

A number of interesting localities for rare Ferns were also noticed, from information furnished by Mr. VROOM, including new stations in New Brunswick for *Adiantum*, *Asplenium thelypteroides*, *Cystopteris bulbifera*, *Woodsia Ilvensis*, *Botrychium Virginicum*, and *Woodwardia Virginica*.

ART. IX. ON THE BONE IN THE HEART OF THE MOOSE. By
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(Read January 8, 1883).

IN most ruminants, especially the larger kinds, there is a bent bone at the base of the heart, on the septal side of the origin of the *aorta*, and imbedded in the tendinous circle which gives attachment to the muscular fibres of the ventricle. In the giraffe this bone was two-thirds of an inch in length. Two such ossifications of the sclerous tissue have been met with. In oxen and red deer, an ossified and unossified piece of fibrocartilage is more commonly observed. In the horse these bodies at the septal side of the aortic ring, are rarely ossified until extreme age. (*Owen, Comp. Anat. Vol. 3, p. 523.*)

The fibrous structure of the heart consists of the firm rings which surround the auriculo-ventricular and great arterial orifices. All of these fibres are more strongly developed on the left side of the heart. The left auriculo-ventricular ring is firmly blended at the fore-part of its right margin with the fibrous structure surrounding the aortic orifice, and behind the aortic opening, between it and the two auriculo-ventricular openings there is found a fibro-cartilaginous mass, which is connected with the several fibrous rings, and to which the muscular substance is also attached. In some large animals, as in the ox and the elephant, there is a small piece of bone in this situation. (*Sharpey & Quain's Anat. Am. edition, 1849. Vol. 1, pp. 481-2.*)

The above quotations from OWEN, and SHARPEY and QUAIN refer to an anatomical peculiarity in the heart of ruminants and

other herbivorous animals, not reported as existing either in man or other mammals. Through the kindness of Mr. MORROW, our President, I had the opportunity afforded me of making a dissection of the heart of a moose, and of examining the bone found in the septum. The heart under examination weighed four pounds twelve ounces, avoirdupois; length from base to apex, 10 inches; circumference at the base, seventeen and one-half inches. Directly at the aortic opening, where the semi-lunar valves are situated, and opposed to the auriculo-ventricular opening on the right side, I found a bony ring, or, more correctly, a section of a circle, measuring one and five-eighths of an inch in length. It was roughened on its surface, widest at its centre where it formed an acute process on one side. From the centre it diminished towards the end on both sides, terminating in points tipped with fibro-cartilage. I have since examined many hearts of oxen, and have invariably found this bone in the same situation as in the moose. In size and shape it differs but little from that of the moose.

The quotations above—particularly from OWEN—would point to the presence of this bone as being due to certain pathological changes consequent upon old age in the animals in which it appeared. But a stricter examination will prove that this bone is not a product of decay, due to the deposition of sclerous or atheromatous matter in the fibro-cartilaginous tissue of the heart. It is a true bone, developed in a situation where its presence serves an important physiological purpose.

A microscopical examination proved it to possess the histological characteristics of bone tissue, there being the lacunæ canaliculi and haversian canals. An atheromatous deposit would, on the contrary, exhibit the deposition of calcareous matter in the fibrous or other tissue without any attempt at organized structure.

The position of the bone renders it an anatomical curiosity. As to its function, I think it serves the purpose of strengthening the aortic opening, maintaining its potency and giving support to the semi-lunar valves. It is a fact in physiology of the heart that the aortic semi-lunar valves will not permit, even under a pressure, sufficient to rupture them, the passage of water from

the aorta into the left ventricle, as shown by Mr. J. W. KING's essay on the safety valve action of the right ventricle of the human heart. (*Guy's Hosp. Reports, 1837. Vol. 11, p. 104.*)

Following the systole or contraction of the ventricles, the mass of blood which had been in their cavities is now in the aorta and pulmonary artery; distending them, the distension of the arterial walls is followed by their recoil. This would drive it back again into the ventricles, were it not for the sudden closure or shutting back of the pulmonic and aortic semi-lunar valves. The pressure which these valves have to bear is very considerable, equalling that of 6 or 7 inches of mercury in man, and of course a still greater pressure in large animals. In regard to the action of the left side of the heart, the needs of the circulation demand that there shall be no regurgitation or backward flow of the blood. It must go forward, otherwise there is produced serious injury to the capillaries of the lungs and to the systemic circulation, a fact well known to pathologists, as in cases of insufficiency or obstruction in openings of the heart in man.

In large animals, more especially those that are required to put forth efforts of strength or speed, which rapidly increase the blood pressure in the whole vascular system, the increased power of resisting pressure afforded by the partial bony ring at the aortic orifice must be of great consequence, so far as the specific functions of the semi-lunar valves here situated are concerned. It must be observed, also, that the bony matter but partly surrounds the aortic orifice, thereby while giving it strength and resisting power, not interfering with the necessary elasticity of the part. More than this, the solid tissue here in the cardiac septum affords more or less resistancy to the valves in the right side of the heart, preventing, during rapid or forced muscular action, the crowding of too much blood upon the delicate tissue of the lungs.

In the various examinations of hearts which I have made, I have not found the second bone mentioned by OWEN and others.