28 (2260)

Reflex immobility and the central nervous system.

By W. J. CROZIER.

[*From the Zoölogical Laboratory, Rutgers College, New Brunswick, N. J.*]

A thoroughgoing theory of animal conduct must be prepared to deal successfully not merely with the orienting movements of animals, as Loeb's tropism conception and the work related thereto seems capable of doing; it must also be in a position to treat the problem of quiescence at one moment, movement at another, and in general the whole matter of "physiological states" in which the central nervous system functions as adjustor organ. The inducible tonic immobility markedly developed among arthropods, often termed "feigning of death" and commonly referred to as an "instinct," provides opportunity for study of just this kind of central nervous function.

The length of an act of immobility initiated by appropriate stimulation of an insect or crustacean is in reality determined by the duration of a sustained condition in the central nervous system. It is easily shown that in a variety of Hexapods and Isopods with which these experiments have been concerned, the animal gives other well defined reflexes without emergence from the specific immobile state. With *Ranatra* in particular several striking proofs are obtained of the reciprocal innervation of the appendages and of the orientations of their central connections.

Nevertheless, as Raboud has insisted, in each organism there are certain peripheral loci stimulation of which at once arouses an immobile specimen at the will of the experimenter.

The duration of successive acts of immobility is rhythmic. In Isopods at least, the rhythm does not exist as a general metabolic rhythm on which the observations are, so to speak, superimposed. It is initiated by the first stimulations of a series. Once initiated, however, a cycle rises to a maximum of possible duration, then falls to practically zero duration, independently of further excitations. This is proved by results of tests in which various known intervals elapse between acts of immobiliza-

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."

29 (2261)

On the character of central nervous processes.

By W. J. CROZIER and H. FEDERIGHI.

[*From the Zoölogical Laboratory, Rutgers College, New Brunswick, N. J.*]

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