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Reflex Time, Velocity of the Nerve Impulse and Duration of Muscular Contraction in the Tortoise.

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Stimulation by means of condensor shocks and induction shocks was found to be unsatisfactory in the study of the reflex time in non-curarized decapitated or decerebrated tortoises. The fall of a hammer from an electromagnet was used as a mechanical stimulus on the skin of the hind foot. A sharp point attached to the hammer served as a pain stimulus. The skin was covered by tin foil which by contact with a thin piece of copper, closed a circuit through a signal magnet as the hammer struck the tin foil, thus marking the time of stimulation. The leading-off electrodes were non-polarizable, of the zinc-zinc sulfate-sodium chloride type. An Edelmann string galvanometer was used.

A part of the shell was removed by a rotating machine-driven saw, so that the biceps cruris muscle could be used. The time between the stimulus and the electrical variation in this muscle was considered the reaction time. Nineteen determinations on 5 tortoises showed an average of 38.7 sigmas for reflex time. The reflex time was greater the longer the time after decapitation. In one tortoise the reflex time was 32.5 sigmas on the first day, 38.7 on the second, and 47.5 on the third. In another, it rose from 35.7 sigmas on the first to 49.5 on the second day. It seemed difficult to obtain crossed reflexes, but in a few satisfactory records the time for a crossed reflex was found to be 53 sigmas.

For a study of the velocity of the nerve impulse, the sciatic nerve and gastrocnemius muscle were used. The electrical stimulus was applied to the sciatic nerve through non-shielded electrodes, and the action current of the gastrocnemius was recorded. Single break induced shocks were used, and a signal magnet recorded the time of stimulation. The results were quite variable, but the average of 14 determinations was 15.1 meters per second.

The duration of contraction in the above records showed 33 sigmas for the biceps cruris and 24.4 sigmas for the gastrocnemius. All of the experiments were performed in March, in a laboratory in which the temperature averaged 20° C.

Since very little work has been done on the tortoise, it seemed advisable to call attention to the use of mechanical and pain stimuli, to the method of removing part of the shell in order to expose the nerves and muscles, and to the results so obtained.