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SOME PSYCHOLOGICAL EXPERIMENTS[1]

IF one of us lifts a hand as soon as a sound is made, the interval elapsing between the sound and the movement will be in the neighborhood of one seventh of a second. This reaction time is measured in thousandths of a second because it is so short and so regular that a very small unit is required. The symbol σ for a thousandth of a second, corresponding to μ for a thousandth of a millimeter, was introduced by me in psychology before it was needed in any physical science. It is evident that in making such measurements psychology is an experimental and an exact science.

During the brief period of the reaction a complicated process takes place. The sense-organ responds in a selective way, the impulse travels along a sensory nerve and perhaps through the spinal cord to lower centers of the brain, then to a higher center, where a selective impulse is formed and is sent back through motor centers and tracts to a muscle that it innervates. The study of these processes and organs—receptors, conductors, reflectors, effectors—belongs primarily to physiology, but any consciousness that may be involved and the total response of the individual are the province of psychology. The sensori-motor arc is a unit; physiology and psychology are as closely interwined as are physics and chemistry in the study of the atom.

The time of reaction varies with the stimulus and the movement, with the condition of the sense-organ and the muscle, with the paths of conduction, with the situation in the nervous centers. Thus the time for a given individual may on the average be 1σ—one thousandth of a second—longer with the left hand than with the right. It may be 20σ longer for light than for sound, a photochemical process in the retina being here involved. It may be 2σ shorter when the intensity of a sound is doubled; thus in so far as there is a logarithmic relation we have the beginnings of a mathematical psychology. The time depends on the condition of the brain centers as related to attention, fatigue and other factors.

As there is no break in continuity between the fertilized ovum and the adult, or, apart from mutations or possible critical points, between the unicellular organism and the highest vertebrate, so

[1] Address of the retiring president of the American Association for the Advancement of Science, given at Kansas City on December 28, 1925.