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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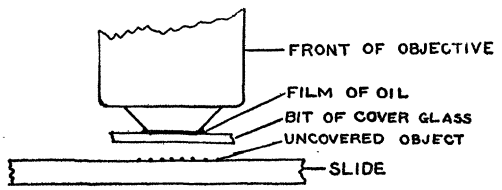
USING A "DRY" MICROSCOPE OBJECTIVE ON UNCOVERED OBJECTS

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

may have a relatively large internal surface ($R = 11.6$ to 16.3); (3) xeromorphic leaves of sun species may have a very extensive internal surface ($R = 22.2$ to 31.3); while (4) xeromorphic leaves of shade species may have a limited internal surface ($R = 8.18$ to 9.88).

Although present data do not warrant final conclusions, the frequent references to the correlation between xeromorphic structure and high transpiration rate may be explained by the high ratio of internal surface in xeromorphic leaves as noted above. The extensive internal surface of such forms is due primarily to the palisade type of mesophyll, commonly found in sun leaves of this type.

The photosynthetic rate likewise seems to be correlated with the area of the internally exposed surface. With this function, however, the importance of the internally exposed area may be somewhat enhanced by the properties of cellulose itself. A more complete account of methods with formulae, data and discussion will be published soon.

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PREDOMINANT STRAIN OF B. INFLUENZAE IN INFLUENZAL MENINGITIS[1]

IN contrast to the multiplicity of strains of *B. influenzae* derived from the respiratory tract and other sources, over 50 per cent. of the strains of influenzal meningitis fall into one group. In the original work of 1921 the author found that 4 out of the 7 strains of *B. influenzae* from influenzal meningitis in her possession fell into one group, while the other 3 seemed to be all different. Rivers obtained our 7 cultures and 6 more from outside, and though he differed from us in the grouping of our cultures, stated that he has been able to confirm and extend our results showing the existence of definite groups embracing the majority of the available strains of influenzae bacilli isolated from cases of meningitis. We continued our studies with the predominating type exclusively up to date and find that the ratio of about 50 per cent. of *B. influenzae* from influenzal meningitis fall into this predominating type (our type I). We did not attempt to group the other half. For practical purposes, however, it was reasoned that a serum which can embrace 50 per cent. of the encountered strains and more of the closely related ones is the best we can have at present until something better is discovered. Our horses are immunized accordingly with formalyzed cultures of this predominating type, to which one heterogenous strain is added. The question of standardization of these sera is as unsatisfactory as in case of antimeningococcic sera. We use agglutination and precipitin tests.

Pittman demonstrated in her studies of hemophilus influenza two kinds of strains S and R (smooth and rough colonies). They differ from each other morphologically and serologically. The S strains are stated to contain capsules and produce a specific soluble substance which is present in culture filtrates and washings of the bacteria. By means of cross precipitation and direct agglutination reactions she has been able to divide 15 S strains—7 of which were isolated from influenzal meningitis, into 2 groups A and B. All seven meningeal strains fell in group B. By this technique all her 7 meningeal strains seemed to comprise one group, whereas by agglutinin *absorption* test we have found that our strains (58) are alike only in 50 per cent. of cases. The same author also states that the S strains are easily converted into R. Because of the permanency of the serologic types, under ordinary conditions it seems to the writer that before anything better is discovered the grouping of *B. influenzae* by agglutinin absorption is by far a more sensitive and reliable test than any other suggested. Direct agglutination is not enough. We encountered many a strain which would be agglutinated by a serum even in a higher titer than its hemologous strain, to find that by absorption it was only either closely related or entirely a heterogenous strain stimulating the production of only common agglutinins.

Since 1922 the writer has received from Dr. Josephine Neal 84 cultures of *B. influenzae* from meningeal influenza; 1922, 13 cultures, 1923, 6 cultures, 1924, 5 cultures, 1926, 6 cultures, 1927, 3 cultures, 1928, 6 cultures, 1929, 6 cultures, 1930, 4 cultures, 1931, 14 cultures, 1932, 12 cultures and 1933, 9 cultures.

Grouping with the serum of the predominant strain by agglutinin absorption test was performed with 58 strains with the following results:

Identical with the predominant strain	27
Closely related to the predominant strain	18
Heterogenous	13
	58

Conclusion: The finding of a dominant type of *B. influenzae* in influenzal meningitis may hold some hope for developing an effective serum for treatment of this fatal infection.

OLGA R. POVITZKY

[1] From the Research Laboratories, Department of Health, New York City.

SELECTIVE FERTILIZATION AND SEX-DETERMINATION IN HYMENOPTERA

THE problem of sex-determination in the bee and in other forms in which males develop by haploid