

vidual being then in abeyance, like his judgment. In short, Dr. Bancroft aptly concludes, the organism has then for the time become an automaton, uncontrolled, and actuated by suggestions more or less subconsciously received in normal hours.

GEORGE V. DEARBORN.

On the Measurement of Mental Activity through Muscular Activity and the Determination of a Constant of Attention. JEANNETTE C. WELCH. Am. Jnl. of Physiology, Vol. I., No. 3, May, 1898, pp. 263-306.

This is an article, timely and concise, describing work done in the Hull Physiological Laboratory of the University of Chicago. It is a 'continuation' of a research reported by Professor Loeb in a preliminary communication published in 1886 ('Muskelthätigkeiten als Maass Psychischer Thätigkeit,' 'Arch. f. d. ges. Physiol.,' XXXIX., p. 592). An important part of the report is that wherein the dynamograph of Loeb, with which the work was done, is illustrated and described. This piece of apparatus will doubtless become common in psychological laboratories, it having some advantages over those now generally in use. It consists of an axle to which is attached below a short flat bar of spring-steel, which when in use impinges against an iron wedge, adjustable in position by a screw. To the upper side of the axle is attached a rod connected to the handle in which the subject's fingers are placed, while the palm of the hand gets its purchase from a small iron post. From the upper portion of the axle's surface a writing lever projects to the surface of a kymograph record-drum.

Miss Welch found that, when various sorts of mental activity were practiced simultaneously with the static maximum contraction of the hand, the physical force decreased in proportion to the attention required upon the mental efforts. The mental work was various in kind, and comprised such exertions as counting the conflicting rhythms of pendulums, strained visual perception, reading, writing, adding, multiplying, etc. By measuring the ordinates and abscissas of the curves traced by the dynamograph the 'constant of attention' was determined in each case, and this afforded the means for determining the concentration of attention required in the various sets of experiments.

This constant of attention was found according to the formula $\frac{P-p}{P}$.

In this P represents the maximum pressure of the dynamograph, *i. e.*, its records when the attention was wholly upon the muscular work; p represents the maximum of the muscular effort with concomitant mental work.

The determination of this constant was found to be no easy task, but in case of some subjects quite satisfactory results were obtained. The attention-constant in the case of one subject was found to range from 0.22 during the 'registration of the vibration of a pendulum by pressing one tube, the perception being visual,' to 0.585 obtained as a mean while 'counting the register of the fifth vibration of a metronome and the second vibration of a pendulum'—the most difficult of the mental tasks imposed.

It was found that the constant of attention for any activity increases with (1) the effort of accommodation of the special sense-organs; (2) the effort in coördination of the muscles; (3) the effort of the memory, and (4) the number of simultaneous 'activities.' It seems likely to the experimenter that all control of the body depends upon inhibition-impulses. "After a certain amount of practice," says Miss Welch, "and with care to have like conditions in every case, I believe that the mean constant of attention for any mental activity can be determined for every subject with as slight variation as the personal equation in time-reaction."

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The Reinforcement of Voluntary Muscular Contractions. ALLEN CLEGHORN, M.D. Am. Jnl. Physiology, Vol. I., No. 3, May, 1898, pp. 336-345.

This is a report of a research conducted in the Harvard Physiological Laboratory to determine what effect sensory stimuli have upon voluntary muscular movements. The stimuli employed were light (from a 32 c.p. glow-lamp), a sudden sound (hammer falling on a tin disk), and induction shocks on the skin (of the arm). These were applied by electrical mechanism at the instigation of the movements studied. A Mosso's ergograph was employed, the resistance being two kilograms.

It was found that a sensory stimulus applied just as the muscles began to contract caused an increase in the recorded contraction, as other experimenters have reported. On the other hand, the relaxation phase of the phenomenon is shortened by a sensory stimulus applied at the beginning of the contraction.

The substance of the experimental portion of this report may be given briefly thus: The average duration in seconds of a voluntary muscular *contraction* with simultaneous sensory stimulation is with light 0.49; with sound 0.47; and with induction shock 0.44, in contrast to 0.51, 0.43 and 0.38, respectively, without sensory stimulation.