From these facts, and a great many others, it results that in the spinal cord, the sensitive and motor nerves, and the sympathetic, as well as in muscles, there is an increase of the vital properties produced by oxygen.

VI. "Summary of a paper (to be presented) on the Power possessed by Motor and Sensitive Nerves of retaining their Vital Properties longer than Muscles, when deprived of Blood." By E. Brown-Séquard, M.D. Communicated by James Paget, Esq., F.R.S. Received July 3, 1857.

It is an admitted doctrine that the vital properties of motor and sensitive nerves disappear much sooner than those of muscles, after death, or when they are deprived of blood. Although founded on positive facts, this theory is not correct, these facts being capable of another interpretation. In the experiments made heretofore, other organs (such as the spinal cord and muscles) had been deprived of blood, at the same time with the sensitive and motor nerves. To ascertain the influence of the deprivation of blood on nerves alone, it was necessary to experiment otherwise than has been done hitherto. I will in this short summary show, only by a few experiments taken at random among many, that the essential vital properties of sensitive and motor nerves can last longer than muscular irritability after a complete or almost complete deprivation of blood.

Exp. 1.—After having placed ligatures around the arteries of the upper part of the thigh of a young Guinea-pig, I amputated the limb, leaving the sciatic and crural nerves uninjured. In the whole length of the thigh I then laid bare these nerves, and dissected their neurilemma all along, so as to cut away as much as possible the little supply of blood they received from above. Voluntary movements existed about 8 minutes in the amputated leg; excitation of the trunks of the exposed nerves continued to produce muscular contractions for 6 minutes more.

In the whole length of the amputated limb, 10 minutes after the operation, sensibility was greater than in the other limbs. Muscular irritability disappeared in the amputated leg from 30 to 40

minutes after the operation, and cadaveric rigidity began in some of the muscles between the 32nd and 35th minute, and was fully established between the 45th and 50th minute.

For more than 70 minutes sensibility remained in the toes and in the skin over the rigid muscles. There was a slight degree of sensibility still evident in the skin of the knee 110 minutes after the operation.

It follows therefore that the duration of the essential vital property of the sensitive nerves may last at least twice as long as the essential vital properties of muscles after deprivation of blood.

Exp. 2.—In a large adult Rabbit I divided the posterior columns of the spinal cord in the dorsal region, so as to leave the sensibility of the hind limbs increased. I then amputated one of these limbs in the upper part of the thigh, leaving the sciatic and crural nerves uninjured, except that I took away their neurilemma in the whole length of the thigh.

The amputation had been made at nine o'clock, A.M.

At 9·15 there was a notable hyperæsthesia in the two hind legs, greater in the amputated side than in the other.

At 10·20′ the hyperæsthesia was at least as great in the amputated limb as in the other.

At 11·15 muscular irritability was much diminished in the amputated limb; sensibility was still very great in this limb, but inferior to that of the other.

At 12 M. no trace of muscular irritability existed in the amputated limb, and cadaveric rigidity had begun almost everywhere. Sensibility, though diminished, was still as great as in the anterior limbs.

At 1 P.M. traces of sensibility were still very evident in the whole skin of the amputated limb.

At 1·15 still some traces of sensibility, which disappeared at 1·30.

In this experiment, as well as in the preceding, the sensitive nerves kept their vital property much longer than the muscles after deprivation of blood.

In all the similar experiments that I have made, I have obtained the same result. But as I have found and shown elsewhere that the vital properties of nerves may be increased by the influence of the oxygen of the atmosphere, there was in the experiments above related a cause of error in the comparison of muscles with sensitive nerves.

Besides, in one of the experiments I have mentioned, the sensibility had been increased in consequence of the section of the posterior columns of the spinal cord. I will therefore relate an experiment in which there was no cause of increase of the vital properties of the sensitive nerves.

Exp. 3.—On a vigorous adult male Guinea-pig I tied the common iliac artery, on the two sides, at 15 minutes past three, P.M.

At 3·25 very weak voluntary movements remained in the posterior limbs; their sensibility almost normal.

From 3·25 to 3·35 slight convulsions in the posterior limbs.

At 4 o'clock muscular irritability was much diminished in the posterior limbs; sensibility not so much diminished.

At 4·30 cadaveric rigidity had begun everywhere, in the posterior limbs; sensibility, though greatly diminished, still existed.

At 5·20 cadaveric rigidity very strong; traces of sensibility still very evident.

At 5·50 the last traces of sensibility disappeared.

This experiment shows that the vital property of sensitive nerves, deprived of blood, lasts longer than that of muscles in the same circumstances.

In the experiments made by other physiologists on this subject, they had put a ligature around the aorta, sufficiently high to diminish circulation in the lumbar region of the spinal cord, and the loss of sensibility which then soon took place in the posterior limbs depended upon the diminution of function of the spinal cord, and, as my experiments show, not on the loss of the vital property of the sensitive nerves of the posterior limbs.

To find out the difference of duration of the vital property of motor nerves and of that of muscles, I have made many experiments of the following kind:—

Exp. 4.—I laid bare the sciatic nerve in the whole length of the thigh of a strong adult Rabbit, and dissected its neurilemma, so as to cut away all the small blood-vessels running on this nerve. I then did the same thing with the crural nerve. Three hours afterwards, a slight diminution of voluntary movement and of sensibility was observed; two hours later, sensibility and voluntary movement were still persisting, though notably diminished.

Five hours still later, sensibility had increased, while voluntary

movement remained the same. I then divided the two nerves as high as possible, and, afraid that there might be some small blood-vessels still giving blood to the nerves, I dissected the whole length of their trunk for the second time. *Near the section, the nerves remained able to cause muscular contractions for seven hours.*

Experiments more or less similar to this one have given very nearly the same results, and I am therefore led to conclude that, with the least quantity of blood, motor nerves retain their vital property *very much longer* than muscles. If motor nerves in a limb separated from the body of a living animal seem to lose their vital property sooner than muscles, it is because, as I will prove in another paper, the transmission of the nervous force from the last nervous ramifications to the contractile elements of muscles, soon becomes impossible in the absence of blood charged with oxygen.

From the facts above related, and from many others, I think I am entitled to conclude that the vital properties of motor and sensitive nerves may last longer without blood than muscular irritability.

VII. "Ocular Spectres, Structures and Functions, Mutual Exponents." By James Jago, A.B. Cantab., M.B. Oxon., Physician to the Royal Cornwall Infirmary. Communicated by R. Were Fox, Esq., F.R.S. Received August 22, 1857.

(Abstract.)

Section I.—*Introduction.*

Our visual organs are not only capable, by an adjusting lenticular system, of painting, under varying conditions, images of luminous objects, upon a membrane in special relation with the brain, but involve many adjuvant structures; and thus it happens that they reveal to us a number of adventitious phenomena—spectres as we may call them, whether caused by light at the parts that cover the eyeballs, or within them, or by any stimulus whatever affecting the special nervous tract. These must be eliminated, if we would avoid the risk of ascribing effects begotten by subordinate parts to more integral portions of the apparatus.