V. *The Croonian Lecture. On the structure of a muscular fibre from which is derived its elongation and contraction.* By *Sir* Everard Home, *Bart. V. P. R. S.*

Read December 15, 1825.

In the course of the last 40 years I have given this Lecture more frequently than any Member of the Society; and, like my predecessors, on those occasions, have taken up the subjects most nearly connected with the inquiry for which the Lecture was instituted.

As far back as the year 1818, while considering the mode in which coagulated blood is rendered vascular, I brought forward a magnified drawing of a muscular fibre made by Mr. Bauer, showing it to be composed of a single row of globules $\frac{1}{2,000}$ parts of an inch in diameter, or in other words, of red globules deprived of their colouring matter.

From that time I had not proceeded further in investigating muscular structure, but the appearance of the nervous fibres of the great splanchnic ganglion in Mr. Bauer's magnified drawings, which I laid before the Society last spring, led me to consider that the organization of these fibres must be so closely allied to that of muscles, that every physiologist who examined the drawings, must immediately come to the same conclusion; and no sooner would those drawings be in the hands of the public, than any one might with the greatest

ease complete the discovery by an actual examination of muscular fibres in the microscope.

Under this impression, I requested the President to appoint me to give this Lecture, which is to be read nearly at the same time my paper on ganglions will be published; so that no one will have an earlier opportunity of applying what is said of nerves in that communication to muscular fibres, the consideration of which is the object of the present Lecture.

In Mr. BAUER's former examination of muscular structure, that the integrant fibre might be more easily separated from the fasciculus to which it belonged, we had gone into the same error with those physiologists who have made diagrams of the internal appearance of the brain, after coagulation, and had boiled the muscle previous to the examination; not being aware that this process must decompose red globules, should any exist, and cause the colouring matter to be separated. Boiling would also destroy any connecting medium by which the globules are united together; so that, if I may use the expression, there would only be the skeleton of a muscular fibre remaining to be examined.

Upon the present occasion, therefore, the fibres belonging to the fasciculi that compose the great muscle that lies upon the back of the bullock's neck, to raise the head, were selected, and were examined in 24 hours after the animal was killed; and we know that in all violent deaths, the muscular fibres continue capable of contraction beyond that period, after apparent death has taken place.

In this muscle the fasciculi are more loosely connected together than in almost any other animal body; and in the interstices between them there is no fat; but Mr. BAUER

found that in this recent state the fibres are held so firmly together by the mucus which surrounds them, and forms them into fasciculi, that it was only under water he could separate an integrant fibre for examination in the field of the microscope.

In its mechanism, he found it to correspond with the nervous fibre of a ganglion, differing only in the size of the globules, which were larger than those of the fibre in the ganglion in the proportion of $\frac{1}{2,000}$ parts of an inch to $\frac{1}{3,000}$ and $\frac{1}{4,000}$ parts.

The elastic transparent jelly uniting the globules together, had not the same elasticity as in the nervous fibre, so that it could not be drawn out from the contracted state to double its length without breaking.

The muscular fibre of a trout was treated in the same way, and the result was the same; the fibres were however more brittle than those in the bullock's neck.

From these facts, in addition to those communicated in the examination of the structure of ganglions, it is at last ascertained, that the structure of the fibres of nerves in general, and those peculiar to ganglions, as well as those that compose muscles, is so far the same, that they consist of single rows of globules united together by an elastic gelatinous transparent matter; they differ however in the size of the globules, and the degree of elasticity of the medium by which they are united; so that a less power will elongate a nerve than the fibres of a muscle, and to a greater extent, and it will restore itself with more velocity to a state of rest.

This structure of nerves and muscles, I consider to be

demonstrated in the annexed drawing; since I cannot believe Mr. BAUER has been led into any error upon this occasion; as no error has been detected in his microscopical observations for so many years continued, and the accuracy of his representations, of what he has seen, no one can doubt.

It is a curious confirmation of the acuteness of his eye, and the accuracy of his glasses, that LEUWENHOEK, who used a single microscope, and says it is the best that can be made, since the magnifying glass is the smallest speck that can be seen, declares a muscular fibre to be made of globules less than the red globules of the blood; and Dr. MONRO of Edinburgh, who published his microscopical observations on nerves and muscles, in the year 1783, made chiefly in the solar microscope, goes so far as to consider muscular fibres to be the continuation of nervous fibres, and gives an engraving of the mode in which the one terminates, or is lost in the other. Dr. MONRO, it is evident, had never seen a single fibre either of a nerve or muscle, only fasciculi of them, and found them so much alike as to be led to consider them the same. Both LEUWENHOEK and MONRO, from the want of a micrometer, were left to guess at relative dimension, and in such guesses were often very unsuccessful.

The globules in the nervous fibre being smaller than in the muscular, oversets MONRO's theory of their being the same; but that both authors, with means so very inadequate to those employed by Mr. BAUER, should have made such approaches to the truth, is highly creditable to them, and must prove highly satisfactory to Mr. BAUER, as well as to the public.

EXPLANATION OF PLATE II.

It represents muscular fibres magnified in different degrees.

Fig. 1. A fasciculus of fibres taken from the bullock's neck, sufficiently dissected to show the separate fibres; magnified 100 diameters.

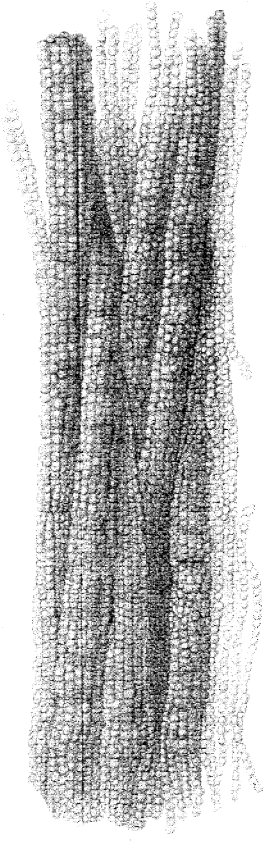
Fig. 2. A portion of the same fasciculus, the fibres more unravelled; magnified 200 diameters.

Fig. 3. A portion of a fibre in its contracted state, consisting of five blood globules, and exactly one inch in length, taken from the bullock's neck; magnified 400 diameters.

Fig. 4. The same length of fibre extended to its utmost, without giving way; magnified 400 diameters.

The calf was selected for this last purpose, the elastic medium between the globules being less brittle in the young than the full grown animal.

Fig. 1.



3.

4.

Fig. 2.