Observations

ON

THE HORNS OF ANIMALS,

Being an Address delivered before the Cambridge and Huntingdon Branch of the British Medical Association.

By GEORGE WHERRY, M.C., F.R.C.S.,

Surgeon, Addenbrooke's Hospital, Cambridge; President of the Branch,

THE most ready way of approaching this subject is by first showing the differences between the antlers of deer and the true horns of bovine animals.

The structure of antlers being of bone instead of horny matter makes the first obvious distinction, and the branching and forking of the antler is not found in the true horn. The fact that the deer sheds its antlers every year, a feat in rapidity of growth not to be surpassed in the animal world, will always remain for our astonishment, and has been wondered at by observers from Aristotle to John Hunter. By the time the stag has lived some fifteen years he has grown and shed a perfect stack of bony antlers. The growth seems more like the pathological working of sarcoma than the quiet proceedings of normal Nature.

Sir Thomas Browne, that quaint, delightful writer, takes the trouble to correct the vulgar error that the stag also sheds his "pizzle" after the yearly rut, and explains that the flies settle on the flaccid and pendulous organ after excessive use, but that it does not annually rot away.

The stag's antler is made of true bone covered with vascular sensitive integument and short hairs. When the antlers arrive at full size the velvety skin dies and peels off, leaving the bone hard and bare, and good weapons for fighting—their sole function.

The time of growth of the antlers precedes the pairing season, and about the end of March or early in April the antler is shed by a process of absorption near the base. In the antler the main stem is called the beam, and in the first year no tine or snag appears, in the second year the brow tine, in the third year the bez, and in the fourth year the trez, the tines above the trez form the crown, and are known as royals and sur-royals.

After the stag has passed his prime the antlers are successively smaller and less weighty, and the number of tines diminishes.

A few, as the musk deer, have no antlers. In all the deer, except the reindeer, antlers are present in the males only, and not in the hinds. The horns of the stag are the insignia of the male, they are used as sexual adornments and in sexual combats. If the stags be castrated they do not renew their horns: but male reindeer must be excepted, as after castration he does renew them.

This fact as well as the possession of horns by both sexes in the reindeer seems at first to prove that the horns in this species do not constitute a sexual character, but they are developed at a very early age, before the sexes differ in constitution, it is not surprising that they should be unaffected by castration, even if they were aboriginally acquired by the male.—*Darwin's Descent of Man.*

When Heracles chased the hind with golden horns, in the heroic story of the early Gods, the horns may be taken as evidence that the creature was a reindeer and that these northern animals were found in the time of the hero Heracles as far south as the Danube.—(*Ridgeway's Early Age of Greece*). The heroic nature of the quest was in the danger and difficulty of the journey into the unknown Hercynian forest whence Heracles brought back a most rare creature, a horned doe.

In the famous statue now in the Louvre (*Diane à la Biche*), Diana with the horned hind, the hind is an attribute of the Goddess Artemis rather than a representation of Nature. It is not necessary to believe what the old French King told his ambitious queen "that God had given horns to hinds as well as stags, but finding that they wanted to govern everybody he took them away as a punishment."

To pass further back into geological times an interesting parallel has been made between the development of the individual and that of the whole race. Thus the earliest known form of deer in the lower miocene of geologists had no antlers as in the young of existing species. The deer of

middle miocene had simple antlers with not more than two branches as in the existing deer at the second year. Species occur in the upper miocene with three branches, but is not until the upper pliocene and pleistocene that deer occur with antlers luxuriously developed.

Horns, truly so called, are found on the forehead of a large section of ruminants. Each horn consists of a horn core of bone and a hollow cap of true horn, which grows continuously though slowly from the base, and wears away at the tip but is rarely shed entire. There is one remarkable exception in the American pronghorn (*antilocapra*). Here the horns are bifurcated, and shed regularly and periodically. Thus in the forking and annual shedding they agree with the antlers of deer.

Fortunately for the females horns are not present at birth, though they might be handy for the obstetric shepherd. Growth begins in the horns at an early age.

The males of all existing bovidae—oxen, sheep, goats, and antelopes in the wild state possess horns, and they are present, though not so well developed, in the females of most species. With sheep both sexes properly bear horns, and both in sheep and cattle the horns of the male are much altered by castration. Also castration leads to the reappearance of an early condition of the horns, in nearly the same manner as the constitutional disturbance in the offspring caused by a cross between two distinct species or races often leads to the appearance of long-lost characters.

Although tusks and horns appear in all cases to have been primarily developed as sexual weapons, they often serve other purposes. The common bull defends the herd with his horns, and the elk in Sweden has been known to strike a wolf dead with a single blow of his great horns.

Darwin appears to think probable what has been observed by Captain Hutton with the wild goat of the Himalayas, and, as is also said of the ibex, that when the male accidentally falls from a height, he bends inwards his head, and, by alighting on his massive horns, breaks the shock. Certain goats not only butt, but use their scimitar-shaped horns like a sabre.

The giraffe uses his short, hair-covered horns—which are rather longer in the male than in the female—in a curious manner, for with his long neck he swings his head to either side, almost upside down, with such force that Darwin has seen a hard plank deeply indented by a single blow.

The okapi, the newly-discovered giraffe-like animal—though the specimen which shows it is not yet on view—carries respectable horns on the frontal bone.

Horns, except in the rhinoceros, are usually in pairs. There is a curious breed of Wallachian sheep with four horns. The idea of a unicorn is possibly taken from an antelope with straight horns, which when seen in profile look like a single horn.

In investigating the causes of directions of various spirals¹ I discovered a certain law and order in the arrangement of the direction of the spiral in horns which greatly interested me²:

1. That in the antelopes the right-hand spiral is on the left of the head and the left-hand spiral on the right of the head (heteronymous or crossed).

2. That in sheep the right-hand spiral is on the right of the head and the left spiral on the left side of the head (homonymous, or same name). The wild goats agree with the antelopes in regard to the spiral direction of their horns (crossed), and the oxen agree with the sheep in cases where the spiral can be noted (homonymous). Exceptions are not numerous and not difficult to remember—*ovis orientalis* and a few others.

If these observations be of value in clearness of description of a difficult point it will be a gain, and they may also prove useful in classification. By taking a corkscrew (or a right-handed spiral) in the hand it is easy to verify on the horns themselves the direction of their spiral curves.

As to cause of the spiral, and why the spiral coil should turn in so fixed a fashion, I am unable to say. The direction of the spiral probably depends on a very slight and subtle cause acting during growth and continuously during growth. An example is the ordinary carpenter's shaving, which usually takes a right-handed spiral, and is due to the fact that the carpenter does not plane perfectly straight fore and aft, but a

little to one side. A left-handed man or a Japanese would turn off a shaving showing a left-handed coil.

In the narwhal, which usually has only the left tusk developed, this has a sinistral twist, and what is very strange is the fact that when, as a rarity, both tusks are grown, each has a sinistral spiral. In this specimen, with the undeveloped tusk embedded in the bone, it will be seen that the tusk, which is not erupted, has no evidence of the spiral marking, and therefore I conclude that the spiral is made after the eruption of the tusk, and may be due to the ploughing of the waves with the head on one side, a habit connected with the want of symmetry in the normal narwhal. The influence of moisture and want of friction is well seen in the horns of Falkland Island sheep, which are strangely intertwined.

With regard to the spiral horns in fossil state, the actual horn has of course long perished with the hide, but the horn cores, being of bone, have remained to show us that when spirals existed they took the same direction in ancestors and predecessors as in the species now living. In our Geological Museum among the horn cores of antelopes are fossil skulls which show clearly spirally-marked horn cores, heteronymous in direction. The horns observed were like the eland, not an open spiral like the koodoo or Indian antelope. The best specimens were found in Greece, in upper miocene formation, by M. Gaudry. It is interesting to find the spirals taking this direction, and not as in the fossil whelk shell which went the opposite way from their modern representatives.

Although all living oxen have horns in both sexes, yet certain fossil species are known in which these are absent in at least the females, and it has been suggested that it is due to this circumstance that "polled" races of oxen are so readily produced, this being, in fact, a reversion to a condition in which both sexes of the ruminants were normally hornless.

In the ancient oxen when a spiral can be found in the horn-cores it takes the same direction as in existing oxen, that is, homonymously.

In watching the Alpine sheep,³ a domestic breed with curling horns, it is remarkable how the horns which are homonymous are arranged around the ear in such a manner that the ear lies in the long axis of the open spiral of the horn, and is caged in the interior. The ear is thus limited and hampered in its movements, and sometimes is dislocated out of the coil and rendered functionless as a movable funnel.

An extraordinary difference is seen in the wild sheep, especially to be noted in *ovis nivicola*. The horns in this creature are enormous, but the ear is remarkably short, though still situated exactly in the axis of the open spiral in such a fashion that the ear appears to be at the apex of a hollow cone formed by the great spiral horn. The form of the horn and the position of the ear enables the wild sheep to determine the direction of sounds; when there is a mist or fog, acting like an Admiralty megaphone or like the topophone (a double ear-trumpet, the bells of which open opposite ways) used on fog-bound British-American vessels to determine the direction of sound signals.

When a man wishes to hear accurately, and judge of the direction of sounds, he often curves his hand behind his ear and makes a sort of megaphone with his curved hand. This sheep, I contend, has his horn so fixed and coiled round his ear that it acts like the man's hand, but the horn being of enormous size and of suitable shape is still more useful as a megaphone or hearing horn.

In fine old Scottish rams the ears are often squeezed and hampered by the growth of the horns, and in scores of Alpine sheep I have observed the ears caged in the open spiral of the horn, limited in movement and sometimes displaced altogether, hampered and useless. It is probably an example like the drooped ears described by Darwin of variation of animals under domestication.

Our domesticated quadrupeds are all descended, as far as is known, from species having erect ears; yet few kinds can be named of which at least one race has not drooping ears. Cats in China, horses in parts of Russia, sheep in Italy and elsewhere, the guinea-pig formerly in Germany, goats and cattle in India, rabbits, pigs, and dogs in long-civilized countries have dependent ears.⁴

With wild animals, which constantly use their ears like funnels to catch every passing sound, and especially to ascertain the direction whence it comes, there is not, as Mr. Blyth has remarked, any species with drooping ears except the elephant. Hence the incapacity to erect the ears is certainly in some manner the result of domestication, and this incapacity has been attributed by various authors to disuse, for animals protected by man are not compelled habitually to use their ears.

In *ovis nivicola*, though the external ear is present, it is very little more use as a movable funnel than is the ear of a man, and it is notorious how difficult it is for man to judge of the direction of sound.

In animals protected by man, the interference with the function of the ear is of no consequence. It is a far different affair for the wild sheep dependent for his defence on his fine sense organs, and, at least in north Kamschatka, liable to be enveloped in mist and fog. If the creature had a large ear, and could turn it to all parts of the compass, it would turn its funnel to a rampart of horn which backs and partly surrounds the ear, in fact the external ear, would be of little value. In these sheep with horns, as described, the ear is small, and in *ovis nivicola* the smallest of all.

By taking the horn off the skull the listening ear, if properly placed, can distinguish the tick of a watch in one position best—namely, in the long axis of the coil—and thus test the value of the horn for determining the direction of sounds. The megaphone, it will be noted, differs from the ordinary ear trumpet, inasmuch as the smaller end surrounds the ear and may be pressed against the head, it has no ear-piece to fit into the external auditory meatus, and is used either to shout or listen through.

Taking advantage of our Cambridge museums, I am enabled to illustrate my remarks with these selected specimens. I hope it will be forgiven me that I have diverted you from the medical and morbid track for a few moments. It has been well said that "observation is the most enduring of the pleasures of life," and it has been my endeavour to share with you "in glimpses which shall make us less forlorn," even if it be beyond our power to gain a sight of "Proteus rising from the sea or hear old Triton blow his wreathed horn."

REFERENCES.

- ¹ *Lancet*, January 1st, 1898. ² *Nature*. ³ *Nature*, December 12th, 1901.
⁴ Darwin, *Domestication*, vol. ii, p. 291.

A SIMPLE AND EFFECTUAL METHOD OF STERILIZING CATGUT.

By A. W. MAYO ROBSON, F.R.C.S.,

Vice-President of the Royal College of Surgeons of England.

A GROWING sense of the superiority of readily absorbable material such as catgut for ligatures and buried sutures, if only one could be sure of its absolute asepticity, and the acknowledged uncertainty of the commercial preparations, led me to make some experiments on the effect of heating catgut in substances other than water with a view of determining whether after heating for some time to a temperature of 100° C., it would still be sufficiently strong to be employed as a suture or ligature. At first I used methylated spirit, which was heated in a cylinder made for me by Messrs. Down Brothers, and specially prepared to withstand the pressure under which spirit would be when subjected to the temperature of boiling water. The results obtained were satisfactory; the catgut, after being heated in alcohol for twenty minutes, being quite as strong as before heating. This substance was given up only because it was considered inadvisable to run the risk of an explosion if some fluid equally suitable in other respects could be obtained which had a boiling point higher than water. Three substances were selected: aniline, the boiling point of which is 184.5° C.; xylol (di-methyl-benzene), which boils at about 140° C.; and glycerine, the boiling point of which is above 100° C., and which at ordinary atmospheric pressure decomposes before it reaches its boiling point. Trials with each of these three substances left the catgut strong, but, on the whole, xylol has been found to give the best results, and indeed, when it is used, the result is better than with methylated spirit, the catgut shrinking, gaining in strength, and "biting" better when tied. For some time I have used catgut, usually the "o" size, prepared in this way, and I have had every reason to be satisfied with it.

At the outset I used the chromic catgut, but I found this persisted too long in the tissues, sometime appearing to be quite unabsorbable. I have, however, for the past year or two employed either the ordinary unmedicated catgut, or, better still, the formalin catgut prepared by Messrs. Macfarlane of Edinburgh. At first I used to wind the catgut loosely