

The government can give means, but not the man. Unfortunately, we have not their confidence, and the unhappy attempt of converting them from their ancient faith a few years since, ended in widening the breach. This mission belongs to the church that won them from paganism. The late Abbe Segoigne is an instance of what good may be done, and how honored he was by the highest authorities and gentlemen of his time; and no doubt should there now arise a gentleman of his profession, who made these two thousand poor souls his special mission, teaching them the language, the habits and manners of our own life, and do it as we unhappily cannot, not disturbing their faith; and if in this he devoted himself, his life, his talents and labour, the government would soon put every means in his power, and men of all parties would honour him,—the government ridding itself of a troublesome thing, and all willing patiently to wait till the Indian stood side by side us as equal man, before he was burdened with the discussion of civil and religious liberties.

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ART. V.—NOTES ON THE CARIBOO. BY ROBERT MORROW, Esq.

(*Read before the Institute, April 9th, 1877.*)

THIS paper is the consequence of the following quotation from the "Fauna Boreali-Americana" of Sir John Richardson, pages 250 and 251:—Mr. Hutchins "mentions that the buck (Cariboo) has a peculiar bag or cist in the lower part of the neck, about the bigness of a crown-piece, and filled with fine flaxen hair, neatly coiled round to the thickness of an inch. There is an opening through the skin, near the head, leading to the cist, but Mr. Hutchins does not offer a conjecture as to its uses in the economy of the animal. Camper found a membranous cist in the Reindeer, above the thyroid cartilage, and opening into the larynx, but I have met with no account of a cist with a duct opening externally like that described by Mr. Hutchins, and unfortunately, I was not aware of

his remarks until the means of ascertaining whether such a sac exists in the Barren Ground Cariboo were beyond my reach."

This account of cist and sac for the last four or five years has occasioned me much thought; having several times looked for the cist without success, but always forgetting the sac, and not being able to obtain any information on these points, it occurred to me last Fall that the only way left was to look for a Cariboo, and examine it myself, and the result of this examination, and dissections of others, male and female, made since, I will now place before you. But first, it is necessary that Camper's description and drawing of the "membranous sac" from a Reindeer "four years old" should be placed before you.

Camper says\* :—"As I did not yet know the Reindeer, and as the inaccurate dissection which Stenon had made of it in 1672, and of which Valentyn gives an account, did not furnish me with much information, I was obliged to proceed to the examination (date, June, 1771) with great caution. I had often observed with astonishment, in the bucks, that when these animals swallowed, all the larynx rose and fell in a peculiar manner, and seemed to indicate something singular in this part. I then removed with much care the skin of the neck, uncertain of what I might find there.

"The muscles having been raised in the same way upon the sides, as I have represented them, I found a membranous sac, of which the origin was placed between the os hyoides and the 'thyroid cartilage.'

"Then I discovered two muscles which take their origin from the lower part of the 'os hyoides' exactly where the base of the 'os graniform' and the cornua meet. These muscles were flat and thin at their beginning, but they widened in descending towards their junction with the sac, and certainly serve to raise and support it, as well as to expel the air at the will of the animal.

"After I had opened the œsophagus from behind, I found under the base of the epiglottis a large orifice which admitted my finger very easily. This orifice spread and formed a membranous canal

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\* Vol. I, Chapter VI, page 338, Paris 1803, where reference is made by letters to a plate.

which, passing between the two muscles, terminated in a species of membranous sac. Consequently, the air driven from the lungs through the cleft of the larynx fell by this aperture into the sac, and necessarily caused a considerable swelling."

On the 4th December, I succeeded in killing a large and old buck Cariboo, some measurements of which were as follows:—

Length from muzzle to back of horns.....	1 ft. 6 in.
Back of horns to insertion of the tail.....	5 ft. 4 in.
Length of tail, including hair.....	9 in.
Height at shoulder.....	4 ft. 6 in.
Length from lower lip to hair sac, and opening into the larynx.....	1 ft. 8 in.
Length of liver.....	1 ft. 2 in.
Depth of liver at widest part.....	7 in.
Length of heart.....	9 in.
Diameter of do.....	6 in.
Lungs very large } I had no means in the woods of weighing Trachea do., do., } either heart or lungs.	

At this time I had not seen the account quoted from Camper, and groping somewhat in the dark, my specimen is not so perfect as it might otherwise have been. Examining the throat of the animal, the cyst of Mr. Hutchins, "with an opening through the skin," does not exist, but immediately under the skin there was a roundish sub-triangular cyst or valve of cellular membrane "of the bigness of a crown-piece," and on cutting through the cellular membrane this valve is found to be a closed sac, with a peculiar lining membrane, and closely packed with what may be called loose hairs of a flaxen colour in a considerable quantity of sebaceous matter; at the same time, however, the lining membrane is covered with hair of the same quality, apparently growing from, and rather lightly attached to the lining membrane. Camper, in the account of his dissection, just read, has described the valve, as if it were the sac, and his drawing, a copy of which is before you, gives only the valve, as may be seen by examining the larynx of the animal obtained by me, or more conveniently the drawing of it, kindly made for this

occasion by Dr. Gilpin. The muscles which Camper describes as connecting the sac with the "os hyoides," and which he considers peculiar to this organ, in my specimen do not exist, but their representatives are probably the muscles found in the larynx of the young buck by Dr. Sommers, as will later appear. The valve is connected with the omo-hyoid muscles as they pass towards their insertion in the hyoid bone. The valve which Camper has evidently taken to be the sac, lies outside of the mucous sac, but is incorporated with its anterior walls; the inner wall of the true sac surrounds and is attached to the larynx, extending longitudinally from the hyoid bone to the base of the thyroid cartilage, but from the imperfect state of the specimen already referred to, I cannot say how much further it extended; and until a more perfect one is obtained, can only call the whole an organ of voice. The slit or "orifice," as Camper calls it, exists as he has described, but it opens into the laryngeal sac which lies above the valve, that is next the larynx, as already shown.

The dimensions of the larynx, after having been some time in spirits, are as follows:—

Length of larynx from base of epiglottis to base of thyroid cartilage .....	5 in.
Circumference of do.....	11 in.
Inside diameter of larynx.....	2 in.

The age of the reindeer, which Camper dissected, he says was "four years," but "it had not attained all its growth;" again he says, "if we admit that this reindeer had not attained its full growth," and still further, "I cannot determine anything respecting the length of the life of the reindeer, save that it ought to reach the age of sixteen years, because it takes four years to attain all its growth, although, however, the epiphyses continue even some time after." He seems by this to have been in doubt as to the age of the animal, or whether it was fully grown, and it is therefore possible that the sac was not perfectly developed. The muscles described by him, taken in connection with those found in the young buck, make this very probable. For further comparison

we therefore require a buck somewhat younger than that from which the larynx shown to you was obtained.

Wishing to obtain a more perfect specimen of the larynx of an adult buck,—during the past winter I have made every exertion to obtain one but without success,—a small buck was sent to me from Cumberland, which was dissected on the 27th January by Dr. Sommers, Dr. Gilpin, and myself, some of its dimensions were, say of Buck Calf 8 months old:—

Length from tip of nose to tail.....	4 ft. 5 in.
do. of tail.....	5 in.
Tip of nose to centre of ears.....	1 ft. 1 in.
Height.....	about 3 ft.
Liver.....	11 x 5½ in.
Weight of liver.....	2 lb. 6 oz.
Heart, 6 x 6, somewhat flattened, weight.....	1 lb. 1 oz.
Weight of lungs only.....	1 lb. 6 oz.
Total weight of animal, including heart, liver, lungs and kidneys, skin, and all except entrails.....	83 lbs.

A female calf, and an adult doe certainly not less than 6 years old, were put at my disposal by Mr. T. J. Egan, and dissected February 19th. Of this calf the measurements were not made, but those of the doe were as follows:—

Length from end of nose to base of horns.....	1 ft. 1 in.
Length base of horns to line of rump.....	4 ft. 11 in.
Height at the shoulder.....	3 ft. 10 in.
Girth behind the shoulder.....	3 ft. 10 in.
Length of trachea to bifurcation.....	1 ft. 8 in.
Length of larynx.....	3½ in.
Diameter of larynx.....	2¼ in.
do. trachea.....	2 in.
do. at bifurcation.....	2 in.
Weight of lungs, including trachea.....	4¼ lbs.
Length of right lung.....	1 ft. 2 in.
Greatest breadth of right lung.....	8 in.
Length of left lung.....	1 ft, 1 in.

Greatest breadth of left lung . . . . . 7 in.

RIGHT LUNG.—3 lobes. Upper lobe deeply cleft, with a small lappet between it and the middle lobe. The upper and middle lobes were quite distinct. The lower lobe had a large lappet nearly as large as the middle lobe.

LEFT LUNG.—2 lobes. Upper lobe deeply cleft, giving it the appearance of two lobes. The lower lobe was quite distinct from the upper.

Weight of the heart . . . . .  $2\frac{1}{2}$  lbs.

Length of the heart . . . . . 8 in.

Circumference of the heart . . . . . 1 ft.  $2\frac{1}{2}$  in.

Of these three Caribou, Dr. Sommers has given me his notes as follows :—

“ The dissection of the young Caribou provided by you, for the purpose of determining the anatomical structure and relations of the laryngeal sac, described by Camper, as existing in the Reindeer, together with subsequent examinations of the same parts in a female calf and an adult doe are recorded below for your information.

“ 1st. *Larynx, &c.* Body of the hyoid bone, horse shoe shaped, flattened laterally having an equal width from middle to the cornua, which have a narrow termination, the representatives of the corniculi in man being greatly developed; they pass upwards and backwards, measuring each over four inches in length, articulating by cartilage with the upper border of the body near its median line, separated, however, by an interval of about one-fourth of an inch, each consists of three pieces with cartilaginous connections, the united whole having the shape of a diminished human clavicle, its acromial end being more curved and attached forward. The larynx measured in front  $2\frac{1}{4}$  inches; behind, from upper border of arytenoid to lower border of cricoid cartilages,  $2\frac{1}{2}$  inches in length—circumference external  $6\frac{1}{4}$  inches; internal diameter nearly 2 inches; the inferior or true vocal cords and ventriculi laryngi appeared faintly marked, for though visible when the larynx was entire, they disappeared when the organ was laid open, its inner face presenting an even surface from thyroid cartilage to sacculi above.

“ At the notch formed in the upper border of the thyroid cartilage, by the junction of its Alæ, is found a pit or depression forward of the mucous membrane which lines it. Viewed in position, it would be taken for an opening leading into the thyro-hyoid space, and seems large enough to admit an ordinary lead pencil; a probe introduced here found a very shallow depression scarcely one-fourth of an inch in depth; this appearance was obliterated when the walls of the organ were stretched apart after section, but returned when the parts were allowed to resume their usual relations to each other. It is therefore a slight hernia or depression forward of the respiratory mucous membrane into the thyro-hyoid space; the thyro-hyoid membrane which forms here, the outer wall of the respiratory passage, is thin and lax; when the point of the little finger is forced into the depression it produces a sacculus, the walls of which will consist of mucous membrane internally, and the thyro-hyoid membrane externally, it finds here also, opposite the depression and partly filling the space, a flattened rounded oblong body about the size of a small horse bean; dissecting the areolar tissue, covering it in front, this body is seen external to and resting upon the thyro-hyoid membrane, its upper border connected with the base of the epiglottis is provided with a thin fibrous coat, and when cut into, presents to the eye a coarse granular structure.

“ Arising apparently from the base of the epiglottis on either side ‘possibly continuous with the thyro-epiglottidean and aryteno-epiglottidean muscles,’ are two bands of muscular fibres, they pass over this body on either side, being connected with it by fibrous adhesions; extending forwards, they unite at its upper border, forming a single muscular band, which becomes inserted into the upper and inner edge of the hyoid bone; these fibres have no analogues in man.

“ A microscopic examination of the structure forming this body, shows it to consist mostly of fatty tissue, with a moderate proportion of granular cells, apparently epithelial.

“ The examination of the organ in an adult female, and female fawn, presents essentially the same anatomical peculiarities as given above; but the pit at the laryngeal notch is deeper in the

doe than in either of the young animals, it not being obliterated when the parts are stretched. The vocal cords and ventricles are also much more developed; but the body described above is absent from the doe, and very rudimentary in the female fawn.

“On a consideration of the facts recorded, we must conclude that the organ described in part by Camper is peculiar to the adult male caribou, the specimen in your possession standing in proof. My dissections given above show that the organ exists in the immature male in a rudimentary form; but having all the parts necessary to its full development, present, we must conclude, that such development will advance with its growth. In both adult and immature females it is still more rudimentary, as the body which forms the valve in the adult male was not present in the doe, and was evidently atrophying in the fawn (female).”

From the above description of the larynx of the young male, together with that which I have pointed out in the adult, it would appear that by some unaccountable oversight, Camper in his account has only described the valve, passing over without observation, the true sac; but he points out that the female reindeer is without the organ above described; and also that it is not present in the male fallow deer; and from the specimen now exhibited, you will also perceive that it is absent in the Virginia deer. In this specimen you will notice the almost bony hardness of the thyroid cartilage.

I need hardly point out to you that the measurements of the two adult animals show that they were very fine specimens; but I may draw your attention to the size of the hearts and lungs, as well as mention that the windpipe in all four was very large, and that Camper has noticed this to be the case in his reindeer.

Inside of the hock of the Caribou, you will observe that there is a patch of hair of a lighter color and somewhat longer than that which covers the skin in its immediate neighborhood, and that the skin under this patch is slightly thicker than that immediately round it. This spot is usually called a “gland,” whether it is strictly so, I cannot say; but at all events it is caused by an enlargement of the hair follicles, has a very strong smell, which



you will immediately notice, and in the Caribou is a scent "gland." The matter producing this scent is of an entirely different character from that contained in the tubes. It appears to be a highly volatile oil, and resists salt for a long time after the surrounding skin has been thoroughly saturated, and when dry collects on the outside of the skin in the form of very small yellow waxy scales, such as would be left by minute portions of varnish. Although I did not see the animal use this so called "gland," yet my Indian who hunted with me in December saw a doe Caribou use it in this way; when she had finished urinating (she squats in the act almost exactly like a sheep), she rubbed these "glands" together, leaving true scent behind her for a short distance. When "creeping" moose or Caribou, it has been often a subject of enquiry with me why it was that beside the smell of the fresh urine, there floated above it as it were, and for some distance in advance, the true scent of the animal; and for myself, I have very little doubt but that this is one way at least in which these "glands" are used, and in confirmation, it may be mentioned that the dogs at one time openly used for hunting moose, did not often take the scent of that animal from the snow over which it had just passed, but stood upon their hind legs and took it, as if it had been rubbed from the "glands," as described. This point is merely mentioned in the hope that some gentleman present may be able to throw some light upon it, or keep it in mind when an opportunity offers for observations confirmatory or otherwise.

If you will look a little further down, that is, nearer the hoof, on the skins now before you, you will perceive on each leg just on the outside of the hinder part of the skin at the hair parting, a second "gland;" it is, perhaps, more "typical," than developed. You will notice that it has no smell, nor had it while the animal was warm. Professor Baird (Mammals of North America, page 633, U. S., P. R. R. Exp. and Surveys General Report), in his diagnosis taken from Gray's "*Knowsley Menagerie*," says: "The external metatarsal gland is above the middle of the leg." For this gland our President, Mr. T. J. Egan, and I had vainly sought

for some years, in answer to enquiries made by an American naturalist, the Honorable Judge Caton, of Ottawa, Ill.; and this is the first one we have ever seen, and my Indian, to whom I pointed it out, immediately after the buck was shot, told me that he had never before seen it. It may be taken as a mark of adult age, and will not probably be found on any Caribou, under the age, perhaps, of six years. This gland was 4 inches above the insertion of the dew claws, and  $10\frac{3}{4}$  inches below the centre of the hock "gland." You will also see it on the leg of the old doe, but not so perfectly marked, perhaps owing to the lighter colour of the hair which surrounds it,—the doe having been killed in February, the buck in December.

It may not be out of place to mention that the buck Caribou, as well as the moose, often voids its urine while on the march, as the ox may be seen to do.

The tubes in the feet of the Caribou are another point to which your attention is directed, and which first attracted the notice of Dr. Gilpin, from inquiries made respecting them by the American naturalist already named. Dr. Gilpin and others, including myself, thought that they were only to be found in the hind feet of this animal, and the discovery of them in the fore feet is due entirely to Dr. Sommers.

In Camper's description of the reindeer, made in 1771, (vol. I. page 347, Paris, 1803) he says, speaking of these tubes: "In addition to the peculiarities of the reindeer, of which I have just spoken, I have discovered besides something very singular in the hind feet of this animal; that is to say, a deep sheath between the skin at the place where the dew claws are united together, of the size of the barrel of a quill, running deeply as far as the point where these dew claws are articulated with the bone of the metatarsus. These tubes were filled internally with long hairs, and a yellow oleagenous matter proceeded from them, the odour of which was not very agreeable.

"I have not found these tubes in the forefeet. It was not possible for me to discover the use of them, inasmuch as the heat of the summer obliged me to remove the flesh quickly from the

skeleton;" and a little further on he says that in the feet of a reindeer, sent him in 1777, he did not find the tube in the hind foot, but one very apparent in the fore foot; and in another, sent him in 1778, the tubes were in the hind feet, but none in the fore feet, "so that I am not able to determine anything very exactly on this subject."

In the skin of one of the hind legs of the old buck, just above the coronet, you will see the tube, the bones having been removed for the purpose. The tube of the other foot has been sacrificed to experiment; and among the other specimens in spirits, are the hind and fore foot of a young buck, and the hind foot of a Virginia deer; and of the latter, a separate tube, and also dried, the hind and fore foot of the old doe caribou, and fore foot of the young one, and skins from the fore feet of the old buck. In the skin of the fore feet of the old buck there is and was no appearance of the tubes, they have been absorbed. By many, it appears to me erroneously, these tubes are considered to be scent "glands." Camper evidently did not think so; but he says (page 348): "The skin of the fore feet, as well as that of the hind, which unite the dew claws, were sprinkled with thousands of glandules, which probably give out an oleagenous matter, intended to protect the hoofs against the snow." This, it appears to me, may be said as to the "glandules" of any part of the skin with equal correctness. Prior to December last, having paid very little attention to these tubes, and having superficially examined only a few specimens some days killed, had the question been asked me, were they scent glands, the answer might have been affirmative; but after a careful examination of the animal while warm, my original note made in the woods reads, "The passage or so-called 'gland,' opening in the front of the hind foot, terminates close to the skin of its under surface. It is hair lined to its extremity. The separation or unity of this tube with the lower part of the sole skin is by 'fascia' attached to the apex of the passage; it is not a gland properly so called." From further examination of a number of fresh tubes, and from the observations made by Dr. Sommers, my first view that they were for the purpose of strengthening the bones of the foot of this

animal in its spring or jump, does not now appear to me to be tenable, and for my own part, I adopt Camper's statement, and cannot say what their use may be; but they are not scent glands, if they were, it appears scarcely probable that as the buck comes to maturity he would be deprived of the means of leaving scent from his fore feet at the time when he most requires it, without taking into consideration the fact that the tube only exists in the fore feet of the male (up to an unknown age), or in the female in a rudimentary state.

The tubes in the hind feet of the Caribou are filled with a waxy matter (those in the fore feet being only rudimentary, contain but very little), and so are the tubes, one in each foot, of the Virginia deer; but this is retained in them, owing to the shape. That of the Caribou is rather wider in its mouth and of more equal diameter to its lower end than that of the Virginia deer, which, at its opening, is somewhat constricted and widens towards its centre; and the tubes of these two animals retain this waxy matter or scales, while the moose which, contrary to preconceived ideas (and this shows how little we study our animals), also has the tubes in its feet, fully developed in the hind, rudimentary in the fore feet, and if you will look at the hind foot, kindly sent me by A. Chipman Smith, Esq., Mayor of St. John, you will see that the tube is of a very different shape from that of the other two animals, being in the hind feet, very wide at the mouth, and gradually narrowing towards its lower extremity; from its shape it can retain but little, if any, of this "waxy" matter, it being washed out by any swamp or by the grass or plants through which it would pass. The disagreeable smell ascribed to this matter is owing in a great measure to the quantity of it which is contained in a narrow space. In general terms it may be summed up that the Caribou buck when young has the tubes in the fore feet in a rudimentary form, which instead of passing upward and backward to the skin close to the dew claws, as in the developed tubes of the hind feet, lie between the hollow of, and nearly parallel with the bones of the feet, and that they are gradually absorbed until certainly in the adult male they entirely disappear. The doe has them also rudimentary in the fore feet;

perfectly developed in the hind, and it is a question which is yet to be decided whether the tubes ever entirely fade out of the feet of the doe. In the old doe, the age of which cannot be less than six years, although small, the tubes are still plainly to be seen.

A young moose, in possession of Mr. J. W. Stairs, has these tubes in all its feet. Those in the hind feet are fully developed, and pass in the same way as those of the Caribou,—between the phalanges; in the fore feet they are as in the Caribou of the same age, not passing upward and backward between the bones, but lying between and nearly parallel with them, and being, as in the Caribou, only rudimentary; but at what time of life they disappear in this animal, or whether in male or female, or both, cannot, owing to our prohibitory law, at present be decided.

The bones of the fore feet of the Caribou have the same general appearance as those of the moose. The "splint" bone is, however, very much shorter in proportion. In the hind feet the bones are the same; in the Caribou they are, however, rounder than in the moose.

Permit me to tax your patience a little longer, it has been shown that the Caribou and Moose have the tubes fully developed in the hind feet, and rudimentary in the fore. An examination of a Wapiti or Elk (*Cervus Canadensis*) skin with feet attached, in Mr. Egan's collection, presented the fact, confirmed by Judge Caton, that this animal has no tube in any foot, and that its feet are of a different shape from those of the Caribou, Moose, and Virginia Deer, being \* broader and shorter, and that the length of the phalanges is very much less in proportion to the size of the animal in

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\* Professor Baird, U. S. P. R. R. Exp. and Surveys, page 638, Sp. ch.: "Hoofs short, broad and rounded;" 639: "The hoofs of the elk, fig. 10, are very different from those of the smaller deer; instead of being narrow and pointed, they are short, broad, and with the outer edge of the under surface much rounded; in fact, they bear a very close resemblance beneath, to those of a buffalo. . . . In the hind foot of the elk, the hoof is rather longer. . . . The length but little greater than the width of both hoofs together. The anterior hoofs are rather the largest.

"There is a patch of whitish hairs on the outer edge of the hind leg, about one-third the length of the metatarsus, from its upper edge. This is narrow and about two inches long. There is no naked space between these hairs, as in the Virginia deer. I have not observed the bushy bunch or patch of long hairs seen on the inside of the tarsal region in the Virginia deer, though it may possibly exist." (Judge Caton says it does not.)

the specimen referred to, than in the Caribou and Virginia Deer; from the metacarpo-phalangeal articulation, to the point of the hoof, they measure 7 inches; while those of the young buck Caribou, measured  $7\frac{1}{2}$  inches, of the old doe  $7\frac{1}{2}$  inches, and of the old buck 9 inches. The gentleman already referred to, informs me that the Wapiti is a natural trotter, \* "he, however, can, and does run much faster than he can trot, but it is a laboured effort, and soon tires him out." "His run is an awkward, lumbering, rolling gallop. A few hundred yards of this gait tells. It is said that an Elk will trot at an equal speed without stopping, or even flagging for twenty miles." The Virginia Deer has a tube scantily furnished interiorly with short hairs, fully developed in each foot, which led me to inquire respecting the gait of this animal, my impression being that it would prove to be a galloping or running deer, and this has been confirmed. "The natural gait of the Virginia Deer is a gallop or run. He never trots except when he wants to move a short distance voluntarily, and then it is a slow lazy gait."

The inference which you will allow me to draw from this is, that the number of tubes in the feet of the different species of deer will point out the gait of the animal, that is, those which have a fully developed tube in each foot, should be bounders and runners, while those wanting the tubes, or having them partially developed in the fore and fully in the hind feet should be trotters. The point is one which has not, to my knowledge, been touched upon by any naturalist; and as it cannot be further inquired into among us where we have only the Moose and Caribou, it is mentioned in the hope that it may be examined into by those who have access to a number of different species of Deer.

It remains for me to present to you the notes of the scientific examinations of the tubes, kindly furnished by Dr. Sommers, as follows:—

In the observations here annexed, I have endeavoured to furnish an accurate description of the so-called "interdigital glands" which exist in the feet of the Caribou, by subjecting them to very careful anatomical and microscopical inspection. The conclusion at which

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\* "Plains of the Great West," by Col. Dodge, pages 164 and 166.

I arrive, relative to their structure and functions is, that they are not glandular, in the correct meaning of that term, an opinion which coincides with that which you previously expressed.

#### CARIBOU BUCK, 8 MONTHS OLD—HIND FOOT.

“The cleft in the hoof is very deep, and the phalanges are loose and movable, the only connection of any consequence existing between them being formed by the skin covering the hoof. It forms a broad web between the phalangeal bones, thus affording a broad surface with which the animal may rest upon the ground; the cleft in the hind foot measures from metacarpo-phalangeal articulation, to the tip of hoof,  $7\frac{1}{4}$  inches. In the fore foot, it measured  $7\frac{1}{2}$  inches, the free border of the web in both feet is found at the insertion of the nails or hoofs into the skin, the length of web being about 5 inches, greatest width at free border  $1\frac{1}{2}$  inches, diminishing gradually upwards, the anterior and posterior walls of the web are separated by an interval filled with areolar tissue, and a small proportion of fat.

“About one and a-half inches above the edge of the web in its anterior wall, at a point midway and opposite to the articulation of the first and second sets of toe bones is found a circular opening or foramen, large enough to admit the barrel of a goose quill, it gives passage to a tuft of hairs lighter coloured than the surrounding ones, which are slightly smeared or stiffened with smegma, a probe introduced here discloses a passage or “cul de sac” continuous with this opening, having a depth of one and a quarter inches. On dissecting the skin from the under side or sole, and removing the surrounding tissue, the “cul de sac” was exposed, extending upwards and backwards between the proximal phalanges, approaching, but contracting no adhesion to the skin of the sole, and terminating at a point corresponding to the articulation of the dew claws with the splint.

“This organ presents the appearance of a fleshy tube with thick walls, and a rounded blind extremity like that of a small test tube, flattened on its posterior or under side, convex on its upper or anterior side, about one and a-half inches in length below, somewhat shorter above, its circumference being about three quarters of an

inch: it tapers slightly towards its termination. When viewed in position, it bears a striking resemblance to the human uvula.

“The surface exposed by dissection exhibits a structure consisting of rounded or slightly polygonal spaces, resembling very large cells, these are convex of a deep red colour, and united by paler interspaces. The whole organ has the appearance of a body constituted of immense cells united by their thin cell walls. This, however is deceptive; these spaces are the rounded terminations or bases of the bulbs or follicles from which the hairs inside of the sac grow: the resemblance to cellular interspaces arises from the pressure of a very delicate layer of true skin upon which they rest, and which has been pushed into these interspaces by the growth of the hair follicles. The same structure can be observed in other parts of the skin by dissecting off the true skin which is underneath from the epithelial layer which covers it, and gives origin to the hairs, but here the spaces observed are much smaller, since the hairs and their bulbs are more crowded, the space occupied by each bulb being less than in the cul de sac, or organ under notice.

“On examining the web of the fore foot, the opening was found similar in character and co-relative position, to that of the hind foot; previous to making these dissections, I was informed that this structure did not exist in the fore feet of the Caribou, nevertheless certain preconceived opinions relative to its structure and function, led me to seek for it here. The organ in the fore feet differs from that in the hind, by being very shallow, measuring not over one-quarter of an inch in depth; this is due to the drawing up and partial obliteration of its anterior wall; when dissected from the surrounding tissue, it presents all the characteristics of the organ in the hind foot, yet it differs in its position relative to the phalangeal bones, for instead of passing obliquely between them as in the hind foot, it lies in the same plane as that of the anterior wall of the web, its own anterior wall being incorporated with the under surface of the skin, being thereby shortened to about one-quarter of an inch in length; the posterior wall, however, remains distinct and measures from the blind extremity to its termination in the skin, somewhat over an inch.



“The microscopic examination of this organ proved it to be of Epidermic origin. Sections through the thickness of its walls showed an external layer of flattened prismoidal cells with small nuclei, a deeper or internal layer in which the cells were more rounded and filled with granular protoplasm, (this difference in the uppermost and lowermost layer was brought out by the staining process, and it is in these only that we find the line of demarcation, the intervening layers merging gradually one into the other). Other structures observed were the hairs and hair follicles with their accompanying tissues, and some fibres representing, no doubt, the true skin, which is not developed in these organs to any considerable extent. The two layers of cells correspond to the same parts in man, viz., a horny layer external, but of course internal in the ‘cul-de-sac;’ a mucous layer external when the sac is dissected from its surroundings, the changed position of these layers is owing to the circumstance of the sac’s being an invagination of the epidermic layer into the true skin.

“Regarding the function of this structure, various and contradictory opinions are expressed, that of its being glandular being most prevalent; again it is said to have no existence in the Wapiti and Moose, and fore feet of the adult Caribou. The fact of its existence in fore and hind feet of the Virginia Deer being well understood, its presence in this animal is said to be for the purpose of leaving a trace or scent on the ground, and in this way serving the union of the sexes at certain seasons, but if this is the case, we may ask why should it not exist in the Wapiti and be fully developed in the Caribou and Moose, since it must be obvious to us that the fulfilment of the conditions which obtain in the Virginia Deer are required also in the Wapiti; more than this, we know that a true scent organ in the Caribou is situated on the inside of the heels or gambrils.

“I may say here that on the occasion of my first dissection of the organ in the Caribou buck fawn, I expressed the opinion, that this organ or structure would be found also in the fore feet of the adult animal, though perhaps more rudimentary; a subsequent examination of the fore feet in an adult doe confirmed this opinion

in the fullest degree, since I there found the structure as well developed as in the young animal. I now feel more than ever convinced that it exists in all our deer tribe, not excluding the Wapiti, although it may be larger in some than in others; an immature living moose in possession of Mr. J. W. Stairs, being provided with it.

“The following summary of its Histological relations will aid in arriving at correct conclusions relative to its importance:—

“1st. It is a growth or offset from the epidermic layer of the skin, invaginated between the phalangeal bones, containing the Malpighian and horny layers of the epidermis, and carrying with it a very thin layer of the true skin.

“2nd. Hair follicles and hairs growing from its internal walls and emerging through its opening, these being also epidermic or of epithelial origin.

“3rd. The absence of glandular tissue, excepting the sebaceous follicles which accompany the hair follicles or bulbs over the whole integument of the animal, ‘this exception is made for obvious anatomical reasons,’ nevertheless the sebaceous follicles were not observed in the specimens examined with the microscope.

“4th. The examination of the matter filling the tubes in the Virginia Deer, and present in much smaller proportion in the Caribou, showed it to consist in principal part of desquamated epidermic scales and oil globules; microscopically it resembled smegma from the skin of man, or perhaps closer still the ‘vernix caseosa,’ from that of the recently delivered infant, remembering that the epidermis in man and in all animals is a non-vascular tissue, that unlike our other tissues it is shelled off from the surface; we can readily account for these desquamated scales being retained here in a narrow pocket, from which they could not be readily discharged. Retrograde changes in these cells, secretions from sebaceous and sweat glands in adjacent parts will account, not only for the oily matter seen, the viscosity of the substance, but also for the odour which it possesses, the latter being no greater than that of the general integument, and arises from the same cause, viz.: the perspiration, but in this respect they are not in

any degree comparable with the glandular collection at the hocks before mentioned, which will retain the peculiar odour of the animal for a long period after the removal of the skin.

“In the presence of these facts we must conclude that this organ is only rudimentary, having no function which is obvious to us, it is not a secreting organ since it lacks glandular tissue; the opening in the dorsum instead of the sole of the foot would point also in this way; it does not serve to give strength or firmness to the foot, having none of the toughness and elasticity of skin in other parts, without comparison with the tendons, etc., which are provided for this purpose. Organs without uses are found from man downwards, we sometimes call them fœtal structures because some are well developed and are in use before birth, wither and remain useless after birth; for example, the wolffian bodies, said to be represented by the suprarenal capsules; others have no obvious use at any period, but are better developed in the fœtus than in the adult; example, Appendix vermiformis in man, others may point to structural affinities inherited from a distant period, of which natural history furnishes many examples.

“From an individual point of view, taking in all the circumstances referred to, there appear to be only two ways of accounting for this structure, it is either an aborted unguis follicle or otherwise it is a ‘cul-du-sac’ representing the suture formed by coalescence of the skin from side to side in the fœtus. Its structure would convince one of the first conclusion, if the animal had rudimentary toe bones in the same position, indicative of a three toed ancestor, but all observations relative to the morphology of the foot, are opposed to this view, since the outer bones and their appendages are aborted in all animals of this kind. We are therefore compelled to adopt the other view which can be only settled satisfactorily by examination of the part in the fœtus. Nevertheless from knowing the difficulty of substantiating any theory connected with its supposed origin and use; still more of ridding one’s mind of a theory once entertained, my faith in either of these is held very loosely.”

In conclusion, it may be that what I have written has been

better told by some one more competent to the task, but I have not met with anything upon the subject of the sac and tubes except in Camper's works. The notes of Dr. Sommers, which he kindly handed to me to be used as I saw fit, are given in full, as those which might have been made by me would only be the notes of a hunter, and therefore of but little value in comparison. I regret that I have been unable to explain more fully the use of the sac, but what additional light has been added may possibly encourage some other, naturalist or hunter, to continue the enquiry.

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**ART. VI.—NOVA'SCOTIAN METEOROLOGY.** BY F. ALLISON, Esq.,  
M. A., *Chief Meteorological Agent.*

(*Read before the Institute, 14th May, 1877.*)

THE facts, deductions, and opinions, brought before this Institute in this little paper, are the results of over fourteen years of personal observation at Halifax, of all elements entering into the constitution of climate; to which are added several previous years of observation of Temperature and Rain by the Medical Officers at the Citadel, which were taken under excellent supervision, and considered to be trustworthy enough for scientific calculation. I have also been much assisted by many careful observers through this Province, and in Prince Edward Island, and Newfoundland, to whom I would thus publicly tender my thanks; and some of whom are now performing good service in the Dominion Meteorological organization. Most of the following remarks, though taken directly at and for Halifax, are applicable to all Nova Scotia. The deviations from this general rule will be noted as we proceed.

Heat—its degree and alternations—must of course lie at the bottom of all considerations of climate; but for several reasons of convenience, the first instrument we record is the Barometer.

Let me again mention, that beside almost all Barometers having a considerable error in themselves, they are commonly observed by the public without regard to the marking of the attached Ther-