tion; and by tests in which the animal is aroused to normal activity before its spontaneous "emergence," then re-immobilized.

The stimulus evoking tonic reflex immobility thus serves apparently to release a system of events, possibly synaptic in location, which determines at any moment the duration of a then initiated control of motor elements by suitable stimulation. The nature of this fundamental cycle, of quite appreciable duration, is deducible from the form of the cycle of successive immobilizations.

This view of central nervous processes is rather different from that customarily entertained. It has obvious advantages for the explanation of such general central phenomena as "facilitation," "reinforcement," and "after discharge."

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On the character of central nervous processes.

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Upon what basis central nervous functions operate has been even more mysterious than the mechanism of nerve-fiber conduction. A large rôle is assignable to the synaptic junction, and to its changes in resistance. Attempts to show that memory and forgetting, favorable to analysis because of their duration and gradual change, are really due to the modification of materials in the cortex, have not been altogether convincing. The development and decay of speed in the execution of a simple action has been described (Robertson) with the aid of the formula of autocatalysis, but it can scarcely be held that this result demonstrates the autocatalytic transformation of a synaptic material concerned in central transmission.

The reflex immobility of certain arthropods, and particularly of the isopod *Cylisticus convexus*, is found to be of rhythmic

duration. If suitably stimulated following spontaneous emergence from induced immobility, the isopod again becomes immobile, but for a longer time; the duration of later acts of immobility decreases. Continuously repeated tests of this sort show a periodic rise to a certain maximum duration. The amount of this maximum duration is determined chiefly by the temperature. At 6°, the maximum duration is 270 sec.; at 29°, 23 sec. The cycle of immobility is not the reflection of a general metabolic cycle, but is determined by a central nervous process initiated by the first stimulations of the series of trials.

The relation of temperature to the processes underlying the duration of reflex immobility involves comparing the durations at different temperatures but at *corresponding stages of the cycle.* Between 5° and 16° the maxima lie upon one exponential curve with respect to temperature; above 16°, and continuing to 30°, the maxima lie upon an interesting exponential curve of lesser slope. The exponential relation of duration to temperature makes it likely that the duration is determined by an amount of substance produced in a chemical system, rather than that the maxima in the duration curves are to be considered points of minimum "speeds of emergence" from the immobile state. The curves are in fact fitted by Arrhenius' equation,

$$K_2/K_1 = e^{\frac{\mu}{2}\left(\frac{T_2 - T_1}{T_2 T_1}\right)}$$

with $\mu = 24{,}000$ for the range 5°-16°, $\mu = 9{,}200$ for 16°-30°. These values of μ are within the range characteristic for chemical processes.

It appears, then, that the duration of an act of reflex immobility is determined by a condition similar to synaptic transmissivity continuously maintained for the duration of the act, and itself proportional to the amount of a substance formed by and broken down in two catenary processes having different temperature coefficients.

This general view may be extended to the consideration of "synaptic resistance" in vertebrates. It places certain phenomena of selective transmission in the central nervous system very definitely within the chemical sphere.