

Periscope.

PHYSIOLOGY (INCLUDING PHYSIOLOGICAL PSYCHOLOGY.

The Muscular Sense. (*Revue Philosophique*, April, 1887.)

At the February session of the *Société de Psychologie Physiologique*, MM. E. Gley and L. Mariller presented some facts bearing on the much-vexed question of the muscular sense, and the feeling of effort. The experiments were made on a patient who had completely lost sensibility in the upper part of his body as far down as his umbilicus. He perceived neither contact, nor heat or cold, nor pressure, nor pinching, nor twisting of the arms; and electrical stimulation was absolutely without effect. The sensibility in the lower part of the body was preserved although obtuse. The experiments were as follows: 1st. His eyes having been bandaged, his arms were placed in many different positions without his knowing that their position had been changed. The arm was flexed and extended alternately without his perceiving it. The patient having placed his hand on his knee, the hand was taken away without his knowing it and raised above his head, the hand of the experimenter being placed on the subject's knee; the patient thought his own hand was on his knee. Unable to measure the amount of power that he uses, he breaks the objects that he handles when he does not look at his hands. 2d. His eyes being bandaged, a weight of 2 kilogm. was attached to his wrist, the forearm being flexed horizontally, and his elbow being placed on the edge of the table, in the manner of Donders and Van Mausveldt for studying the muscular elasticity. The string being cut the weight fell (without noise), and the arm quickly flew back, but the patient was not conscious of any movement and thought his arm had not moved. Similar experiments made with weights of 100 gm., 200 gm., 500 gm., 1, 2, and 5 kilogm. gave the same result; he perceived neither the movement of the arm, nor the effort necessary to hold up the weight, nor the difference in the weights.

3d. Asked to lift three similar closed vessels (two empty and weighing 250 gm., the third filled with mercury and weighing 1,850 gm.), he says all three are of equal weight. Repetition of this on succeeding days gives the same result. His eyes being bandaged, he is asked to lift a weight of 11 kilogm., but he does not perceive that he is holding a very heavy object and lets it go without attempting to retain it in his hand.

4th. With his eyes closed he cannot distinguish between a piece of modeller's wax, a piece of very hard wood, a large rubber tubing, and a folded and wrinkled newspaper, feeling no difference in resistance and not perceiving that he held anything in his hand.

This experiment appears very important to the authors as showing that the disappearance of the sensibility of the skin and of all the subjacent parts carries away also the feeling of resistance, that is to say, that form of muscular sense that has especially served the classical psychology to uphold its theory.

5th. His forearms were tied very tightly to a table so that he could not move them. He was then asked to fold his arms and to say when he had done this. He always thought that he had completely succeeded in folding them, whereas he moved them only slightly; his reason for thinking that he had accomplished the movement was because of the time that he had occupied. This last experiment is not cited as a proof of the non-existence of the muscular sense, since alone it is susceptible of two interpretations; but in view of the preceding experiments this interpretation is thought to be the only legitimate one. It is important to note that the statements of the patient himself show the importance of the notion of time in the appreciation of movements, since the indications furnished ordinarily by the sensations are lacking. These experiments are held by the authors, and with good grounds, to show that the disappearance of the superficial and deep sensibility carries with it the disappearance of the muscular sense, since, if he has still, with his eyes closed, some appreciation of movements, it is due especially to the knowledge of the time it takes to effect them, and perhaps also to an obscure consciousness of the modifications of respiration. If some movements may still be accomplished—and they can only be performed imperfectly when the sight does not direct them (*motor memory*)—this is due on the one hand to habit and on the other to the motor power of the images. The experiments add to the weight of cumulative evidence against the theory that the feeling of effort is due to a feeling of innervation ("*innervationsgefühl*"), and go to show that it is due to *afferent* sensations "coming from the tense muscles, the strained ligaments, squeezed joints, fixed chest, closed glottis, contracted brow, clinched jaws, etc." (Prof. James).

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The Muscular Sense; its Nature and Cortical Localization. By H. C. BASTIAN, M.D. (*Brain*, April, 1887).

The object of this long and exhaustive article, recently read before the Neurological Society of London, is to prove that the so-called motor centres of the cerebral cortex are in reality the cortical termini of muscular-sense impressions.

Starting from the proposition that all purposive movements are guided by sensations or by afferent impressions of some kind, the author proceeds to discuss these "kinæsthetic impressions." Impressions of various kinds combine for the perfection of a sense