An Apparatus for Microscopic Study of Frog Heart *in Situ*

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It has been shown by Gramenitsky, in articles which have since been neglected, that the excised, beating frog heart can be stretched in such a way as to render its atria and sinus venosus translucent and amenable to microscopy (*1, 2*), and that with such a preparation, new discoveries are made possible concerning structure and functioning (*3*). This means of investigation was extended by Fedorov (*4*) and by Smitten (*5*) to a study of the cardiac autonomic synapses.

An apparatus which I have devised, and which I term a *cardiostat,* permits the beating heart to be investigated similarly but without its removal from the body (Fig. 1). A narrow platform serves for placing the frog supine, with its legs straddling. A transverse strip of spring metal on the under surface clips its feet. A shield of coke tin on the end of a strip of metal keeps its head bent under the forward edge of the platform. An inverted shallow cup on another strip of metal restrains the upturned viscera other than the heart. A frame proceeding from the forward edge of the platform serves for the attachment of ligatures through the apex of the heart and the tissues at its base. A vertical shaft under the back edge of the platform supports the latter as it rests on the microscope platform. A system of ways and carriages gives movement in two horizontal directions, and a plate of metal pierced by thumbscrews allows vertical adjustment.

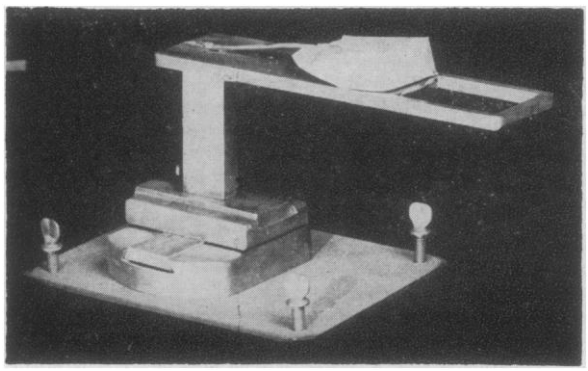

FIG. 1.

By means of the preparation described, the beating heart can be studied under the microscope with its innervation and to some extent its circulation intact. For the former purpose, the frog is to be anesthetized intraperitoneally instead of being pithed.

A preliminary report on the appearance of the vagal synapses in functional and deteriorated states, as investigated by this means, is presented elsewhere (*6*). It may here be noted that without staining reversible changes are visible during synaptic transmission, the end-feet glistening as if with clear exudate and the ganglion cells undergoing a definite enhancement of detail. Morphologic deterioration, it may be added, becomes visible in the form of a slight enlargement of the end-feet, and a permanent enhancement of the cellular detail, within an hour of interruption of the innervation and circulation, and passes after many hours into a second stage, associated with functional deterioration, characterized by a numerical reduction of the visible end-feet, and tenacity of stains on the part of the ganglion cells.

The further range of investigation to which the cardiostat preparation is amenable includes problems of physiology, pharmacology, histology, and cytology. Observations are in progress on these. Excellent visualization, with or without staining, is afforded by an oil-immersion objective used with Ringer's solution instead of oil. Photomicrography and cinematomicrography are eminently feasible.

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Perfect Demarcation of the Diamond Crystal Structure in Germanium

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In our studies of single crystal growth in germanium, careful consideration was given to the advantages of both radiant heating and RF induction heating. Analyses of the advantages pointed to the use of direct radiant heating to eliminate the turbulence caused by induction methods. After this choice was made, it was then necessary to establish a desirable temperature gradient of horizontal isotherms from the lowest temperature at the top to highest at the bottom.

The over-all arrangement of our equipment permits observations of the top surface of the molten germanium. Thus one can watch the germanium nucleate into a single crystal solid. Visible nucleation commences from the top and is associated with definite geometric patterns, which may be triangular, hexagonal, or diamond in nature, depending upon the plane of growth.

Nucleation starts in a very small area, and the pattern formed continues to grow in size toward the sides