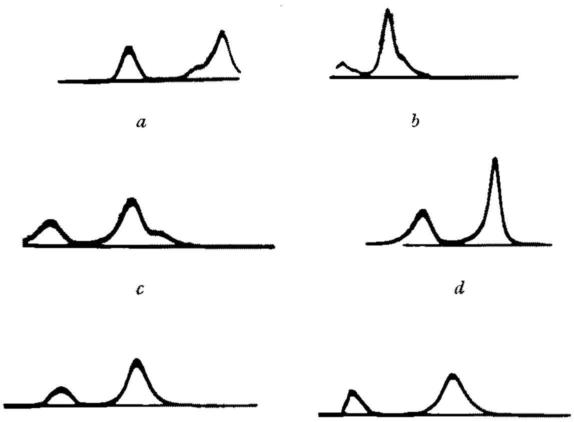
| Preparation | Intrinsic viscosity +25°, 0·16 *M* NaCl | Electrophoresis results | | | | | | Pattern in Figure 2 |
|---|---|---|---|---|---|---|---|---|
| | | Component I | | | Component II | | | |
| | | mobility $U \cdot 10^5$ $cm^2/V \cdot s$ | molecular weight $\times 10^{-3}$ | % | mobility $U \cdot 10^5$ $cm^2/V \cdot s$ | molecular weight $\times 10^{-3}$ | % | |
| ,Intradex' Benger Labs. England . . . . . . . | 0·22 | 1·14 | > 60·0 | 21·8 | 1·76 | 46·6 | 78·2 | *a* |
| ,Dextraven' Benger Labs. England; Nr. 18055 . | 0·26 | 0·99 | ≫60·0 | 65·0 | 1·56 | 53·8 | 35·0 | *b* |
| ,Macrodex' Pharmacia AG., Sweden; A7673A . | 0·24 | 1·41 | 61·0 | 79·2 | 2·36 | 16·0 | 20·8 | *c* |
| ,Expandex' Com. Solv. Corp., U.S.A. Nr. 36610A | 0·20 | 1·59 | 52·4 | 100·0 | – | – | – | *d* |
| ,Gentran' Baxter Labs. U.S.A., Nr. 94090 . . . | 0·22 | 1·11 | > 60·0 | 100·0 | – | – | – | *e* |
| ,Poliglukan' Experimental preparation, Poland . | 0·19 | 1·49 | 57·0 | 100·0 | – | – | – | *f* |

pendent on molecular weight, at least within the molecular weight range of about 18,000 to about 60,000. This relationship has been made use of in determination of molecular weights of investigated dextrans described below.



*a* *b* *c* *d* *e* *f*

Fig. 2.

Samples of clinical dextrans of various manufacturers obtained from commercial sources, were analysed under the same conditions. Typical electrophoretic patterns are presented in Figure 2 *a–f*, and the results of corresponding calculations in the Table.

The above results clearly point to the usefulness of electrophoresis in the analysis of clinical dextrans.

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*Department of Biochemistry, Institute of Haematology, Warsaw (Poland), July 26, 1957.*

*Résumé*

On démontre que l'électrophorèse de dextrans cliniques peut être employée pour la détermination de leur poids moléculaire et de la polydispersité.

PRO LABORATORIO

## Techniques for Making Capillary Microelectrodes[1]

The use of the LING-GERARD capillary microelectrodes[2] in electrobiological research has been rapidly growing. While microelectrodes can be made by hand and commercially made capillary pullers are available, a puller which can be assembled from parts found in a laboratory would have wide usefulness. A technique for rapidly filling capillaries is also described.

The principle of the puller is simple. A short length of soft glass tubing (about 1 mm o.d.) is held in the jaws of a tong-like holder. The tongs are so constructed that approximation of the handles causes the jaws to separate. An elastic band is stretched across the handles, but the jaws are prevented from separating by the capillary tubing. The tubing is heated with a microflame and the softened glass pulled to a fine capillary tip as the result of the restoring force of the elastic band. Simultaneously, with the sudden release of tension, the microflame is automatically pushed aside.

A detailed description of the component parts follows:

A tong-like holder (*A*) may be adapted from any tongs whose arms do not cross over at the pivot point, or may be fashioned from small stock. The ends of the tongs with the wider excursion (of about 4 inches) are fitted with alligator clamps (*B*) in the jaws of which are placed thin strips of rubber. One arm of the tongs is fixed by a clamp, while the other arm is free to move. With the capillary tubing (*C*) inserted, the alligator clamps are approximately 1–2 inches apart. A rubber band (*D*) is looped several times across the opposite ends of the tongs so as to be under stretch when the capillary tubing is in place.

The microburner (*E*) is made from a 13 gauge hypodermic needle flared at the point to simulate a wing tip. The wing tip is made by cutting off the bevel of the needle and pinching the ends with a pair of pliers. The microburner is clamped to a horizontally oriented rod

[1] This work was supported by a research grant from the National Institute of Neurological Diseases and Blindness, U. S. Public Health Service.

[2] G. LING and R. W. GERARD, J. cell. comp. Physiol. *34*, 382 (1949).

bent at 120 degrees and the other end of the rod fixed to a pulley (*F*) to provide movement in the horizontal plane. The wing tip is oriented along the long axis of the capillary.

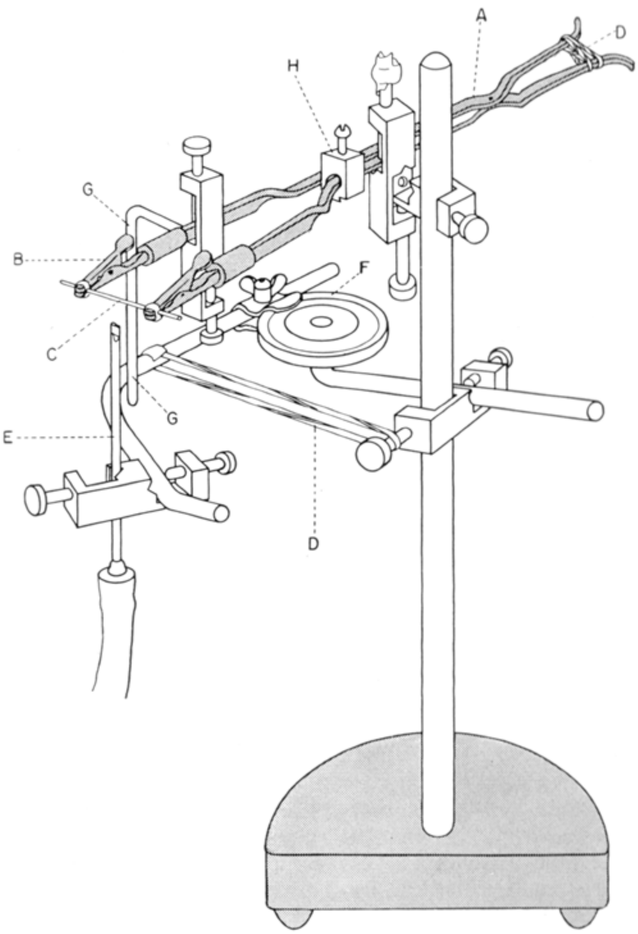


Diagram of micropipette puller.
*A* Tong like holder, *B* Alligator clamp, *C* Capillary tubing, *D* Rubber band, *E* Microburner, *F* Pulley, *G* Vertical rod, *H* Movable stop

A vertical rod (*G*) is fixed to the movable arm of the tongs through a 90° angle and rides in the angle of the horizontally oriented rod holding the microburner. The vertical rod functions as a stop for positioning the microburner and also pushes the microburner aside in the final stage of pulling. In order to align the flame consistently with respect to the capillary tubing, a rubber band (*D*) may be attached between the horizontal rod and a clamp on the stand. A movable stop (*H*) on the stationary arm of the tongs is a convenient aid in the initial alignment of flame and capillary tubing.

The size of the flame and its distance from the tubing seem to be the only critical variables. In general, a small blue cone flame gives the most satisfactory results. Electrodes of less than 0·5 $\mu$ can be fabricated routinely.

The filling of capillary micropipettes under reduced pressure has been in use for some time[3]. It appears worthwhile to describe in detail a simple filling technique which does not seem to be widely known. The capillaries in a plastic rack are held vertically with tips down and shank ends covered by filtered 3 *M* KCl. The top of the rack is a flat disc of the same diameter as the containing vessel, a heavy-walled Pyrex cylindrical jar (4″ × 6″), filled to a level about $^2/_3$ capacity. The cuff of a large sized heavy rubber glove is fitted on the wide end of a Büchner funnel and then stretched down over the Pyrex jar to give a vacuum seal. The solution is heated to almost boiling and reduced pressure then applied from a water pump while the heating is continued. After 5 min air is admitted to the system. It is important that the electrodes are completely immersed in solution at all times during the filling process. Cooling to about 4°C will usually eliminate a small air space which may remain occasionally in an electrode.

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*Résumé*

Nous décrivons un appareil facile à construire pour étirer des microélectrodes capillaires et une manière simple de remplir ceux-ci sous pression réduite.

[3] R. D. KEYNES and H. MARTINS-FERREIRA, J. Physiol. *119*, 315 (1953).

## PRO LABORATORIO

### A Perspex* Moist Chamber for Micromanipulation

A modification of the moist chamber described by FOWELL[1], for the isolation of yeast ascospores and vegetative cells has been constructed from perspex. Incorporated in the design is an easily removable lower floor of glass. This facilitates initial inoculation, final isolation and any intermediate macromanipulation that may be required, without the removal of the chamber roof, on the underside of which the micromanipulation has been carried out.

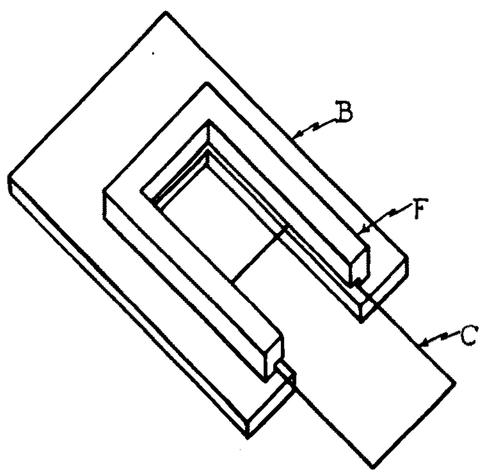


Fig. 1.

The U shaped frame (*F*) is made from $^1/_4$ in. square section perspex and is mounted on the base (*B*) made from $^1/_8$ in. sheet material. The portion of the base lying

* = Plexiglas.
[1] R. R. FOWELL, J. appl. Bact. *18*, 149 (1955).