

naked ear applied over the region of the heart. The second sound could be distinctly recognized through the medium of the stethoscope. It immediately succeeded the first sound, but was shorter, more acute and sharper, and appeared to be deeper seated. On dividing the thoracic muscles and opening the pericardium, we distinctly recognized this (second) sound to be produced by the contraction of the auricles projecting their blood into the ventricle. It succeeded the first sound, commencing immediately after its termination, and consisted of a short whiff or sharp sound, and then silence intervened between it and the commencement of the first sound. When the action became weaker, both sounds seemed to partake of a slight murmur, as is observed in cases of anæmia, and then the second sound appeared to be rather longer—both were distinctly heard.

We have examined this subject by a few carefully conducted experiments on the turtle during the highest temperature of the season, as the animal at this period assumes the physiological condition of warm-blooded animals; and the sounds produced by the action of the heart must depend on exactly the same principle as in warm-blooded animals. We performed a number of experiments on large warm-blooded animals to determine the manner in which the ventricle contracts and the cause of the sounds; but as regards the latter, we found it more difficult to arrive at sufficiently satisfactory results. In the turtle the effects of the operation are but slight, and after the heart has been denuded, its action is maintained with apparently the same power as during health. The animal will survive for several days, and move about and exert itself with great energy.

July 4—The heart of a turtle having been denuded, we applied the stethoscope, and distinctly heard both sounds. Pulsations 40 per minute. Temperature of day 90° Fahr.

The action of the heart was displayed in a most beautiful and interesting manner; the ventricle contracting and projecting the blood into the aorta, produced a pulsation in its walls a little above its origin, where the first sound of the heart is clearly heard and appears to terminate, being there most distinct; and immediately after this sound ceases, the auricles contract, and a sharp short sound is heard through the medium of the stethoscope, as the blood is projected by them into the ventricle. Sometimes this second sound has a little bellows murmur with it, and then we think we almost hear the blood enter the cavity of the ventricle. In observing this action of the heart with the eye, the cycle of movements appears to commence with the contraction of the auricles, projecting their blood

into the ventricle, and then the ventricle contracting and propelling the blood into the aorta, producing the systole, terminates the cycle. But in listening with the ear, applied to the stethoscope, the cycle of sounds appears to commence with the contraction of the ventricle, as that is the loudest and most prolonged sound; and the second sound appears to succeed the first sound, as the second is the shortest and sharpest sound, and in unison with this, the auricles commence to contract immediately after the termination of the contraction of the ventricle, as the action of the heart is now quick and rapid, and do not immediately precede the contraction of the ventricle, as is the case when the action of the heart is slow, and an interval occurs during the dilatation of the ventricle.

In a turtle, the action of whose heart amounted to 45 and 50 pulsations per minute, the highest we have met with in this class of animals. Temperature of day 90° Fahr.

The first sound was dull and prolonged—appeared to commence in the ventricle, and to terminate a little above the origin of the aorta, the sound being there most distinctly heard and fully brought out. It was quickly performed, and more rapid than formerly—more like the sound of the human heart. The second sound commenced instantly after the first sound terminated. It was a short sound, and appeared more distant—not so near the ear as the first sound, because in the turtle the auricles are seated deeper than the arch of the aorta. But it was heard instantly to succeed the first sound. The first sound took place during the contraction of the ventricle, and distension and pulsation of the origin or arch of the aorta, and the second sound corresponded with the contraction of the auricles and dilatation of the ventricle.

On observing the action with the eye, the auricles appeared to contract instantly after the pulsation took place in the aorta—point of termination of the first sound, the movement following the other so rapidly, that it was difficult to estimate the short interval. But the auricles appear to commence, at an appreciable instant, sooner to contract, after the pulsation in the aorta, when the action of the heart is 45-50 per minute, than when it is at 30 pulsations per minute. It is difficult to estimate by the ear, the precise interval that intervenes between the first and second sounds of the heart. Muller, we believe, estimates it at 1-5th of a whole beat. According to our observations, this appreciable interval seems to diminish, as the action of the heart increases, to a certain extent or point. Laennec considers that no interval occurs between the commencement of the second sound and the termination of the first sound. Dr. Williams