tion but incomplete (Fig. 5). Thus the muscle reproduces those phenomena which are similar

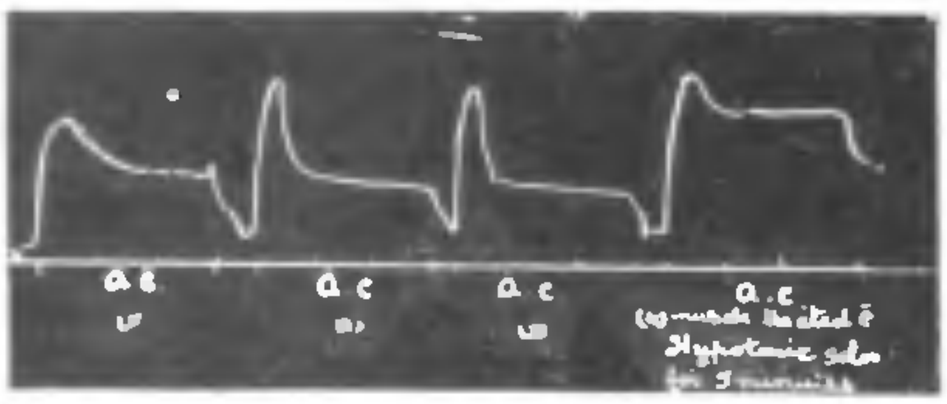

FIG. 5. *Mytilus* muscle. Stimulation with A.C. 10 volts for 3 minutes each.

to those of sleep of varying intensity. In some individuals sleep is disturbed often during the night; such a condition in muscle is shown in Fig. 6. This curve will also represent sleep

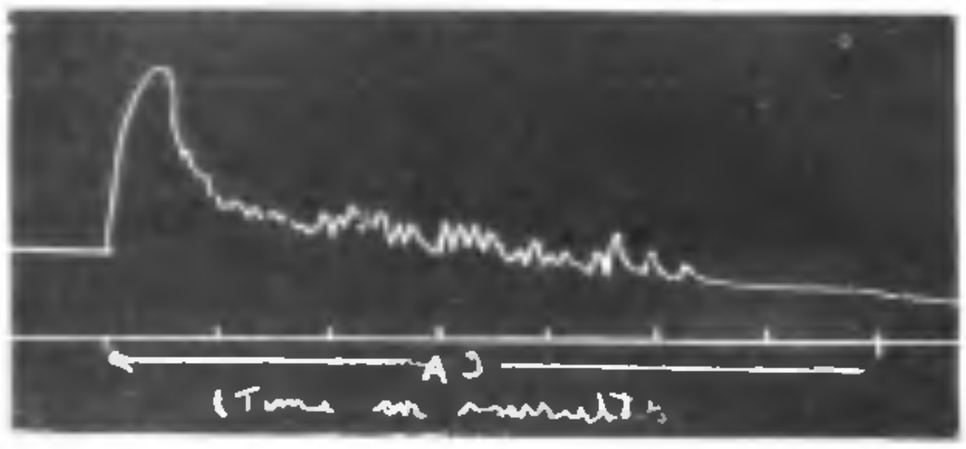

FIG. 6. *Mytilus* muscle. Stimulation with A.C. 10 volts.

with dreams. In some individuals sleep may be deep of short duration. This will be due to rapidity of adaptation to initial adaptation, as may be found in unstriated muscle.

Evidence that sleep is due to adaptation.—If sleep is due to adaptation, then it will be the result of activity. It is common knowledge that one desires to sleep if one is tired, in unstriated muscle, fatigue and adaptation are the same.[6,7] The great inclination to go to sleep as a result of excessive use of the eyes, the auditory apparatus or muscles is thus accounted for on this hypothesis.

The effect of activity is also shown by the following experiment. Three students did not sleep one night. The next day they could keep awake without much difficulty, but if they attended a lecture on nervous system, and paid attention to it, they fell asleep.

An interesting fact is that in unstriated muscle subliminal stimulation produces inhibition when greater stimulation excites the muscle;[6] this is due to the fact that adaptation accompanying the excitation exceeds the latter, thus causing inhibition insted of contraction. The same appears to apply to sleep. Thus an infant may be put to sleep by rocking, patting or mild stroking of the back; travelling in a vehicle produces sleep. Lullabies act in a similar way. Even adults fall asleep in a running train; monotonous stimuli thus induce sleep; these stimuli if excessive will produce the opposite result. Procedures preparatory to routine sleep in one's life reduce excessive stimulation; thus it is found in unstriated muscle, that if the stimulation is excessive then inhibition or adaptation process is overcome (Fig. 7). Adaptation may not be equal in all

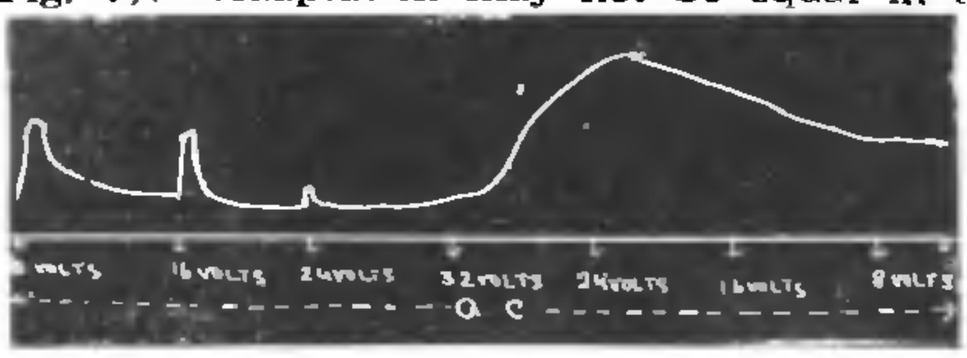

FIG. 7. *Mytilus* muscle. Stimulation with A.C.

parts of the cortex, thus accounting for sleep-walking, dreams, persistence of the sense of time during sleep, sensibility of the mother to the voice and movements of the child.

The injection of dilute calcium chloride into the third ventricle has been found by Demole to produce sleep. So it is possible that sleep is due to local accumulation or liberation of calcium in some part of the nervous system. There is a fall of the blood calcium in normal sleep and in that produced by sedatives and hypnotism.[7] This may be due to its withdrawl by the nervous system.

Adaptation may be effected by chemicals and from impulses from other parts of the brain, such as a "sleep centre". The effect of raw hen's eggs on one kind of insomnia[8] suggests that chemicals may effect this adaptation.

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RADIO-ISOTOPES FROM ATOMIC PILES

THE cyclotron was a useful source of radio-isotopes and put at the disposal of research workers in medicine, biology and chemistry a supply of "tagged" or "labelled" atoms—atoms that can be traced and counted by convenient physical means. But in this field the cyclotron is now eclipsed by the atomic pile that was devised in connection with the atomic bomb programme. The uranium chain-reacting pile is far more efficient for synthesising these isotopes which for the first time are becoming available in really large quantities. Whereas a millionth of a gram of a radio-isotope used to be something to talk about, radio-isotopes are now being prepared by means of the atomic pile in grams and, in some cases, kilograms. A month ago it was announced by the U.S. War Department that one hundred isotopes were coming into large-scale production and would be made available to hospitals, industrial and university research laboratories, and medical research institutions.

—(*Discovery*, August 1946, p. 227).