to revert to those holding for the non-atropinized preparation.

The results obtained from smooth muscle are likewise significant. The siphon muscle of the clam reacts to variation in frequency of stimulation in much the same way as the omohyoid of the turtle, though it relaxes in response to lower frequencies. The frequencies required to cause relaxation of the smooth muscle of the alimentary canal, on the other hand, are extraordinarily high. In one Magnus preparation[3] of the circular coat of the duodenum, taken from a cat anesthetized with urethane, frequencies of 320 and above were required to cause relaxation during stimulation. In a preparation taken from the lower end of the esophagus of a decerebrate cat, and arranged to record the contractions of the longitudinal coat, the myenteric plexus remaining intact, a frequency of 240 per second caused well-maintained, rhythmic contraction. Relaxation took place, however, when the frequency was increased to 400 per second. The latter frequency when applied to the resting preparation, the intensity remaining constant, caused contraction.

These observations tend to establish a definite relation between frequency of stimulation and the response produced in the effector: low frequencies of stimulation are excitatory and high frequencies are inhibitory. The analogy to Wedensky inhibition[4] is close, and we are inclined to account for the results chiefly on the basis of the reduction in magnitude of a propagated disturbance, which travels in the relative refractory phase following its predecessor. This has been shown by Lucas to be true for the sciatic nerve[5] and the sartorius muscle[6] of the frog. We place the seat of reduction of the propagated disturbances to subnormal magnitude in a conducting mechanism of the muscle. The reduced disturbance might be rendered thus subthreshold for the contracting mechanism. Rhythmicity is seen to be explicable on the same basis. Fatigue would lower the threshold of the contracting mechanism and result in relaxation. During relaxation, the contractile forces would be recovered, with a resulting fall in threshold, and the conditions would be established for contraction. The occurrence of contraction, however, would fatigue again the contracting mechanism, and the process might thus be repeated rhythmically. Incidentally, the results indicate that the seat of inhibition for the turtle's heart is within its musculature. They indicate also that the chief cause of the production of Wedensky inhibition may lie in the properties of a conducting mechanism of the muscle fiber.

[3] Magnus, R., *Arch. f. d. ges. Physiol.*, 1904, CII., 349.

[4] Wedensky, N., *Archives d. Physiol.*, 1891, XXIII., 687.

[5] Lucas, K., *Journ. Physiol.*, 1911, XLIII., 46.

[6] Lucas, K., *Journ. Physiol.*, 1909, XXXIX., 331.

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A HIGH RESISTANCE FOR USE WITH ELECTROMETERS

A quadrant electrometer may be used to measure current by two methods: (1) By measuring the rate of deflection when one pair of quadrants is attached to a system of known capacity which is being charged by the current to be measured; (2) by using the electrometer to measure the potential drop across a high resistance through which the current is flowing. The resistance to be used in the latter method should be high, non-polarizable and it is desirable to have it made of such materials that the magnitude of the resistance may be varied to meet the requirements of the experiment. It was suggested by Professor G. N. Lewis that solutions of iodine in non-conducting solvents such as benzene might meet these conditions.

The benzene used in these experiments was washed successively with concentrated sulfuric acid, sodium carbonate solution and distilled water, dried with phosphorous pentoxide and distilled. The iodine used was purified by resubliming the commercial product. The conductivities of the solutions were measured in a glass cell with platinum electrodes which were four centimeters in area and approximately one millimeter apart. The concentrations of the solutions tested varied from 10.62 to 2.69 grams of iodine in 100 cc of solution and the specific resistances ranged from 1.1×10^{11} to 4.8×10^{11} ohms. At the lower concentrations of iodine the conductivity is very nearly proportional to the concentration of the iodine but at higher concentrations the ratio of conductivity to concentration increases slightly. The temperature coefficient is fairly high, the conductivity increasing approximately one per cent. of the value at 20° C. for each degree rise in temperature.

Several resistances have been made using these solutions and have been tested with a Compton electrometer with satisfactory results. The currents which have been measured with this arrangement are of the order of 10^{-15} ampere, but it is evident that by suitable variation of the resistances or of the sensitivity of the electrometer a wide range of currents may be covered. If the resistance is adjusted so that with the maximum deflection observed the potential drop across the resistance is not more than about one tenth of a volt the system rapidly adjusts itself to a change of current. If actual values of the current are desired the system should be calibrated by one of the usual methods.

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