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Electrical stimulation of luminescence in Ctenophores.

By A. R. MOORE.

[*From the Physiological Laboratory of Rutgers University, New Brunswick, N. J.*]

A dark adapted specimen of Mnemiopsis, when subjected to the action of the galvanic current, reacts by a display of luminescence at the anode. In lively specimens the glow may extend to the middle of the animal, and last for as long as five seconds. The instant the current is broken the glow at the anode ceases and a momentary flash occurs on the cathodal side of the animal. These effects are observable whether the current be passed through the animal lengthwise or transversely. If a transverse incision be made in a specimen of Mnemiopsis, then, when the current is passed longitudinally through the animal, in the region of the cut surfaces luminous secondary anodes or cathodes appear whenever the animal is subjected to the make or break of the current. The reaction of Mnemiopsis to the galvanic current therefore constitutes a complete case of "reversed Pflüger's law". The same phenomena may be demonstrated with specimens of Beroe, except that the effect of the break shock is not apparent in a luminescent flash at the cathode. In a solution of pure NaCl no galvanic stimulation of luminescence is possible, but in a solution containing 1 mol $CaCl_2$ to 500 NaCl galvanic stimulation occurs, although the luminescent flashes are of short duration. The current used was from 3 dry cells and from 2 to 10 milliamperes strength.

The fact that secondary regions of stimulation can be created by means of incision proves that the current produces excitation only at the protoplasm-sea-water surface, and that a movement of ions within the cells and their subsequent blocking at the cell boundaries is not in this case the cause of stimulation. This conclusion is further supported by experiments with the spark discharge from an influence machine. Electricity from such a source possesses a potential of several hundred volts and a current strength of less than 1/20 milliampere. The spark discharge is known to have a high physiological efficiency for vertebrate tissues.[1] In order to test the effect of the spark on Mnemiopsis or

[1] Loeb, J., *Pflüger's Archiv.*, 1897, lxix, 99.

Beroe, the specimen was laid on a glass plate. In a moment the luminescence from mechanical stimulation ceased. The animal was now brought as near as possible to the spark discharge; no effect in a luminescent reaction was observed. If the arrangement of the experiment was altered by connecting one of the poles of the machine by means of a wire with the glass plate, then, by bringing the other terminal near the animal, a spark 1 or 2 cm. long could be played over the surface of the animal. The result in the case of Beroe was again negative—no stimulation of luminescence. With Mnemiopsis a slight stimulation occurred when the spark was applied.

For these reasons the question may be raised whether the mechanism of electrical stimulation of luminescence in Ctenophores does not differ from that of electrical stimulation of the neuromuscular system of higher forms.

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Further studies on so-called bacteriophage.

By J. BRONFENBRENNER

[*From the Laboratories of the Rockefeller Institute for Medical Research, New York, N. Y.*]

D'Herelle's hypothesis as to the parasitic nature of the "bacteriophage" is questioned by a number of investigators. However, the evidence which would definitely disprove its animate nature is still lacking. It seemed to us that the question of the nature of the bacteriophage might be approached by the study of its metabolism. The behavior of the bacteriophage with regard to respiration was first studied.

Different amounts of bacteriophage, representing from 5×10^{10} to 1×10^{15} active units, were placed in a microrespirometer, constructed on the general principle of the respirometer of Professor Osterhout, for varying periods of time up to 96 hours at 22° C. It was found that neither entire active filtrates nor the precipitated substance produce any CO_2 in the presence of oxygen. The method used was sensitive enough to indicate production of CO_2