The experiments described show that it is possible to equilibrate protein solutions against a buffer within 2 hrs, using Cellophane tubing and a simple mechanical dialyzer. This reduces considerably the time required for electrophoretic examination of clinical material, e.g. blood serum.

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A Simple Aid for the Cannulation of Small Blood Vessels

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Cannulation of the larger blood vessels (1 mm or more in diameter) offers no special difficulty. The most common method is to pick up a small portion of the wall of a vessel with tissue forceps, snip part way through the wall (about one-third of the circumference), lift up the triangular flap with the tissue forceps, and insert the cannula through the opening. If the head of the cannula is not too large for the size of the opening in the vessel, no difficulty is encountered. In the case of smaller blood

FIG. 1. Forceps to aid cannulation of small blood vessels.

vessels, however, such as the artery of the rabbit's ear, the caudal or carotid artery or jugular vein of the rat or mouse, or the aorta of a small frog or toad, cannulation may prove difficult and time consuming. Making the usual cut in the wall of a very small blood vessel is difficult, even with small sharp-pointed scissors, and when this is accomplished, the cut vessel is frequently torn across during manipulation for the insertion of the cannula. For this reason, either a sharp metal needle or sharp-pointed small glass cannula of appropriate size has usually been inserted into the lumen by direct puncture of the wall of the vessel. This has the obvious disadvantage of leaving in the vessel a sharp point which frequently punctures the wall at some other site, if the animal moves or if the cannula is manipulated. For these reasons it is considered of interest to report on the development of a simple contrivance (Fig. 1) which enables the rapid insertion of a blunt glass, metal, or plastic cannula into a small blood vessel.

The lower portions of the two blades of a small tissue forceps are bent at a right angle and sharpened into two thin, short, (about 3 mm) sharp-pointed prongs with flat inner surfaces which can be brought into perfect contact by pressure on the handles. The distance which the blades of the forceps are permitted to separate is first adjusted with the set screw, as shown in Fig. 2. A slight pressure exerted on the handles approximates the prongs of the blades to form a thin, sharp needle with which the wall of the vessel is pierced. Upon release of the pressure on the handles the prongs separate to the predetermined distance, creating an opening through which the head of the cannula can be introduced. The

FIG. 2. Position of forceps during insertion of cannula into blood vessel (×5).

prongs also act as guides for the insertion of the head of the cannula. With the blood vessel held in position, a slight upward pull of the forceps results in an enlarged opening which further facilitates insertion of the cannula. The blades of the forceps are then withdrawn from the vessel, leaving the head and neck of the cannula in place, to be tied in in the usual fashion. Precaution to keep the vessel moist is observed throughout the course of these manipulations. If the head of the cannula is not too large for the opening in the wall and for the lumen of the vessel, the insertion is accomplished easily and expeditiously.

In experiments in which it was frequently necessary to cannulate small arteries and veins as small as 0.3 mm in diameter, this instrument proved of great help. The device can also be used for the cannulation of large vessels, because it facilitates the insertion of a cannula with a head of even larger diameter than that of the natural, undistended lumen of the vessel, and because this is accomplished with a minimum of injury to the wall of the vessel.