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Examination of the Brain of a Man who Lived Seven Hours after Receiving a Shock of 20,000 volts.[1]

By F. W. Mott and Edgar Schuster.

The material was sent to the Pathological Laboratory, Claybury, for examination by Sir Thomas Oliver on January 12, 1909. It consisted of a small piece of brain showing a small hæmorrhage, the medulla oblongata, and portions of the spinal cord. The following notes accompanied the material, which was preserved in alcohol:—

The notes which we have been able to obtain are extremely scanty. The patient was admitted to the Newcastle Infirmary, and the doctor who sent the case reported that the man had received a shock of 20,000 volts; he lived seven hours after the injury. There were several burns, one large one over the occipital region laying bare the bone of the skull. The post-mortem examination was made thirty-nine hours after death. At the autopsy a hæmorrhage was found in the occipital lobe. In addition to the cerebral hæmorrhage there were petechial hæmorrhages in the visceral pericardium, and the urine in the bladder was deeply blood-stained.

The fluid in which the material came was deeply stained with blood. The portions of tissue were placed in alcohol, and subsequently in xylol, then embedded in paraffin, and sections cut upon the rocker microtome 5 μ in thickness. These were stained by the Nissl method and with polychrome and eosin.

Microscopic examination of the sections showed the following histological changes which are represented in the accompanying drawings made by one of us (Edgar Schuster).

[1] Read at the laboratory meeting of the Section at the National Hospital, February 1.

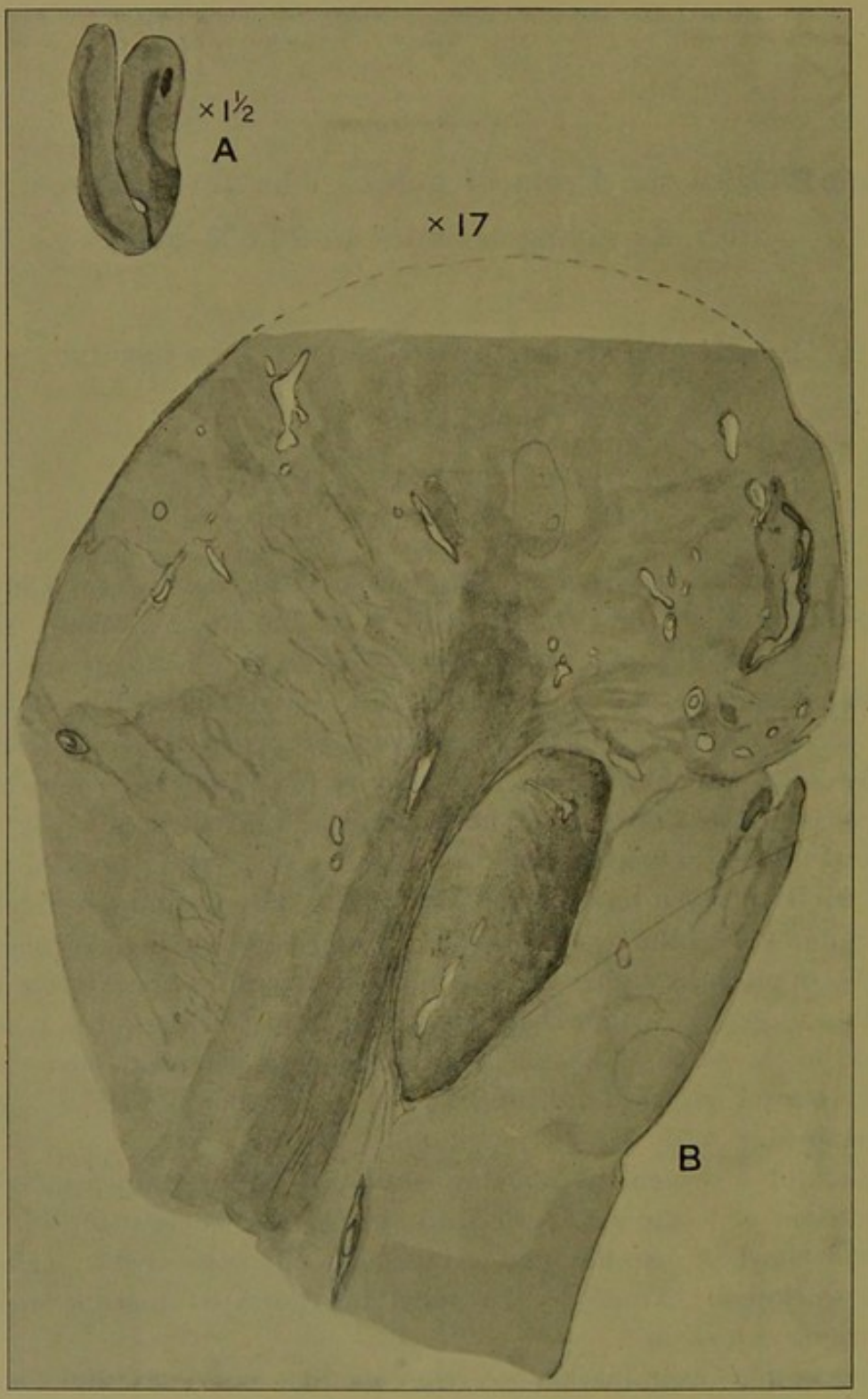

FIG. 1.

A, Small section of occipital cortex, showing a hæmorrhage about 2 mm. long. Magnification 1½. B, The same magnified 17 times.

The hæmorrhage is in the cortex, and is typical of many other hæmorrhages in the cerebral cortex; it is probable that these small vascular hæmorrhages were similar to the petechial hæmorrhages in the pericardium; they were very probably due to the effect of the electric

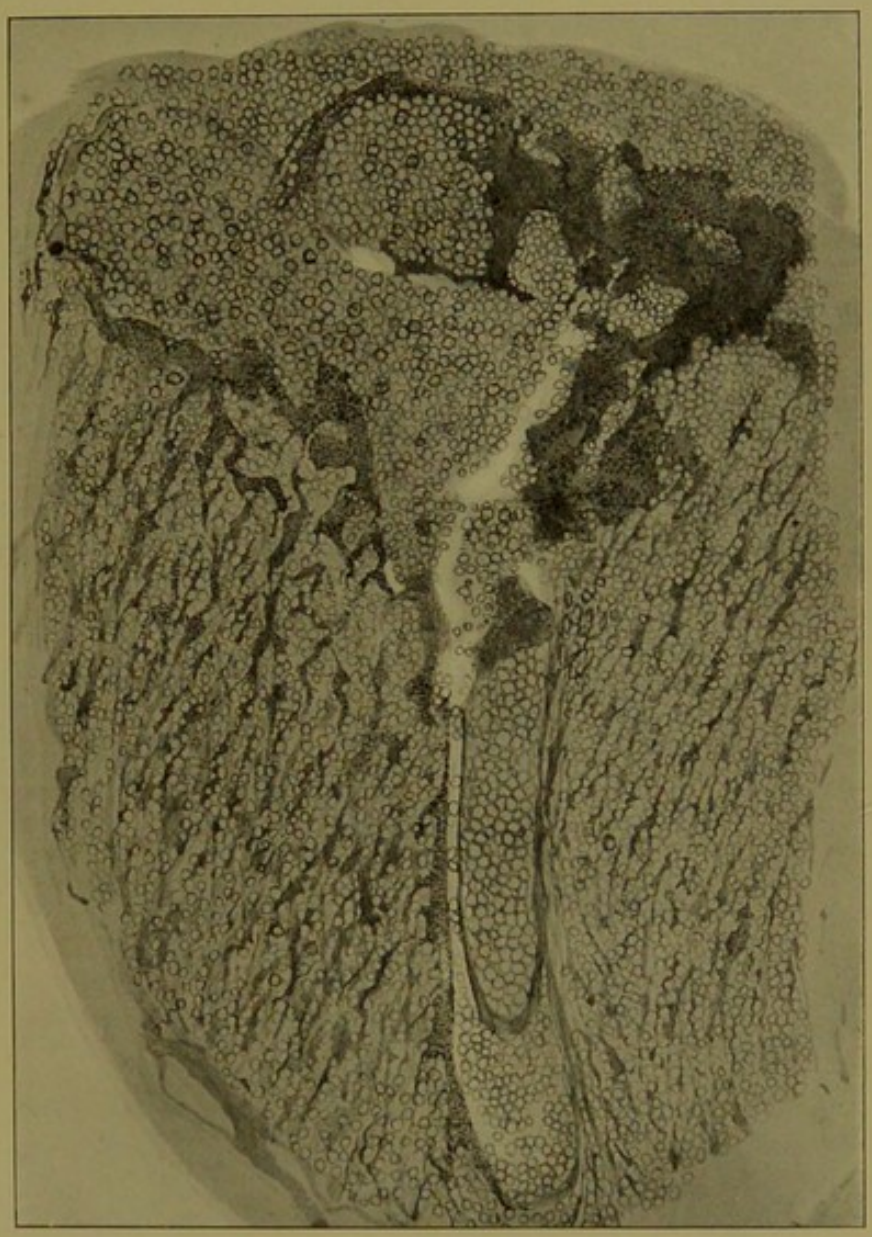

Fig. 2.

Small hæmorrhage into the cortical substance; masses of coloured amorphous substance are seen between the corpuscles, indicating hæmolysis. Magnification 310.

shock on the blood, for we observed in places not only extravasation of corpuscles as seen in fig. 2, but sometimes, instead of corpuscles, irregular masses of amorphous-coloured matter, as if the corpuscles had

undergone hæmolysis. Such a condition would account for the blood-stained urine. In fig. 3 there are seen masses of coloured amorphous substance between the corpuscles. The ganglion cells are uniformly stained a diffuse dull purple, as if they had undergone a change of the

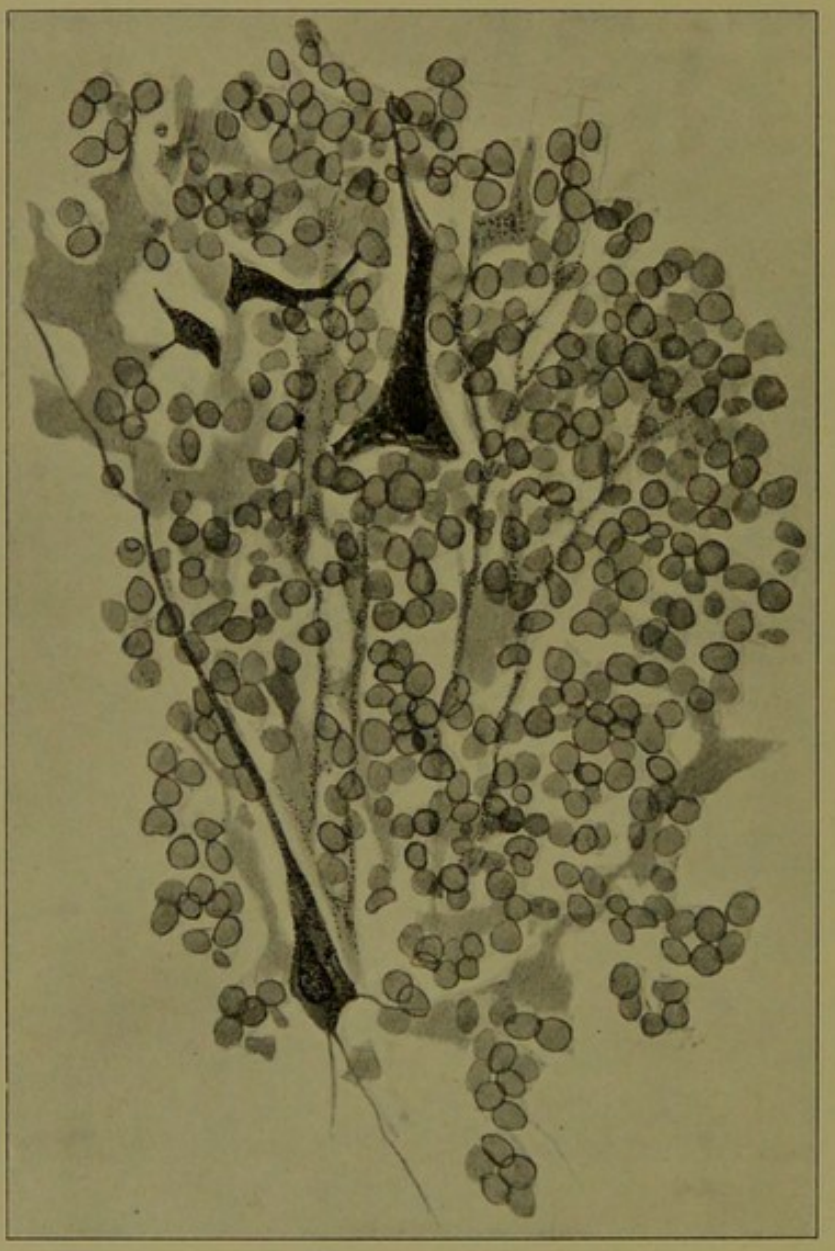

Fig. 3.

Small hæmorrhage of cortex showing several ganglion cells exhibiting a diffuse staining reaction. Between the corpuscles are coloured amorphous masses. Magnification 640.

nature of early coagulation necrosis. The pyramidal cells (fig. 5) elsewhere in the cortex than in the actual hæmorrhages exhibit a change which was found also in the cells of the medulla oblongata (fig. 4)

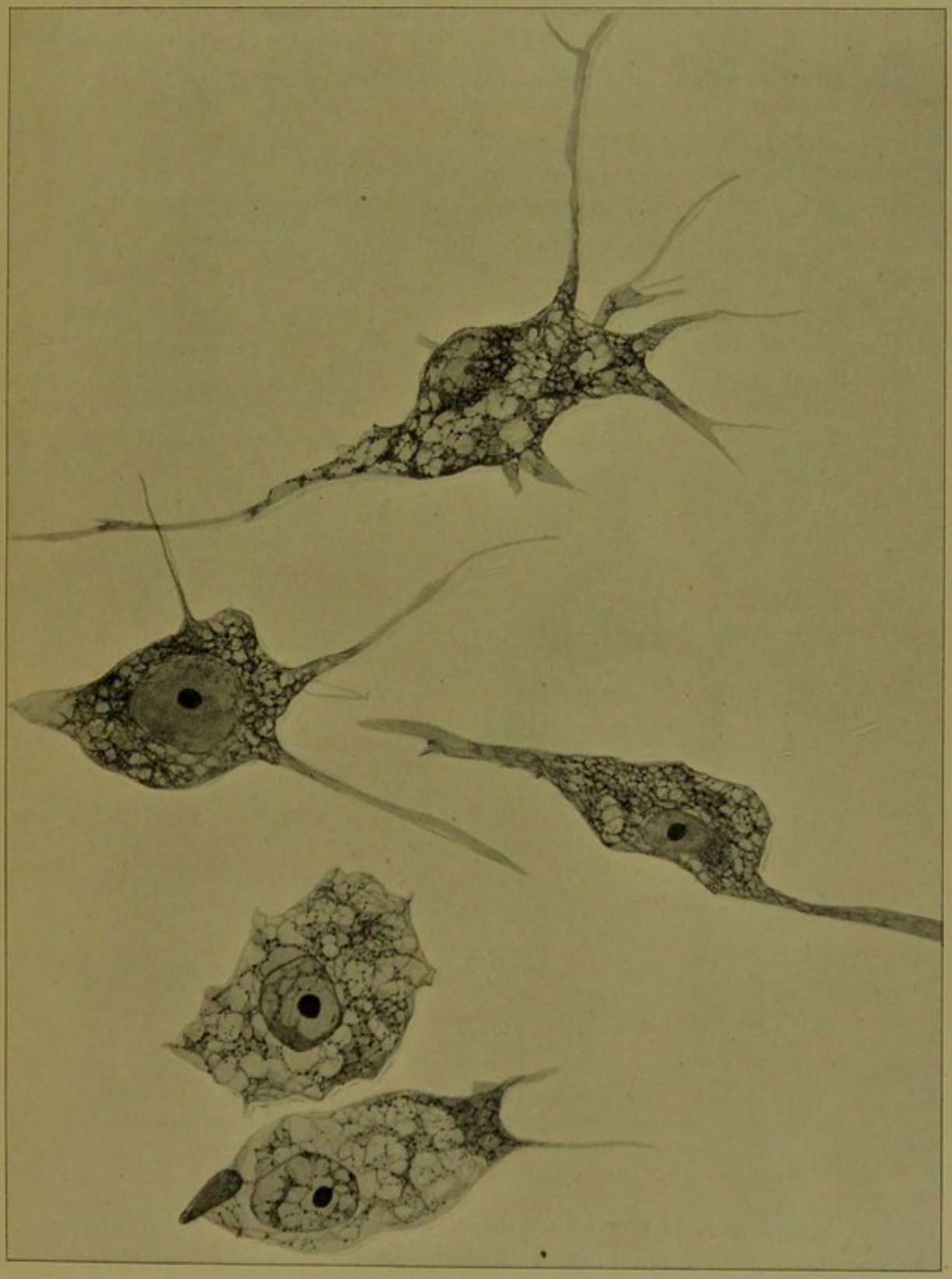

FIG. 4.—Four cells from the medulla oblongata, showing a very diffuse chromatolysis and thereby revealing the intracellular and intranuclear networks. Polychrome staining. Magnification 810.

and the spinal cord. It is one of marked diffuse chromatolysis whereby an intracellular and intranuclear network is disclosed, owing to hardly any of the basophile chromophilous substance being left. That which remains is more or less encrusted on the trabeculæ of the network. I have never seen so profound and universal a chromatolysis, and we

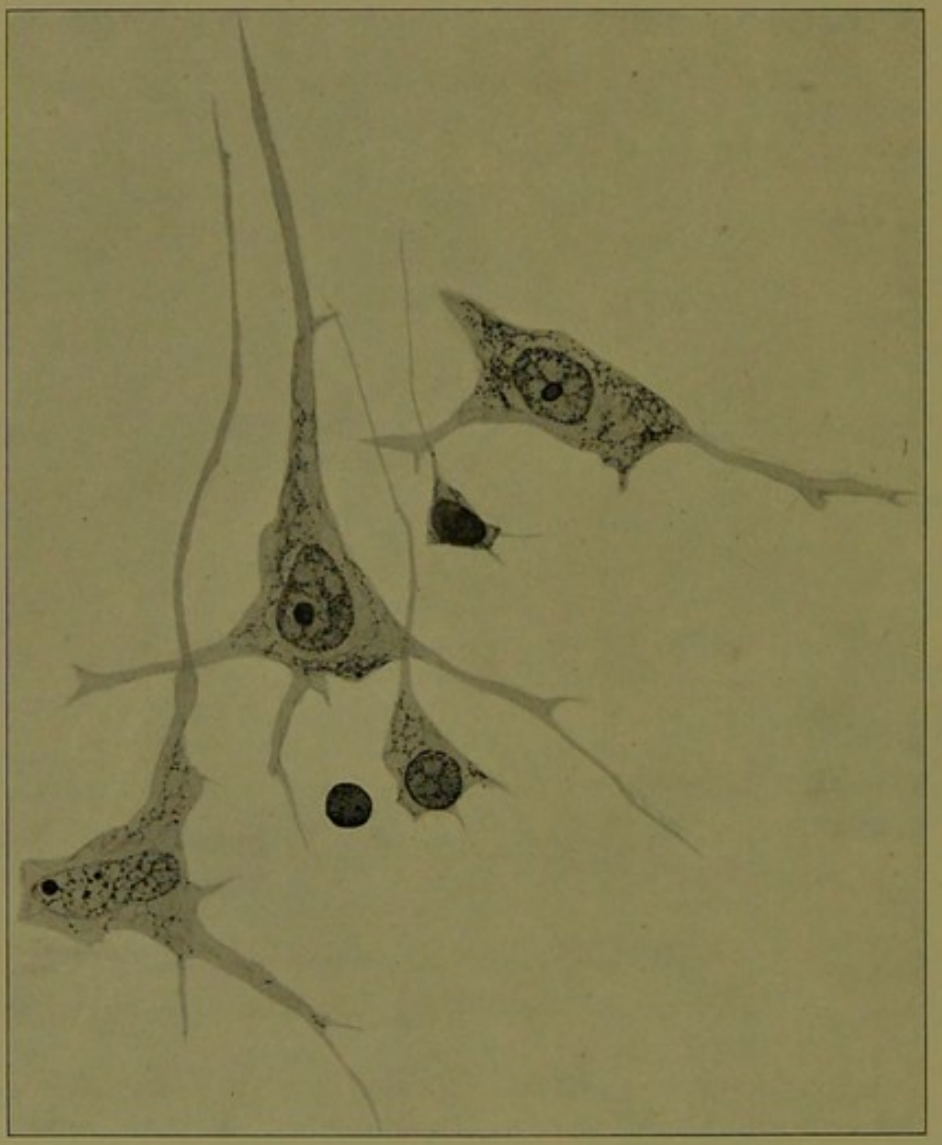

Fig. 5.

Cells of cerebral cortex, showing the same diffuse chromatolysis as the cells of the medulla oblongata. They likewise reveal, in the same manner, the intranuclear and intracellular networks. Magnification 810.

would suggest that it was either directly or indirectly the result of the electric shock. It might be said that the changes may be post-mortem effects, but we have never seen changes like this occur in the medulla

oblongata from post-mortem effects, even though the examination was not made till three days after death; moreover, the accident occurred in the middle of winter. If, then, we are permitted to exclude the changes due to post-mortem decomposition, how can we explain these chromolytic changes? The question may be asked: Did the electric shock directly affect the nervous tissue in such a way that the cells could no longer assimilate material during the seven hours the man lived, and consequently the neurones used up the basophile substance without any subsequent reparation? Or was this change due partly or wholly to the effect on the blood and the circulation? It may be suggested that the electric current not only destroyed the osmotic membranes of a large number of the red corpuscles, thus permitting the hæmoglobin to escape, but at the same time it also destroyed the osmotic membranes of the nerve-cells.

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