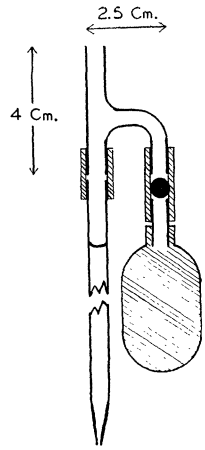

FIG. 1. Diagram of a simple and easily constructed pipette.

the liquid is drawn into the pipette to the desired level, the glass bead is again released. The meniscus is adjusted and the contents of the pipette delivered with finger tip control as with an ordinary pipette.

The apparatus described here does not fulfill the need for a truly remotely controlled pipette. It does, however, provide many advantages over the available types of safety pipettes. (*a*) It is simple in design and inexpensive. (*b*) One can accurately control the delivery of any desired volume of liquid by varying the size of pipettes and rubber bulbs employed. (*c*) Smaller pipettes may be filled several times with a single emptying of the rubber bulb. (*d*) With practice it is possible to accomplish the entire pipetting operation using only one hand.

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Manuscript received September 18, 1953.

Local Refractometry of Cell Particulars with the Cylindrical Lens Microscope

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Cylindrical lens systems, as used preferably in electrophoresis equipments, permit the direct registration of local refractive differences within mobile protein fractions. This ingenious registration method, as described by Philpot (*1*), Svensson (*2*), Wiedemann (*3*), and others, is suitable not only in electrophoretic problems but likewise for studies on resting boundaries and refractive gradients within anatomical microscopic specimens. While by other refractometric methods only the optical properties of one structure point after the other can be measured, the Philpot-Svensson method directly shows the refractive gradients, i.e., the local changes of the product of refractive index × thickness, of the microscopic structures within a rectangular area of the sample and records it. Therefore, the one dimension is available for automatically plotting a diagram of the refractive gradient, and the other dimension is used as abscissa to show position in the object.

Generally, the usual Philpot-Svensson optics within an electrophoresis equipment reproduce an image of an area of 40–50 mm in height; in microelectrophoresis apparatuses the distance may be 10 times less, i.e., a few millimeters. For further biological studies it would be of value to increase the resolving power of the instrument or, accordingly, to minimize the structure particulars which can be analyzed by this method.

For such studies the use of a cylindrical lens microscope (Fig. 1) is recommended. In this instrument the image of the entrance slit (2) is projected onto a revolving slit (5) by means of a schlieren objective (3, 4). The microscopic specimen (7) is placed between the two symmetrical halves of the objective.

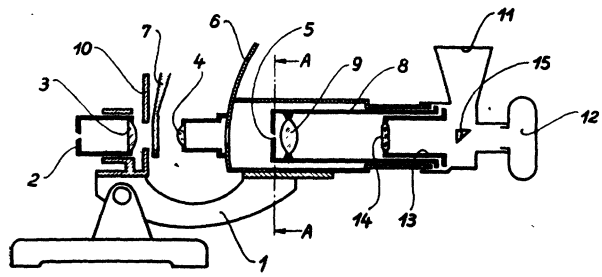

FIG. 1. Scheme of the cylindrical lens microscope.

A small area of the specimen, screened out mechanically, is projected by the lens (9) onto a focusing screen (11) by means of the prism (15) or immediately onto the film of a miniature camera (12). The oblique slit (5) is reproduced by the cylindrical lens (14) as a sharp, vertically arranged line seen as the base line in the final diagram, provided the microscopic specimen is optically empty. In this way each structure detail of the sample, based on differences of refractive gradients, leads to a lateral deviation from the above-mentioned baseline.

If a microscopic specimen is put into such a cylindrical lens system, a result is obtained such as that shown by Fig. 2. These schlieren graphs are taken from different, not fixed, and not stained tissue sections, cut at approximately 30 microns thickness. Each tissue has a relatively characteristic diagram. Homogeneous biological tissue gives relatively uniform diagrams. Complexly composed tissues such as human parenchymatous organs give more complicated graphs difficult to interpret. On the other hand, simple model tests, such as thin glass threads in one or more imbibition fluids, give simple graphs mathematically easy to explain (*4*). Keck (*5*) shows diagrams of skeletal muscle tissue of the isolated singular living muscle

[1] I am indebted to H. Engel of the University's Institute for General Botany for helpful suggestions.

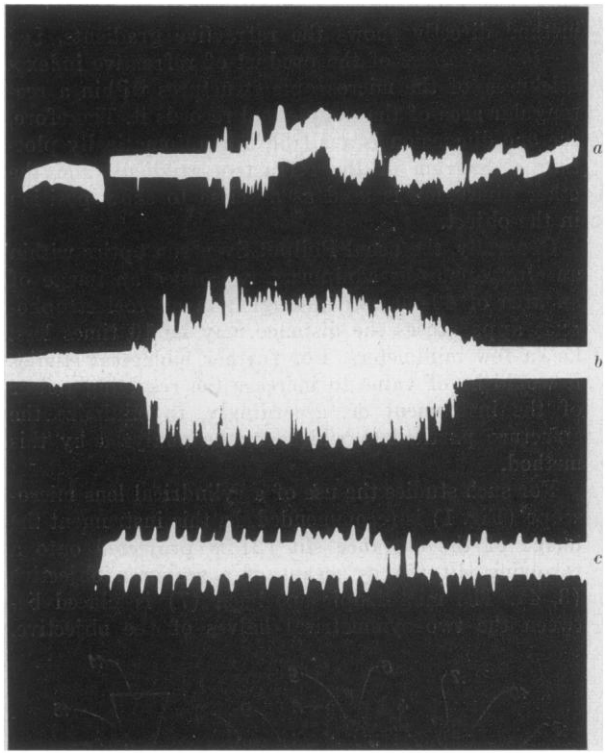

FIG. 2. Cylindrical lens diagrams representing the refractive gradients within a microscopic specimen: *a*, from a colloid-rich goiter; *b*, from skeletal muscle tissue; and *c*, from epithelium tissue of *Allium cepa*.

fiber and likewise of actomyosin obtained in the usual way.

Figure 3 shows the minimal range from which the author was able to take a self-plotting diagram of refractive gradients formed by cylindrical lens optics. The photomicrograph is taken with epithelium cells of *Allium cepa* after experimentally induced plasmolysis. The plasmolysis was carried out according to Cholodny and Sankewitsch (*6*) by short evacuation of small parts of the upper concave epidermis and by immersion of the epithelium cells into a 0.025 *M* potassium chloride solution for 24 hr. Then the tissue was brought into a 0.75 *M* solution of saccharose in 40 min. The rectangle drawn in the photomicrograph signifies the area from which the cylindrical lens measurement can be made. This area includes a part of only *one cell*. Within the cell two clots of the protoplast and a ghost of the nucleus are to be seen. The corresponding schlieren diagram of refractive gradients is given in the lower half of the photograph. Each detail of the cell structure corresponds to a part of the diagram.

This is the smallest area that, at present, can be screened for cylindrical lens measurements and analyzed for self-plotting one-dimensional refractometric studies by the usual Philpot-Svensson optics. The described method gives a more quantitative but less obvious result about local refractive gradients within a biological structure than colored phase contrast or schlieren methods, as published by Sailor-Brice-Zernike (*7*) and by the author (*8*).

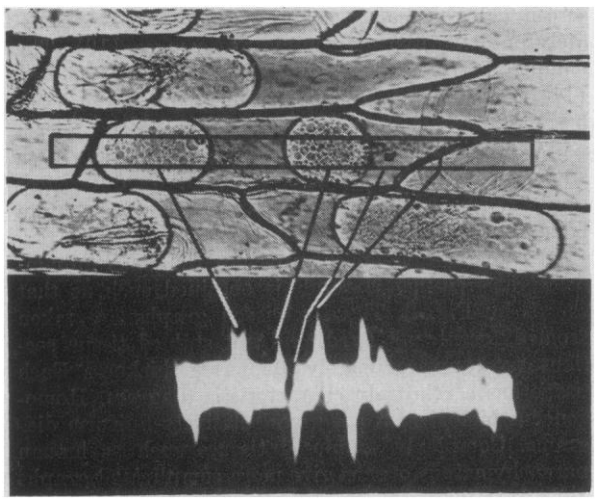

FIG. 3. Photomicrograph from epithelium cells of *Allium cepa* after experimentally induced plasmolysis. A part of one single cell is screened out. Below in the figure is the cylindrical lens diagram corresponding to the inserted rectangular area of the same cell as shown on the photomicrograph above.

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Manuscript received March 9, 1953.

A Technique for Collecting, Mounting, and Sectioning Airborne Particulate Material

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The collection and identification of airborne particulate material is an important part of many studies of the earth's atmosphere. One of the most convenient and efficient methods for collecting such material is by filtration. However, if filtration is employed, it has usually been necessary to remove the particles from the filters in order to identify the material collected. Such removal is tedious and is usually not quantitative.

Recently a technique has been developed in these laboratories for mounting and sectioning such particles without removing them from the filters. The filters are rendered transparent in the process, which greatly aids in determining the optical properties of the sectioned particles. The filters used are the cellulose acetate-cellulose nitrate filters developed by Goetz