

of voluntary co-ordination among the muscles which are concerned. On the whole, then, it is not improbable that on stimulating artificially these motor-centres of the brain, a physiologist is actually playing from without, and at his own pleasure, upon the volitions of the animal.

Turning, now, from this brief description of the structure and leading functions of the principal parts of the nervous system, I propose to consider what we know about the molecular movements which go on in different parts of this system, and which are concerned in all the processes of reflex adjustment, sensation, perception, emotion, instinct, thought, and volition.

First of all, the rate at which these molecular movements travel through a nerve has been measured, and found to be about 100 feet per second, or somewhat more than a mile a minute, in the nerves of a frog. In the nerves of a mammal it is just about twice as fast; so that if London were connected with New York by means of a mammalian nerve instead of an electric cable, it would require nearly a whole day for a message to pass.

Next, the time has also been measured which is required by a nerve-centre to perform its part in a reflex action, where no thought or consciousness is involved. This time, in the case of the winking reflex, and apart from the time required for the passage of the molecular waves up and down the sensory and motor nerves, is about $\frac{1}{20}$ of a second.