the electrical circuit. By opening and closing the stopcock in tube F the mercury in tube G can be brought to the desired height for any temperature. A tube, 1 inch in diameter, of 4-mesh hardware cloth provides a satisfactory shield for the expansion bulb.

In selecting the relay care should be taken that the thermostat circuit has a current small enough to prevent arcing and fouling of the mercury. The types proposed by the authors cited ([1, 2]) are satisfactory, but several commercial makes are also good and are considerably less expensive. Any "super-sensitive," positive-action relay that does not use more than 3 volts at 4 milliamperes should be entirely satisfactory.

The atmospheric-pressure stabilizer suggested by Ferguson and coworkers can be improved by inserting a stop-cock between the upper bell and the air bottle. This enables one to set the apparatus for a given temperature at any atmospheric pressure, to place the upper bell in the water seal without changing the pressure, and then by closing the stop-cock to maintain this pressure except for variations due to temperature on the portions of the glass above the bath. Another suggestion is to place some lead in the air bottle and submerge it in the water bath so as to reduce these temperature effects to a minimum.

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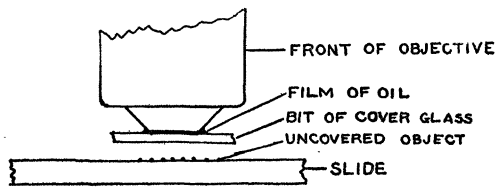
USING A "DRY" MICROSCOPE OBJECTIVE ON UNCOVERED OBJECTS

THE usual type of high power "dry" microscope objective is not satisfactory for use on uncovered objects, as its optical combination is calculated on the assumption that a cover-glass of definite thickness intervenes between the front lens and the object. Such objectives would often be convenient for use on uncovered objects, such as blood smears, small parts of insects, etc., and can be adapted to such use by a simple expedient.

All that is required for the proper working of the objective is the presence of the cover-glass between



the front lens and the object; either on the object, on the front lens or at any point between. Hence, if a bit of cover-glass is fastened over the front lens, the objective will give good images of uncovered objects. The piece of cover-glass may be made to adhere temporarily with a drop of cedar oil, mineral oil or water.

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SPECIAL ARTICLES

THE INTERNAL EXPOSED SURFACE OF FOLIAGE LEAVES

THERE has been increasing realization of the importance of the internally exposed surface of foliage leaves. Much of the water lost and most of the carbon dioxide absorbed by leaves must pass through the cellulose walls bordering on connected intercellular spaces. The rates of leaf functions have often been expressed in terms of external surface but a knowledge of the extent of the internally exposed areas bordering on the intercellular spaces is important and without such information comparisons based on superficial area may not be significant.

Irregularity in the form of mesophyll cells has been probably the greatest barrier to such measurements. The writer has developed a method based on careful camera lucida drawings of the several cell layers in both vertical and horizontal sections; measurements of these drawings were then made with chartometer and planimeter. Formulae were derived to facilitate computation of the ratio between the internally exposed cell wall and the externally exposed surface of selected samples which were free from veins.

Ratios for a few species appear in the following table.

Leaf	Type	Exposure	Thickness	Ratio
Syringa vulgaris	Mesomorphic	Sun	228 μ	13.2
Vitis vulpina	Mesomorphic	Sun	163 μ	11.6
Citrus limonia	Xeromorphic	Sun	238 μ	22.2
Berberis nervosa	Xeromorphic	Shade	254 μ	9.8
Bryophyllum Calicynum	Succulent	Greenhouse	610 μ	7.8

The method, which is too elaborate for description here, involves many measurements of a number of items, averages being used in the formulae. Though many measurements enter into the computation for a given species, differences in the internal organization of leaves even on the same tree indicate that the ratio in a given case should be considered as a mean about which variation must be expected.

Preliminary results, which include other species in addition to those noted above, indicate: (1) that succulents may have a relatively small internal surface ($R = 7.86$); (2) mesomorphic sun leaves though thin