by the very elevated sharp ridge running from the alveolus forwards.

A feature more akin to Deer than to Antelopes is the way in which the anterior palatal portion of the maxillary forks and embraces the outer limb of the præmaxilla (*Pmx*). This is more marked in some Prongbuck skulls than in others; but in all the coadaptation of the bones, or the sutural line, manifests cervine instead of bovine construction.

In Deer the upper canine tooth is implanted in the said fork or angle; and though, in the adult Cabrit, there is no such tooth extant, yet the bifurcation of the bone may be interpreted as a foreshadowing of the Stag's dental development.

Each præmaxilla is of a fair size; and its ascending limb articulates with and between the nasal and maxillary, in a narrow wedge-form an inch or so in length. The ascending or outer limb is narrowish throughout, the horizontal or inner one slender, and their flattish anterior angle of junction moderately expanded.

The jugal or malar bone (*Ju*), 3 inches long and $1\frac{1}{4}$ in greatest depth, offers an elliptical outline, a large portion of which constitutes a cheek-buttress. The zygomatic splint posterior to the orbit agrees with that of the Chamois in its uncommon shortness. The segment of the lachrymal contributing to the orbital ring forms no more than an eighth of the circuit; here the lachrymal is broadest, tapering forwards almost to a point, which reaches the hinder border of the ascending or nasal portion of the maxilla. The surface of the bone is smooth and not impressed for the reception of a crumen; and its superior border is excluded from touching the nasal by the intervention of a large open space or fissure (*f*).

The lachrymal of the alpine Gems answers to the above, but the fissure is reduced to a minimum. Most Deer have the bone broadly triangular and deeply sunk for the reception of the suborbital gland. The facial plate of the os unguis in the Camelopard is relatively small. In the Antelopes the lachrymal varies according to the presence or absence of infraorbital fossa and fissure; but in most instances its breadth anteriorly is relatively greater than in the Prongbuck.

The interspace between the frontal, nasal, lachrymal, and maxillary bones, denominated the suborbital fissure (*f*, fig. 6, *A*), is in the Prongbuck, as in most Deer and in the Giraffe, a proportionally extensive area—differing thus from the Bovidæ, where it is notable rather by its diminutive size or absence than conspicuous by its dimensions. The space in question is a shallow depression floored by a thin, smooth, delicate osseous plate, which overlies the post-turbinal bone, and partly of the frontal sinuses. It has an elongate sinuous or *f*-shape, 1·8 inch in antero-posterior diameter, and 0·4 inch in breadth at the widest point. Its anterior horn terminates obtusely or in a rounded manner; the posterior one narrows more, and diverges considerably from its fellow of the opposite side. The fronto-lachrymal suture passes outwards half an inch behind the posterior angle of the fissure.

Those Antelopes with a suborbital fissure have it elliptical and very diminished as regards length and breadth from the foregoing; a few examples (*Damalis pygarga*, Gray, for one) have it placed far forwards. It is large in all Deer, and broadly triangular; but exceptionally it is found partially lyriform, as obtains in the Chinese long-tailed species, *Elaphurus davidianus*, Alph. Milne-Edwards. In the Giraffe it is a large crenated-edged oval.

The frontal, or fore part of the vault of the skull, is broad and remarkably flat, rising, however, a very little towards the coronal suture. The width between the horn-cores is from 2¾ to 3 inches. At their inner base, well forwards, is a very large elliptical supra-orbital foramen (*s o f*, fig. 6, *A*), which enters quite through the roof of the orbit; a superficial shallow groove for a venous sinus passes betwixt the foramen and the lyrate supraorbital fissure.

The compressed dagger-shaped horn-cores (*c*, fig. 7, *B*), flattened from without inwards, thickest behind, and narrow-edged in front, spring well nigh directly over the orbit, and with divergently inclined postures, overtop the eye, the tips being 9 inches apart. They are each 5 inches long, and at their broadest part, or where the prong is given off, measure, in different crania, from 1·5 to 2 inches in diameter. From the lateral position whence the osseous horn-supports start, the orbito-frontal rings are partly deprived of that salient configuration which essentially belongs to them.

Each parietal (*Pa*, fig. 7, *B*) constitutes a broad but low arch; the narrow anterior crescentic angle, as in other ruminants, goes down between the squamous postfrontal and orbito-sphenoid elements to meet the alisphenoid.

The squamous element of the temporal bone, agreeably to the low form of the brain-case, is not deep. The convexity of the bone is moderate, and the upper sutural arch long and a little raised. The foramen, situated at the root, and upper surface of the zygoma, common to the Ruminants, in the Prongbuck, as in the Antilopidæ and Ovidæ, is wide to excess; and the perforation is seen to run superficially or within the diploë of the cranium, and to communicate with the mastoidal cells. The articulating surface or glenoid facet (*gl*), moreover, is more bovine- than cervine-shaped; only that the bounding ridge behind and the tubercle and post-glenoidal ridge are not so prominently developed as in the former. The external auditory canal (*Au*) is large, and sticks upwards and backwards prominently.

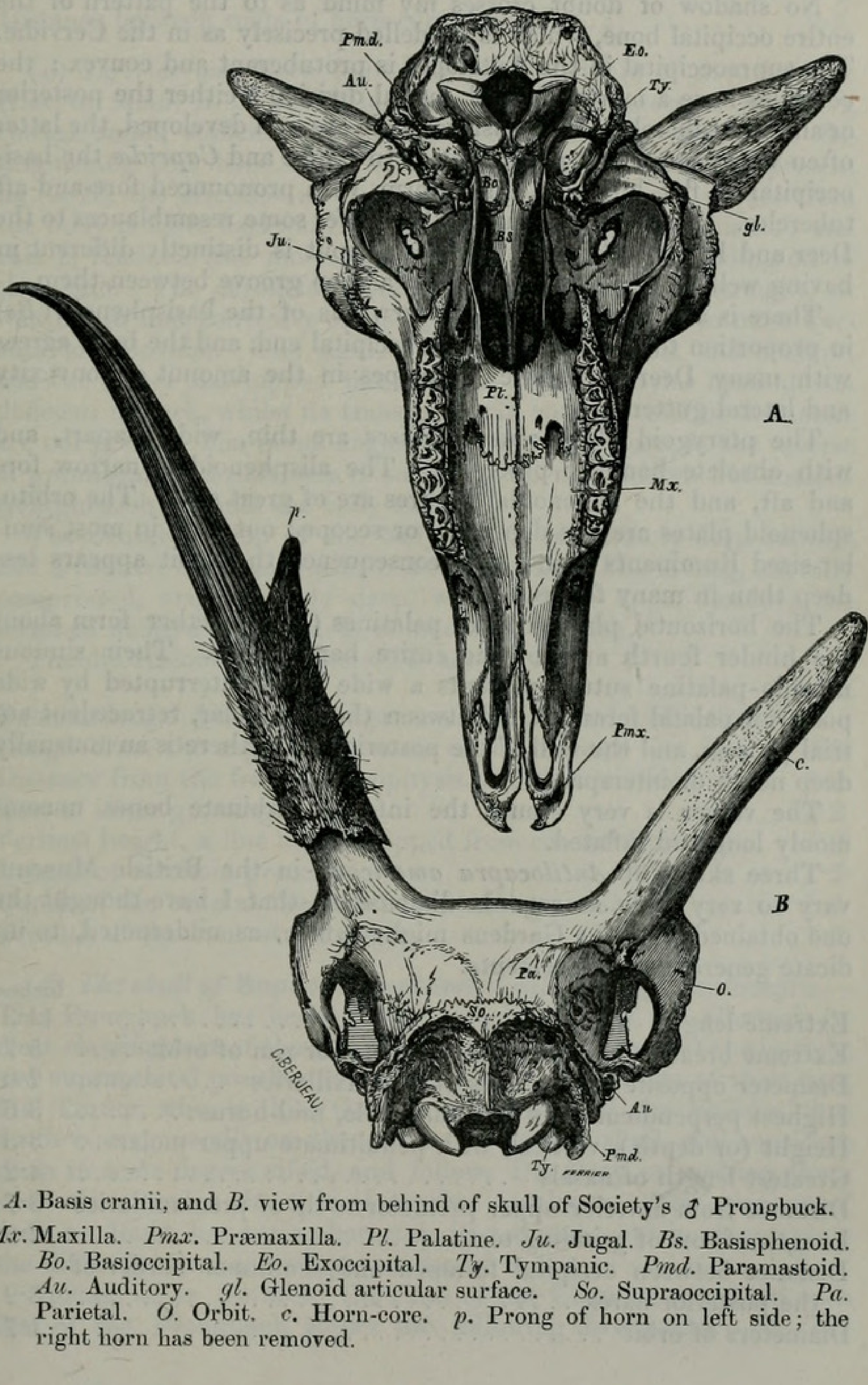
With the discrimination displayed in all his papers, the late Mr. Turner points out "that in the Moschidæ and Cervidæ the styloid process becomes free almost immediately at the base of the auditory process, while in the Bovidæ or Cavicorn Ruminants it is enclosed more or less completely for some distance in the downward and forward direction." *Antilocapra* claims kindred with the latter family in the disposition of its styloid process, which is short and ensheathed. But, furthermore, the moderately enlarged tympanic (*Ty*) does not agree with that of its supposed ally, the Chamois, where it is remarkably triangular and compressed. Neither does it display a roundish inflated character as does the Antelopes', excepting the caprine group. On the contrary, in spite of the styloid ensheathment, the tympanic element of the Prongbuck, as far as my observations go, is singularly cervine or Goat-like in its development. The paramastoid process (*Pmd*) is short, moderately wide antero-posteriorly, and does not underhang or pass beyond the condyles. It is thick-rooted, or has a considerably high rough mastoidal eminence behind the auditory canal.

I have alluded, in the general views of the skull, to the perpendicular character of the supraoccipital plane, and may further note that it is surmounted by a narrow transverse portion suturally connected with the parietals. The truncation of the supraoccipital (*So*) is not only very apparent, but it absolutely inclines forwards below. The spine and occipital protuberance are each well marked. The former is broad, moderately raised, and the muscular impressions on each side are deep rough concavities. The superior curved line forms a wide, sharp-edged, and regularly formed arch, terminating laterally in the short paramastoids, at the root of which posteriorly a short shallow groove is discernible.

The condyles possess two distinct articular planes, which meet in a mesial raised acute line, whose direction is parallel with the posterior border of the paramastoid. Both facets, as in Deer, are relatively flat, the hinder one nearly vertical, the fore one directed obliquely forwards and outwards, though approaching its fellow of the opposite side.

The hollow between the condyle and paramastoid is wide, but only moderately deep. The condyloid foramen is hidden well forwards.

Fig. 7.



A. Basis cranii, and *B.* view from behind of skull of Society's ♂ Prongbuck.
Mx. Maxilla. *Pmx.* Præmaxilla. *Pl.* Palatine. *Ju.* Jugal. *Bs.* Basisphenoid. *Bo.* Basioccipital. *Eo.* Exoccipital. *Ty.* Tympanic. *Pmd.* Paramastoid. *Au.* Auditory. *gl.* Glenoid articular surface. *So.* Supraoccipital. *Pa.* Parietal. *O.* Orbit. *c.* Horn-core. *p.* Prong of horn on left side; the right horn has been removed.

The basioccipital (*Bo*) is an inch broad behind, continued forwards with a steady reduction of breadth to the junction of the basisphenoid (*Bs*). There is a trace of a middle longitudinal ventral crest with wide muscular concavities on either side of it. The so-called posterior tubercles of the basioccipital are badly represented, though not perfectly obsolete as are the anterior tubercles.

No shadow of doubt crosses my mind as to the pattern of the entire occipital bone, which is modelled precisely as in the Cervidæ. The supraoccipital in the Antelopes is protuberant and convex; the condyles have a more rounded mesial division; either the posterior or anterior tubercles of the basioccipitals are well developed, the latter often very convex and prominent. In *Ovidæ* and *Capridæ* the basioccipital is flat but wide, quadriform, with pronounced fore-and-aft tubercles. The superocciput in Oxen offer some resemblances to the Deer and Prongbuck, but their basiocciput is distinctly different in having well-developed tubercles and a deep groove between them.

There is a moderate narrowing forwards of the basisphenoid (*Bs*) in proportion to the breadth of its occipital end, and the bone agrees with many Deer and some Antelopes in the amount of convexity and lateral guttering.

The pterygoid plates and processes are thin, widely apart, and with obsolete hamular processes. The alisphenoid is narrow fore and aft, and the sphenoidal fissures are of great size. The orbitosphenoid plates are less depressed or scooped out than in most similar-sized Ruminants; and as a consequence the orbit appears less deep than in many forms.

The horizontal plates of the palatines (*Pl*) together form about the hinder fourth area of the entire hard palate. Their sinuous maxillo-palatine suture presents a wide arch, interrupted by wide posterior palatal foramina. Between the last molar, retrocedent antrial process, and the wall of the posterior nares there is an unusually deep notch or interspace.

The vomer is very stout, the inferior turbinate bones uncommonly long and inflated.

Three skulls of *Antilocapra americana* in the British Museum vary so very little as regards dimensions, that I have thought the one obtained from the Gardens might suffice, as undernoted, to indicate general admeasurements.

	inches.
Extreme length	11·3
Extreme breadth, viz. diameter at posterior rim of orbit	5·7
Diameter opposite hinder ends of premaxillaries	2·0
Highest perpendicular without mandible, mid-horns	3·6
Height (or depth), vertical, with penultimate upper molar	3·3
Greatest length of nasals	4·2
Distance from anterior upper premolar to tip of premaxillaries	3·7
Length of row of grinding-teeth	2·9
Distance between occipital foramen and semilunar border of the posterior nares	3·2
Diameters of orbit	1·7

	inches.
Vertical depth of the anterior nares	1·7
Vertical depth of the posterior nares	1·6
Distance between tips of horn-cores	9·0
Length of horn-core	5·0
Its greatest breadth—that is, where prong is given off—in different skulls from	1·5 to 2·0
Distance between roots of horn-cores	2·5

(*c*) *Inferior maxillary bone.*—Dr. Gray's figure of the mandible (Cat. of Mam. B. M. 1852, tab. xv. fig. 1, *Dicranoceros furcifer*), though small, sufficiently indicates the peculiarities of outline distinguishing this bone. As is therein shown (and in the present fig. 6, *B*), the direction in which the ramus rises and recedes from the body is more backwardly oblique than in most Ruminants; and this is rendered the more apparent by the unusual rounding-off of the angle. The coronoid process is long, narrow, and straight, or wanting in that convexity of its upper border met with in most Cervidæ and Bovidæ. The sigmoid notch is both short and shallow, and the rather flat-topped facet of the small condylar head almost deficient in neck, whilst its transverse and antero-posterior diameters are not great. The ramal angle, as mentioned above, is the reverse of prominent, and possesses in some specimens a widish but shallow emargination towards the body end.

The dental portion of the body is only moderately deep behind, and is concave below forwards to the diastema. This is long, laterally compressed, and relatively deep, with a sharp upper border; the terminal incisive expansion is of moderate breadth.

The dimensions of the mandible are:—

	inches.
Extreme length from coronoid process to cutting-edge of incisors	10
Length from the angle to the roots of the incisors	8·5
Distance from the front of symphysis to first premolar	3·4
Row of lower grinding-teeth	3·2
Vertical height, a line being dropped from coronoid process	5·2
Length of coronoid process	1·5
Depth of the bone at the middle of the last molar	1·4
Breadth of the bone at the angle	1·6

(*d*) *The skull of* Rupicapra *contrasted with that of* Antilocapra.—The Prongbuck has been closely associated with the Chamois by most classificators of the Artiodactyla, chiefly because of the upright and supraorbital position of the horns, and recurvation of their tips. Mr. Turner, who, in his 'Generic Subdivision of the Bovidæ,' has dwelt more generally on the characters of the skull, still considers them in some degree allied, and follows Dr. Gray in ranking them and others under the title of caprine Antelopes. The cranium of each, no doubt, has some characters in common; but in many points the differences are as well pronounced.

Among other features, the skull of the Chamois compared with that of the Prongbuck shows the following divergences:—1. The nasals narrow forwards much more and taper to a point, as in the Goats and Antelopes. 2. The supraorbital fissure is minute. 3. The supraorbital or antecorneal foramen is small. 4. The horns are round, more erect, and prongless. 5. The premaxillary does not articulate with the nasal. 6. The frontal region is much rounder and more highly arched. 7. The masseteric ridge ascends high before the orbit. 8. It wants the anterior palato-maxillary valley so conspicuous in the Prongbuck. 9. The horizontal plate of the palate-bone is relatively shorter. 10. In the Chamois the palatine arch of the posterior nares is narrow and acute, in the Prongbuck widish and rounded. 11. In the first of these the basioccipital and the basisphenoid are much flatter than in the second. 12. The auditory bullæ are very small and compressed, much more Goat-like by many degrees than are those of *Antilocapra*. 13. The paramastoid of the Chamois greatly exceeds that of the last-mentioned genus, and is more pointed. 14. The glenoidal articulation is convex to its outer edge, and the posterior transverse ridge is rudimentary. 15. The occiput is antilopine and not cervine in its character, inasmuch as it is prominently convex. 16. The condyles are rounded or not so sharply mesially ridged into a partially double facet as in the Prongbuck and Deer; and they jut rearwards and not so much downwards as in these. 17. The foramen magnum is decidedly very large.

(*e*) *Dentition.*—As respects the deciduous dentition of the Prongbuck my observation is confined to a skull of an apparently adult animal in the College of Surgeons' Museum. In the said specimen, No. 3713, the three upper and lower deciduous premolars present (corresponding to the second, third, and fourth premolars of other Bovidæ?) are partially uprooted and about to be replaced by their successors. The permanent successors seem nearly equally advanced; the canines less so. Judging of the age of the animal by the character of the horns, I should be inclined to think the change of dentition in the Prongbuck coincidentally approximates to what obtains in the Sheep.

The dental formula and series throughout are facsimiles of what is met with in the majority of Antelopes.

The upper molars have smooth shallow outer concavities and low ridges. The hindermost tooth has a posterior tubercle. There are neither supplementary enamel columns nor lobules in these, nor in the lower molars. The median central crescents are of moderate size and simple.

The premolars of the superior and inferior maxillæ are fair-sized, increasing from the first to the third.

The three mandibular true molar teeth have their longitudinal enamel ridges ill defined; the concave internal depressions are very shallow. The outer lobes of the teeth are more angular than rounded. The crescentic fissures of the grinding-surface are simple.

The incisors are sloping, subequal, and not equal-sized as Turner mentions; for the middle ones are moderately expanded at the tips and slightly larger than those outside.

B. *The Extremities.*

(*a*) *Anterior limb.*—Little deviation in the form of the scapula from that of ordinary ruminants is perceptible; it is of a long isosceles triangular shape, with a flat smooth blade, short neck, and well-developed spine (mesoscapula of Parker) an inch high at the middle. A tuberous but compressed coracoid process barely projects beyond the deeply scooped glenoid cup; but no acromion extension is definable as obtains in Bovidæ. The spine is situated anteriorly to the mesial line, so that the suprascapular is one-third less in width than the infrascapular fossa. The axillary border does not present a gutter and slope into the subscapular facies as is the rule in Artiodactyla, but, instead, forms a flat flange or shelf of bone $\frac{1}{2}$ an inch broad at right angles from it, and whereon the teres major muscle arises. The bone of the scapula is $7\frac{1}{2}$ inches in long diameter, and 4 inches broad at the vertebral border; a semiossified cartilage (Parker's suprascapular segment) extends $1\frac{1}{4}$ inch beyond.

The humerus is shorter than the scapula by 0·3 inch. It has a moderately stout smoothish shaft, the upper half of which on cross-section would yield an antero-posterior subelliptical circumference, but its lower half a transverse one. A depressed articular semilunar head diverges backwards at almost right angles to the shaft's axis. The large inflated inner tuberosity, like the head, is flattish atop; the bicipital groove is broad, elevated rather than depressed, with a wide excavation to its inner side for the insertion of the subscapularis. The outer tuberosity, ruminant-like, is a massive three-sided eminence raised $\frac{1}{2}$ an inch higher than the capitulum; and it partially overarches the bicipital groove, though not at all so sharply in-turned as in the Mazama (*Aploceros americanus*).

A smooth broadish boss marks the place of insertion for the supraspinatus muscle; and an oblique deltoid ridge is amply represented. A minute nutritious foramen enters on the outside of the shaft at the commencement of its lower third.

Laying the radius of the Prongbuck (which measured 7·8 inches long) side by side with that of a Fallow Deer of equivalent length, I observed the former had a narrower rounder shaft, and this gave to its proximal and distal extremities a more expanded character. The less convex but broader shaft of the Dama implied greater strength throughout.

The shaft of the ulna is adnate to the above, it being a thin delicate bony splint, complete, however, from above downwards, and terminating in a well-developed trihedral styloid process. The olecranon is of good size. The entire ulnar bone measures $9\frac{1}{2}$ inches.

From the limb-bones having been wired together in position before I had access to the skeleton, I was unable to compare the individual carpal and tarsal bones with those of other forms. The number, however, appears to agree with the typical ruminants and not with the aberrant Giraffe and Camel—there being in the carpus a scaphoid, lunare, cuneiform, and pisiform in the proximal row, and a trapezoides and os magnum in the distal one.

The cannon-bone of the pectoral extremity is an elegant subcircular rod, 8·1 inches long, and grooved behind for more than three-quarters of its proximal length.

The six phalanges of the digits present no features worthy of remark, further than that they have sesamoid bones appended posteriorly behind their articulating surfaces. The first phalanx is 1·8 inch, the second 1 inch in length.

(*b*) *Posterior limb.*—The formation of the pelvis is of the same long, narrow, and light build characterizing both Antelopes and Deer. The brim has a blunt oval figure, the conjugate diameters being, however, nearly equal. The elongated neck of the ilium has a blade with moderately broad wings, and everted anterior superior spinous processes (*a. s. sp*); the external muscular impressions on this are divided mesially by an elevated ridge. The acetabulum is wide, shallow, and with deep synovial notch. The symphysial portion of the pubic bones is flattish, wide, and indeed rather broad above; it is 3 inches long, with a roughened symphysis; the subpubic angle is obtuse. There is only a moderate expansion of the usual tripodal-figured ruminant ischium; the tuber ischii (*ti*) is broadly rounded, and not prominent as is the external ischial spine (*e. sp*).

The pelvic measurements are as undernoted:—

	inches.
Extreme length from the anterior superior spinous process to tuberosity of ischium	8·5
Greatest breadth (crests of ilia)	5·5
Distance between external ischial spines	5·2
Brim of pelvis (ant. post. diam.)	3·2
Brim of pelvis (transverse diam.)	2·2
From centre of acetabulum to tip of crest of ilium	4·5
Symphisis pubis	2·8

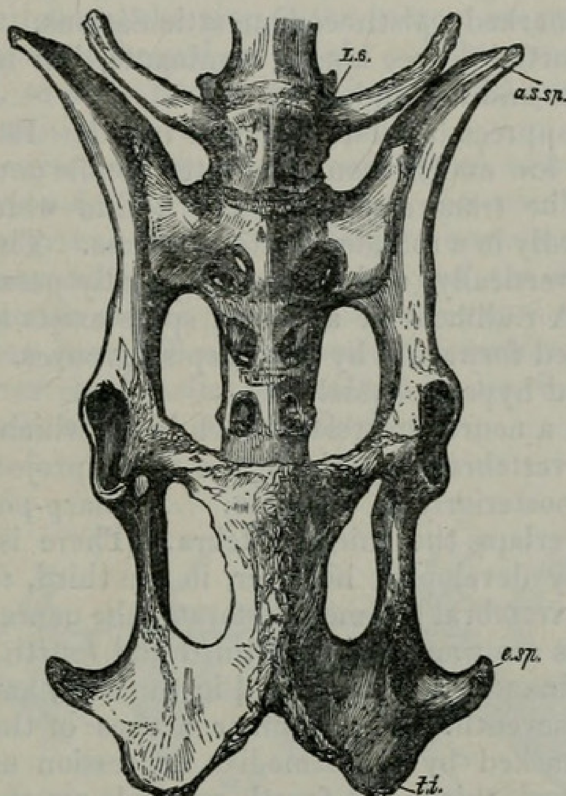
The head of the femur is subglobular and small. The great trochanter, laterally flattened, rises $\frac{1}{2}$ an inch higher than the head. The trochanteric fossa is, as in other ruminants, wide, but only moderately deep. The stoutish shaft, though less so than in *Dama vulgaris*, has usually a slight forward bend; and the nutrient foramen obliquely penetrates the front of the shaft at its upper fourth. The linea aspera is both broad and well defined. Though the distal extremity of the thigh-bone does not offer such comparative magnitude as in the Giraffe, its condyles nevertheless are large and backwardly extending; the outer is the larger and most tuberose. The groove and pit for the popliteus muscle is not so well marked as in *Dama vulgaris*.

As regards the fibula, in its non-development of shaft, depending spicule representing its upper extremity or head, and inferior kidney-shaped and separate bone homologous with its styloid process the structure resembles that of Sheep.

The tibia has a length of 10·3 inches. The head is large, the anterior tuberosity or cnemial prominence moderate and sharp-edged in front. The groove for the tibialis-anticus tendon is deep and broad. The shaft is stoutish, convex anteriorly, but doubly grooved and ridged posteriorly for the attachment of the long flexor muscles. The internal malleolus is large, triangular, and flat.

The tarsus consists of os calcis, astragalus, adnate cuneiforms, scaphoids, and a cuboid.

Fig. 8.



The male pelvis: *a. s. sp.* Anterior superior spinous process; *e. sp.* External ischial spine or tuberosity; *t. i.* Tuber ischium.

The conjoined metatarsals of the hind limb or cylindrical cannon-bone, as in the majority of Antelopes and Deer, evinces a greater tendency to duplicity than does its equivalent bone of the pectoral extremity—this by its being grooved throughout in front, but not deeply cleft. There is also longitudinal grooving in its after surface, but only in its lower part, the gutter being shallow. This cannon-bone measures 8·7 inches in long diameter, and shows a very slight lateral flattening of the shaft. There is an entire absence of accessory splints, or rod-spicules, corresponding to extra metatarsals, and the same may be said of the metatarsal segment of the fore limb. The osseous conformation thus tallies with the outer aspect of the legs in deprivation of false hoofs.

The digits and their additional sesamoidea are completely identical with those of the fore foot.

C. *Vertebral Column and Thorax.*

(*a*) *Spine.*—The vertebral elements present in the spinal column are 35. Several of the last caudal, it may be noted, are wanting, having been injured during the process of maceration; so 37 to 38 may more truly be considered the total number. Of those present, 7 are cervical, 13 dorsal, 6 lumbar, 4 sacral, and 5 caudal.

The cervicals are distinguished by their great size, compared with the other spinal regions. The 5 hinder ones interlock with each other by well-marked opisthocœlian articulations. This is not uncommon in a partial degree among ruminants, but is best observed in the Camelidæ and Giraffidæ.

The atlas is appreciably flattened and broad. Its condylar articular surface is low and without the outer double notch of the Goats and Sheep. The transverse process is a thin wide plate of bone, ending backwardly in a rounded flattish process. The vertebral foramen pierces it vertically, and then horizontally passes through the neural arch. A rudiment of a neural spine exists at the middle of the bone, flanked forwardly by two deepish grooves. The body has a moderate-sized hypapophysial keel.

The axis has a neurapophysis an inch high, which runs the entire length of the vertebra; anteriorly the spine projects as a process forwards, but posteriorly is truncate. A sharp-pointed barb-like anapophysis overlaps the third vertebra. There is a well-marked keel, more fully developed, however, in the third, fourth, and fifth cervicals. The vertebral foramen perforates the neural arch in front.

Neural spines are wanting in the third and fourth vertebræ; but, as in most ruminants, it is developed in the fifth, and lengthened in the sixth and seventh. The laminar arches of the third, fourth, and fifth are marked by a postmedian depression as well as lateral ones. The second, third, and fourth cervicals are the longest. The pleurapophysial element of the transverse process of the sixth cervical is unusually broad.

The dorsal vertebræ, in a bird's-eye view, are seen steadily to decrease from the cervical towards the lumbar region. The centre of movement of the spine hinges on the tenth dorsal vertebra; this is shown by the change of direction forwards in the neurapophysis.

The first dorsal spinous process is of considerable length; and from it to the third they increase in size; between this latter and the sixth they remain nearly uniform in length, and slope sharply backwards.

The next four gradually shorten. The last three dorsal neurapophyses are broader and directed forwards.

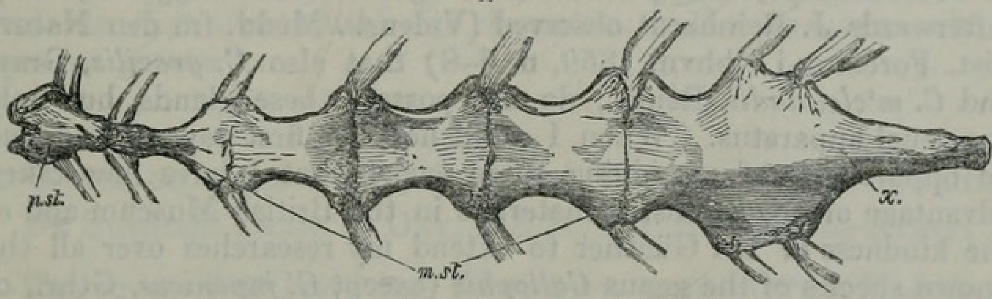
A metapophysis in the form of a tubercle is developed on the first dorsal vertebra, enlarges on to the third, then remains small as far as the eleventh. The twelfth and the thirteenth increase in magnitude and approach the prominent plate-like form found in the lumbar region. The dorsal vertebral region measures 13½ inches.

The bodies of the six lumbar vertebræ are subequal in size. Their transverse processes are only of moderate breadth, but very long, and subequal from the second to the sixth. The neurapophyses, on the other hand, are very broad, of nearly uniform height, and curve forwards. The metapophyses are prominent and thick; the interspinal muscular fossæ deep. Between the last lumbar and first sacral vertebral lamina there is a large lozenge-figured interspace.

The funnel-shaped sacrum has a length of $3\frac{1}{4}$ inches; and its anterior transverse diameter is almost as much. The sacro-iliac synchondrosis is formed by a single articulation of the foremost vertebral element; it possesses but a diminutive neural process. The three hinder vertebræ belonging to the sacrum are partly anchylosed, and possess spines subequal in height; their transverse processes are anchylosed, so as to form a tapering vertical plate of bone parallel with and as high as the neural spines.

The caudal vertebræ, as already mentioned, were imperfect, five alone being present, the small terminal factors having been lost. Those extant, together $4\frac{1}{2}$ inches in length, were remarkably porous, evincing a diseased condition or atrophy of the cancellous tissue. The first or anterior caudal possessed broad transverse processes of bony plates, but gave off no backwardly extending zygapophyses; the remaining vertebral bodies diminished in size, but each had long slender prominent spicula passing distally.

Fig. 9.



Ventral view of the sternum and sternal ribs.
p. st. Præsternum. *m. st.* Mesosternum. *x.* Xiphosternum.

(*b*) *Chest.*—The eight elementary constituent parts of the sternum are partially coalesced, so that it appears to be composed of but five separate pieces. Of these the foremost are narrow, stout, and cylindroid, the middle and hindmost on the contrary wider and thin. The manubrium or præsternum (*p. st*) of Parker* is bifid anteriorly. It is a short stout bone, with an upward projecting boss between the first two ribs. The thick vertically narrow second and the rather wider third elements are ossified together; the fourth and fifth expand in breadth but diminish in thickness. The sixth, seventh, and eighth fœtal segments are firmly united, the seventh or post-mesosternal being the broadest of the whole series.

The xiphosternum or ensiform piece (*x*) is a long, flat, and strong process of bone, narrowing considerably at its distal and finally truncated extremity.

Eight sternal ribs or costal cartilages on each side abut against the lateral margins of the sternum.

The ribs number thirteen pairs, of which eight are true and five false. The first two are nearly straight or with but slight arching.

* 'The Shoulder-girdle and Sternum in the Vertebrata,' Ray Soc. 1868.

The three or four hinder ones are slenderer than the others in advance, which are broad but only moderately strong. It is not until the ninth is reached that the maximum of length is obtained.

The hyoid bones have been described along with the laryngeal apparatus (*anteà*, p. 348).

2. Some Remarks on the Poison-glands of the Genus *Callophis*. By Adolf Bernhard Meyer, M.D.

In a paper published in the 'Monatsberichte der k. preuss. Akad. d. Wiss. Berlin,' March 1869, I gave a description of the large poison-glands of two snakes belonging to the Asiatic Elapidæ, namely, *Callophis intestinalis*, Laur., and *C. bivirgatus* (Boie). These glands are situated in the body-cavity itself, and occupy from one-third to even one-half of the whole length of the snake, and, in consequence thereof, influence the situation of the intestines, pushing them back towards the tail. I did not find these poison-organs in *C. maculiceps*, Gthr., nor in *C. calligaster* (*Hemibungarus*, Pet.). Afterwards J. Reinhardt observed (Vidensk. Medd. fra den Naturhist. Forening i Kbhvn. 1869, n. 6–8) that also *C. gracilis*, Gray, and *C. m'clellandii*, Reinh., do not possess these glands, but only the usual apparatus. When I published my first paper I had had no opportunity of examining these snakes, but I have now taken advantage of the extensive materials in the British Museum and of the kindness of Dr. Günther to extend my researches over all the known species of the genus *Callophis* (except *C. japonicus*, Gthr., of which there is only one, typical specimen).

I can confirm Reinhardt's statement of the absence of the poison-glands in question in *C. gracilis* and *C. m'clellandii*, and have found that all the other species of this genus likewise do *not* possess the glands, viz. *C. trimaculatus*, Daud., *C. annularis*, Gthr., and *C. nigrescens*, Gthr. Likewise *Megærophis flaviceps*, Reinh., a snake which resembles strikingly *C. bivirgatus* (var. *tetratænia*, Bleeker), except in the vertebral scales and the head-shields, does not possess this peculiarity, but only the usual gland.

I found, however, the gland in all the varieties of *C. intestinalis* and *C. bivirgatus*, viz. in var. *malayana* (*Elaps thepassii*, Bl.), as already stated by Reinhardt, in var. *philippina* and var. *melanotænia*, Bl., of *C. intestinalis*, and in var. *tetratænia*, Bl., of *C. bivirgatus*.

We can therefore affirm that only the *Callophides* of the islands in the Malay archipelago, and of the Philippine Islands (which inhabit the Malayan peninsula too, and *C. intestinalis* also Central India), possess this large poison-apparatus, whereas the *Callophides* of Central India and the Malayan peninsula do not possess them. Whether it be allowable to found on this character a generic difference or not, can only be decided after further researches on the skeleton &c. of these snakes, which I am prevented now from undertaking, as I am about to depart for the Malay archipelago.

But it seems probable that other points of structure, not yet known, may correspond with this character, which will enable us to find out the natural affinities of these snakes. In the highest degree remarkable is it at all events that *C. gracilis* does not possess this poison-gland, as it resembles *C. intestinalis* in such a manner that only after exact examination the differences of colour and marking are visible. Can we here have to do with a case of mimicry? as it might be of advantage for *C. gracilis* to mimic *C. intestinalis*, more formidable in consequence of the poison-apparatus. I may remark that *C. intestinalis* has a wide area of distribution, whereas *C. gracilis* has only been found at Pinang and Singapore; and we know, from the researches of Messrs. Bates and Wallace, that all mimicked species are widely spread and plentiful, while the mimicking species are rare and confined to a restricted region. Perhaps, too, the great resemblance between *Megærophis flaviceps* and *Callophis bivirgatus* (var. *tetratænia*) is another example of mimicry, the latter having this formidable poison-apparatus, and *M. flaviceps* not, and the latter being rare, the former very plentiful. But only further observations can determine whether this explanation is a right one or not.

That *C. japonicus*, Gthr., possesses the large poison-gland is not probable, as it approaches in its characters to *Hemibungarus*, which does not possess it.

3. Notes on some Fishes from the Western Coast of India. By Surgeon Francis Day, F.Z.S., F.L.S., Madras Army.

Having received leave last February to proceed from Madras to Europe, I availed myself of the opportunity of crossing that Presidency by rail to Beypore on its western or Malabar coast. Passing on to Calicut, I obtained a few fishes there, when, finding it would be a week before the steamer could arrive, I paid a flying visit to Vithry in the Wynaad range of hills, as there were several questions respecting the fishes of that mountain-range which I was desirous of solving. With respect to some of these I believe I have been successful; a few, however, must still remain for further inquiry and future investigators.

Arriving off Mangalore I received a small but very interesting collection of the fishes of South Canara, from H. E. Thomas, Esq., C.S., the collector of the district, who has paid great attention to the finny inhabitants of his range.

In the following remarks it is not my intention to refer to all the species I obtained, but merely to those apparently new, or respecting which I have a few remarks to record.

Family Percidæ.

Ambassis thomassi, sp. nov.

B. vi. D. $7\left|\frac{1}{11}\right.$. P. 15. V. 1/5. A. 3/10. C. 15. L. l. 38. L. tr. 6/13.

Length of head $\frac{2}{7}$, of caudal $\frac{1}{4}$, height of body $\frac{1}{3}$ of total length.

Eyes. Diameter not quite $\frac{1}{3}$ of length of head, $\frac{3}{4}$ of a diameter from end of snout, $\frac{1}{2}$ a diameter apart.

The posterior extremity of the maxilla extends to under the centre of the orbit. Vertical and double edge of horizontal limb of præopercle and also margin of interopercle strongly and evenly serrated. Nine strong teeth directed posteriorly, along the lower edge of the præorbital. One spine at the posterior superior margin of the orbit; the lower two-thirds of the orbital edge serrated.

Teeth fine, in jaws, vomer, and palate.

Fins. Second dorsal spine strong, and as long as the head, without the snout. Caudal deeply forked.

Lateral line continuous.

Colours. Greenish, shot with silvery; no lateral silvery band.

Hab. Calicut and Mangalore. I have named the species after Mr. Thomas, who obtained the finest specimen, $3\frac{1}{2}$ inches long.

Family NANDIDÆ.

BADIS DARIO, Ham. Buch.

B. vi. D. $\frac{14}{8}$. P. 9. V. 1/5. C. 15. L. l. 26.

Lateral line absent in this species, which otherwise closely resembles the *B. buchanani*.

Hab. Wynaad range of hills.

Family OPHIOCEPHALIDÆ.

OPHIOCEPHALUS DIPLOGRAMME, Day.

B. v. D. 43. P. 15. V. 6. A. 27. C. 15. L. l. 112. L. tr. $\frac{7\text{–}8}{13\text{–}12}$.

I received a specimen 8 inches long from Mr. Thomas, and was informed the species was not uncommon in Canara.

In the adults the reddish colours fade, but the bands are very distinct.

Family CHROMIDES.

I obtained both the *Etroplus suratensis*, Bl., and the *E. maculatus*, Bl., at Calicut.

Family SILURIDÆ.

CALLICHROUS BIMACULATUS, Bl.

Having, through the kindness of Dr. Günther, been enabled to examine the typical specimen of this fish from Dr. Bleeker's collections, no difference is apparent.

MACRONES ARMATUS, Day.

? *Bagrus montanus* et *malabaricus*, Jerdon.

Hab. Wynaad and fresh waters of the plains, also Mangalore.

Family CYPRINIDÆ.

LEPIDOCEPHALICTHYS BALGARA, H. B.

? *Cobitis carnaticus*, Jerdon.

This fish is very similar to the *L. thermalis*; but in this species the dorsal fin, consisting of 8 rays, is opposite to the ventrals, in the latter it is in advance of them.

Colours. Body dotted with rows of black spots; a black ocellus at the upper margin of the base of the caudal fin; six to eight rows of black spots along the dorsal fin, and about ten more broken-up lines of spots on the caudal, which is cut nearly square.

The suborbital spine becomes minute in this species when adult.

Hab. Wynaad.

NEMACHEILUS SINUATUS, sp. nov.

B. iii. D. $\frac{2}{8-9}$. P. 12. V. 8. A. 2/5. C. 18.

Length of head $\frac{1}{5}$, of caudal $\frac{1}{6}$, height of body $\frac{1}{6}$ of the total length.

Eyes situated in the middle of the length of the head, 2 diameters from end of snout, $1\frac{1}{2}$ diameter apart.

Barbels long and thin.

Scales distinct.

Lateral line ceases opposite the end of the dorsal fin.

Fins. Dorsal arises slightly in advance of the ventrals, and midway between the snout and the base of the caudal, which last is cut square, but some of the outer rays are rather shortened.

Colours. Body olive, with irregular vertical brown bands, having shorter intermediate ones. A black ocellus exists at the base of the upper portion of the caudal fin. Dorsal yellow, with three or four rows of black spots. Caudal orange, with four sinuous black >-shaped bars with an inverted centre.

Hab. Wynaad.

LABEO NIGRESCENS, sp. nov.

B. iii. D. 2/14. P. 15. V. 9. A. 2/5. C. 21. L. l. 36. L. tr. 6/7.

Length of head $\frac{1}{5}$, of caudal $\frac{1}{5}$, height of body $\frac{2}{7}$ of the total length.

Eyes. Diameter $\frac{1}{5}$ of length of head, 2 diameters from the end of snout.

Snout rather swollen, rounded, and somewhat projecting over the lower jaw; a small lateral lobe; glands over the whole of the snout. A very distinct labial fold both above and below, a deep transverse groove across the chin; lower lip deeply fringed. The rostral barbels reach to beneath the anterior margin of the orbit, the maxillary to below its posterior third.

Fins. Upper margin of dorsal fin straight; the pectoral extends to the ventral, which latter fin reaches the anal. Anal rather elongated anteriorly, and if laid backwards it reaches the base of the caudal, which latter fin is deeply forked.

Scales. Four and a half rows between the lateral line and the base of the ventral fin.

Colours. Deep brown, each scale with a black spot at its base. Fins black.

Hab. Mangalore.

The *Crossocheilus reba*, H. B., exists in the Wynaad and South Canara rivers.

BARBUS (BARBODES) JERDONI, sp. nov.

B. iii. D. 3/9. P. 17. V. 9. C. 19. L. l. 28. L. tr. 6/4.

Length of head $\frac{1}{6}$, of caudal $\frac{1}{4}$, height of body $\frac{1}{4}$ of the total length.

Eyes. Diameter $\frac{1}{3}$ of length of head, 1 diameter from end of snout.

Body compressed, a considerable rise to the base of the dorsal fin.

The maxilla extends to under the anterior margin of the orbit. Four thin barbels, the maxillary pair as long as the orbit, the rostral a little shorter.

Fins. Dorsal arises midway between the snout and the base of the caudal; its third ray is entire, osseous, weak, not enlarged, and as long as the head without the snout. Caudal forked.

Scales. Four rows between the lateral line and the ventral fin.

Colours. Silvery; fins tipped with black.

Hab. Mangalore.

BARBUS (BARBODES) PULCHELLUS, sp. nov.

B. iii. D. 4/9. P. 17. V. 10. A. 3/6. C. 19. L. l. 30. L. tr. 6/5$\frac{1}{2}$.

Length of head $\frac{2}{9}$, of caudal $\frac{1}{5}$, height of body $\frac{2}{7}$, of dorsal fin $\frac{2}{9}$ of the total length.

Eyes. Diameter $\frac{2}{7}$ of length of head, 1$\frac{1}{4}$ diameter from the end of the snout.

There is a very gradual rise from the snout to the base of the dorsal fin.

Interorbital space nearly flat. The anterior two-thirds of the præorbital covered with large mucous pores. Four fine barbels, the maxillary pair being the longest, equalling one-third of the length of the head. Mouth of moderate width.

Teeth pharyngeal, crooked, pointed, 4, 3, 2/2, 3, 4.

Fins. Dorsal arising slightly anterior to the ventral and rather nearer to the snout than the base of the caudal fin; its upper border is concave, it is two-thirds the height of the body, its last undivided ray being weak, smooth, and articulated. Anal of moderate size. Caudal deeply forked.

Scales. Four rows between the lateral line and the base of the ventral fin.

Lateral line nearly straight.

Colours. Deep grey, with darker bases to each scale. A black band runs from the eye to the centre of the base of the caudal fin.

Hab. I received one stuffed specimen, 17$\frac{1}{2}$ inches long, from Mr. Thomas, C.S., who found the species frequenting the inland streams.

BARBUS (BARBODES) MOSAL, H. Buch.

Mahseer.

Dr. Günther, in his 'Catalogue of Fishes,' vol. vii. p. 130, places the *B. tor*, H. B., as one of the synonyms of the *B. mosal*, H. B.

The species, if it is distinct, which exists in South Canara, is the *B. mosal*, H. B., whilst I have taken the *B. tor* in the Bowany and also in Orissa. In the Calcutta Museum are two specimens of the latter variety.

The question is, are the *B. morsal* and the *B. tor* the same? and this must be decided by fresh investigations in India. The difference between the two does not depend on age, as I have examined both from 6 to 30 inches in length; neither does it depend on season, which I have not found to exercise any influence: it may be due to sex; but I doubt it.

The number of rays, scales, and the proportions of the two fishes, *posterior to the eye*, appear to be identical; but the great differences are in advance of that organ.

In the *B. tor* the snout is pointed and compressed, the lower jaw being the shortest, the mouth is somewhat deeply cleft, whilst cartilaginous thick lips exist in both jaws, forming a lobe above and below; the summit of the head is mostly flattened.

In the *B. mosal* the snout is rounded and not compressed, the jaws of equal length, the mouth is not deeply cleft, and there are no thickened cartilaginous lips. The summit of the head is convex.

Both *Barbus* (*Barbodes*) *conirostris*, Günther, and *Barbus* (*Barbodes*) *carnaticus*, Jerdon, were found to be common in the Wynaad and rivers around their bases. They were also received from Mangalore. It appears not improbable that *Barbus mysorensis*, Jerdon, is the same as *B. conirostris*, Günther. The species I termed *B. dubius*, I find, has five series of scales between the lateral line and the base of the ventral fin.

Barbus (Capoeta) amphibius, C. & V.

Systomus carnaticus, Jerdon.

Cuvier and Valenciennes have stated their species has no lateral blotch on the side of the tail, whilst the *B. carnaticus* has one. Having examined several of my fresh specimens, with an old one in the British Museum, in which the lateral blotch appears to have become bleached, no difference is apparent.

Barbus (Capoeta) arulius, Jerdon.

I find, on examining a large number of fine specimens of this species, obtained in the Wynaad, that it has a maxillary pair of fine long barbels.

Barilius gatensis, C. & V.

? *Opsarius malabaricus*, Jerdon.
Barilius rugosus, Day.

Having obtained numerous specimens of this fish from the rivers of the Western Ghauts, whence Cuvier's also were procured, I find it apparently identical with the *B. rugosus* of the Neilgherries. The remark in Cuv. & Val., however, that the *cheek is entirely covered by the suborbital ring*, is erroneous; a portion equal to about one-fourth of the height of the third suborbital bone is left uncovered. My reason for supposing this fish may be *Opsarius malabaricus*, Jerdon, is that I found it very numerous, as Jerdon remarks, in "the streams that run from the Western Ghauts into North Malabar," and that it was the only species of the genus which I could find there, whilst the difference is that the *O. malabaricus* is said to have fourteen dorsal rays. If they are not the same, Jerdon has entirely overlooked this common species, which I think is very improbable; consequently D. 14 I believe to be a misprint for D. 10.

BARILIUS CANARENSIS.

Opsarius canarensis, Jerdon.

B. iii. D. 2/10. P. 15. V. 9. A. 2/13. C. 21. L. l. 38. L. tr. 9/4.

Length of head $\frac{2}{9}$, of caudal $\frac{2}{9}$, height of body $\frac{1}{4}$ of the total length.

Eyes. Diameter $\frac{1}{4}$ of length of head, more than one diameter from end of snout.

This species is very similar to the *B. gatensis*, C. & V., differing, however, in a few points: there are a smaller number of rays in the dorsal fin; the inferior lobe of the caudal is the longest; the lower jaw is less broad; and the dorsal commences midway between the snout and the base of the caudal.

Scales. Two and a half rows between the lateral line and the base of the ventral fins.

Colours. Greenish above with purple reflections, golden on the sides and beneath; a double row of large green spots along the sides as far as the base of the anal, when they become single; dorsal, caudal, and anal dark grey, with broad white margins.

Hab. Mangalore.

DANIO MALABARICUS.

Perilampus malabaricus, Jerdon (male).

Perilampus canarensis, Jerdon (female).

Are identical with *Danio micronema*, Bleeker. I obtained numerous specimens in the localities where Dr. Jerdon records having collected his. *Danio alburnus*, Heckel, is probably the same, the barbels having been overlooked.

4. List of Additional Species of Land and Freshwater Shells collected by Mr. E. Bartlett in Eastern Peru, with Descriptions of New Species. By HENRY ADAMS, F.L.S.

(Plate XXVII.)

Fam. MELANIIDÆ.

1. PACHYCHEILUS HIANS, Lea.

2. VIBEX (DORISSA) AQUATILIS, Reeve.

Fam. AMPULLARIIDÆ.

3. POMUS SPIXII, D'Orb.

4. POMUS COLUMBIENSIS, Sow.

5. POMUS COLUMELLARIS, Gould.

Fam. HELICIDÆ.

6. SUCCINEA ELONGATA, Drap.

7. RUMINA (OPEAS) CUENCANA, Pfr.

8. RUMINA (OPEAS) MICRA, D'Orb.

9. CLAUSILIA (NENA) EPISTOMIUM, Kust.

10. SOLAROPSIS CASTELNAUI, Hupé.

11. AMMONOCERAS THOMASI, Pfr.

12. OPHIOGYRA ENTODONTA, Pfr.

13. BULIMUS OBLONGUS, Müll.

14. OTOSTOMUS (DRYMÆUS) STRIGATUS, Sow.

15. OTOSTOMUS (DRYMÆUS) SIMILARIS, Moric.

16. OTOSTOMUS (DRYMÆUS) SACCATUS, Pfr.

17. OTOSTOMUS (LEIOSTRACUS) RECTILINEARIS, Pfr.

18. OTOSTOMUS (LEIOSTRACUS) GUEINZII, Pfr.

19. TORNATELLINA (LEPTINARIA) ANTILLARUM, Shuttl.

Fam. LIMNÆIDÆ.

20. PLANORBIS (HELISOMA) TENAGOPHILUS, D'Orb.

21. PLANORBIS (HELISOMA) PEREGRINUS, D'Orb.

22. PLANORBIS (SPIRORBIS) ANATINUS, D'Orb.

Fam. CYCLOPHORIDÆ.

23. CYCLOPHORUS CROSSEANUS, Hidalgo.

24. APEROSTOMA BARTLETTI, sp. nov. (Plate XXVII. figs. 1, 1*a*). hm

A. *testa late umbilicata, depressa, solidiuscula, confertim plicatulo-striata, sub epidermide fulva albida, ad suturam albo fasciata; spira modice elevata, sutura impressa; anfr.* 6, *convexiusculis, ultimo circa umbilicum costa prominente instructo; apertura obliqua, subcirculari, intus albida; perist. continuo, recto, subacuto, superne angulatim producto, margine columellari subcanaliculato. Operc.* ——?

Diam. maj. 21, min. 19, alt. 14 mill.

25. BOURCIERA FRASERI, Pfr.

Fam. Helicinidæ.

26. Helicina (Oligyra) zephyrina, Ducl.

27. Helicina (Oligyra) rotunda, D'Orb.

Fam. Proserpinidæ.

Genus Cyane, gen. nov.

Testa imperforata, helicinæformis, depresso-globosa, nitida; columella truncata; apertura sublunaris; perist. simplex, rectum.

In *Cyane* the base of the columella is truncate, instead of being furnished with a spiral plait, as in *Ceres* and *Proserpina*; and both the palatal and parietal laminæ are wanting. It appears to be intermediate between *Proserpina* and *Proserpinella*, in which latter genus, according to Mr. Bland, the columellar margin is quite simple.

83, 1953 28. Cyane blandiana, sp. nov. (Plate XXVII. figs. 2, 2*a*.)

C. *testa depresso-globosa, tenui, diaphana, nitida, concentrice minutissime et confertissime punctulato-striata, lutea vel fulva; spira convexo-conoidea, apice obtuso, sutura distincta; anfr.* 5, *vix convexis, ultimo basi paulo convexiore, medio excavato; apertura obliqua, sublunari; columella callosa, leviter arcuata, ad basin truncata; perist. recto, tenui.*

Diam. maj. 8, min. 7, alt. $5\frac{1}{4}$ mill.

Fam. Unionidæ.

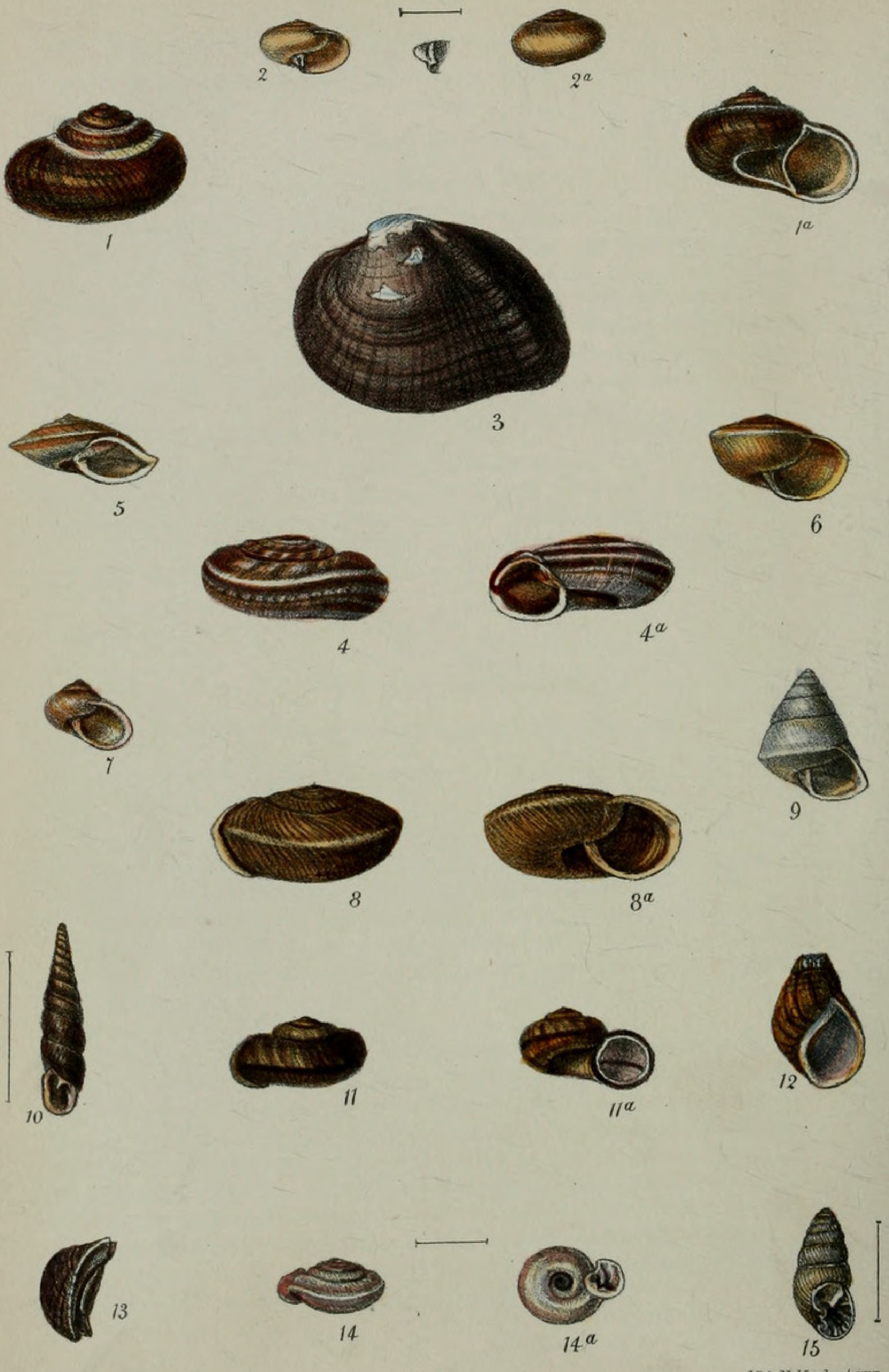
29. Anodonta (Lamproscapha) tenebricosa, Lea.

30. Monocondylæa (Plagiodon) semisulcata, sp. nov. (Plate XXVII. fig. 3.)

M. *testa transversa, ovato-trigona, solida, ventricosa, valde inæquilaterali; margine dorsali arcuato; margine ventrali sinuato; latere antico circulari; latere postico elongato, oblique ovato; umbonibus tumidis, incurvis, erosis; superficie valvarum concentrice rugose striata, ad aream medianam radiatim sulcata, epidermide subrugosa olivaceo-nigra induta; intus margarita alba et iridescente.*

Long. 34, alt. 25, lat. 18 mill.

An example of this species, but of larger size (the result probably of age), and in which the radiating furrows on the valves are almost obsolete, was before obtained by Mr. Bartlett, and in the list of the shells then collected by him, which I communicated to the Society, was referred to by me, with doubt, as *M.* (*Plagiodon*) *isocardioides*, Lea. On comparing, however, the specimens since obtained with Lea's figure and description in the Philadelphia 'Proceedings,' although possessing the same general character, they are, I consider, distinct, Lea's shell being much shorter compared with its altitude, and the surface of the valves being entirely smooth.



G. B. Sowerby lith.

M & N Hanhart imp.

NEW SHELLS

5. Descriptions of Ten New Species of Land and Freshwater Shells collected by Robert Swinhoe, Esq., in China and Formosa. By Henry Adams, F.L.S.

(Plate XXVII.)

1. Helix (Plectotropis) christinæ, H. Ad. (Plate XXVII. figs. 4, 4*a*.)

H. *testa late et profunde umbilicata, sinistrorsa, tenui, subdiscoidea, oblique irregulariter plicato-striata, sub lente minutissime granulata, albida, supra strigis diffusis fulvis ornata, ad peripheriam albo fasciata, infra fulvo cingulata; spira subplanata, sutura mediocriter impressa; anfr.* 6, *convexiusculis, lente accrescentibus, ultimo antice breviter descendente, angulato, basi convexiore; umbilico conico, anfractus usque ad apicem exhibente, intus fulvo; apertura obliqua, lunari, margine dextro expansiusculo, basali incrassato, expanso.*

Diam. maj. 25, min. 22, alt. 12 mill.

Var. carinifera. *Minor, anfractu ultimo acute carinato; umbilico minore.*

Hab. Ichang and Fungsiang gorges, China.

2. Helix (Plectotropis) mariella, H. Ad. (Plate XXVII. fig. 5.)

H. *testa aperte umbilicata, depresso-lenticulari, tenui, subarcuatim irregulariter rugose striata et sub lente minutissime granulata, pallide fulva; spira paulum convexa, sutura marginata; anfr.* $4\frac{1}{2}$, *ultimo breviter descendente, carinato, carina acuta, compressa, albida, basi convexiore; umbilico mediocri, profundo; apertura perobliqua, angulato-ovali; perist. expanso, albido, marginibus proximis, callo arcuato tenui junctis, basali vix incrassato.*

Diam. maj. 18, min. 16, alt. $7\frac{1}{2}$ mill.

Var. aquila. *Minor, fulva; spira elatiore, anfractu ultimo minus convexo.*

Hab. Ichang and Fungsiang gorges, China.

3. Helix (Acusta) brevispira, H. Ad. (Plate XXVII. fig. 6.)

H. *testa anguste umbilicata, depresso-orbiculata, pertenui, fragili, fulvo-cornea, pellucida, oblique striata; spira brevi, apice obtuso, sutura impressa; anfr.* 5, *subplanatis, ultimo antice non descendente, carinato, subtus tumido; apertura lunari, margine dextro et basali vix expanso, columellari dilatato, reflexo, umbilicum semitegente.*

Diam. maj. 17, min. 15, alt. 11 mill.

Hab. Ichang gorge, China.

4. Helix (Acusta) nora, H. Ad. (Plate XXVII. fig. 7.)

H. *testa perforata, depresso-globosa, tenui, rugose striata, fulvida;*

spira conoidea, apice obtuso, sutura impressa; anfr. $4\frac{1}{2}$, *convexis, rapide accrescentibus, ultimo obsolete angulato, magno, antice descendente, basi subcompresso; apertura ovali, marginibus proximatis, dextro expansiusculo, basali simplici, columellari dilatato, reflexo, perforationem fere occultante.*

Diam. maj. 11, min. 9, alt. 8 mill.

Hab. Ichang gorge, China.

5. Helix (Camena) constantiæ, H. Ad. (Plate XXVII. figs. 8, 8*a*.)

H. *testa umbilicata, depressa, tenui, oblique plicata, rufo-fulva; spira subplanata, apice parum elevato, sutura leviter impressa, submarginata; anfr.* $5\frac{1}{2}$, *planiusculis, ultimo antice non descendente, compresso-carinato, basi convexo; umbilico mediocri, profundo; apertura obliqua, rotundato-lunari; perist. expanso, pallidiore, marginibus conniventibus, callo tenui junctis.*

Diam. maj. 25, min. 21, alt. 13 mill.

Hab. Ichang gorge, China.

Pm.

6. Helix (Satsuma) albida, H. Ad. (Plate XXVII. fig. 9.)

H. *testa subobtecte perforata, conoidali, tenui, oblique leviter striata et sub lente transverse tenuissime striatula, albida; spira conica, apice obtusiusculo; anfr.* 6, *subplanatis, ultimo carinato, antice non descendente, basi paulum convexo, pone aperturam modice constricto; apertura obliqua, subquadrato-lunari; perist. tenui, expanso, margine dextro flexuoso, basali strictiusculo, columellari superne reflexo, perforationem tegente.*

Diam. maj. 14, min. 12, alt. 15 mill.

Hab. Taiwan, Formosa.

This species, which is allied to *H. japonica*, forms another addition to the section *Satsuma* of A. Adams.

Pm

7. Clausilia (Phædusa) bensoni, H. Ad. (Plate XXVII. fig. 10.)

C. *testa breviter rimata, fusiformi, solida, capillaceo-striata, sericea, fulva, ad suturam pallidiore; spira a medio attenuata, apice acutiusculo, sutura anguste marginata; anfr.* 11, *convexiusculis, ultimo angustiore, subsoluto; apertura verticali, subpyriformi; lamella supera marginali, infera profunda, furcata; lunella imperfecta; plicis palatalibus pluribus, suprema elongata; perist. continuo, albo, expanso et reflexiusculo.*

Long. 18, diam. 4 mill.

Hab. Ichang gorge, China.

Pm.

8. Cyclotus taivanus, H. Ad. (Plate XXVII. figs. 11, 11*a*.)

C. *testa umbilicata, suborbiculata, tenui, striatula, sublævigata, rufobrunnea, superne strigis fulguratis castaneis obliquis picta, et ad peripheriam unifasciata; spira brevi, apice prominulo; anfr.* $4\frac{1}{2}$, *convexis, ultimo descendente; umbilico lato, perspectivo; apertura parum obliqua, circulari, intus fusco-violacea; perist. continuo,*