tains 0.1 M KCl. But with *Nitella* a slightly soluble dye compound is formed in the sap which would tend to produce a more rapid rate of penetration than would otherwise be the case. Thus if sodium tannate is added to the artificial sap containing 0.1 M KCl, the rate of penetration of dye into the sap is hastened, owing to the formation of slightly soluble dye tannate in the sap.

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Cell Models Representing Various Types of Living Cells.

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The behavior of a variety of cells can be roughly imitated by models[1] consisting of a non-aqueous substance (representing the plasma membrane) placed between dye solution and artificial sap (representing vacuolar sap). The rates of penetration of dye into the sap are compared during one hour. The range of pH values studied is between pH 5 and pH 9.

(1) *When chloroform[1] is used as the membrane.* (*a*) Penetration of dye from cresyl blue solution at pH 9 into the sap at pH 5 has a high temperature coefficient ($Q_{10} = 2.3$ between 15° and 25°C.) This may depend on the change in the viscosity of chloroform. A similar explanation may account for the high temperature coefficient in the penetration of the dye into the sap of *Nitella* and *Valonia.* (*b*) From cresyl blue solution at pH 9 the dye accumulates rapidly in the sap at pH 5 as in *Nitella.*

(2) *When aniline is used as the membrane.* (*a*) The higher the pH value of the cresyl blue solution and lower the pH value of the sap, the more rapid is the rate of penetration and accumulation of dye in the sap. From the solution at pH 9, the dye passes into aniline chiefly as the dye base and upon reaching the sap it is converted to the dye salt. From the solution at pH 5 the dye passes into aniline chiefly as dye salt. (*b*) The lower the pH value of a phenol red solution and higher the pH value of the sap, the greater is the rate of penetration and accumulation of dye in the sap. The dye accumulates rapidly in the sap at a high pH from phenol red solution at low pH; the dye passes into aniline as free acid (yellow) and is converted by the sap to the dye salt (red). This may explain the accumulation of phenol red in the vacuoles of some cells of kidney tubules.

[1] For description see Irwin, M., PROC. SOC. EXP. BIOL. AND MED., 1928, **26**, 135.

(3) When salicylic acid is added to the aniline the rate of penetration of cresyl blue into the sap is so greatly reduced that there is no penetration even from cresyl blue solution at pH 9 into the sap at pH 5.5. But the rate of penetration of phenol red is still rapid from the solution at pH 5 into the sap at pH 8.

(4) When oleic acid is added to chloroform, neither cresyl blue nor phenol red penetrates into the sap at any external or internal pH values.

The rate of penetration of dye into the sap is related to the concentration gradient of the dye in the non-aqueous layer. The rapid rate of penetration and accumulation of these dyes is due to the high concentration gradient: these dyes enter the membrane in undissociated form, and are converted by the sap to the dissociated form, which is not very soluble in the membrane.

Determination of the absorption coefficients shows that the reduction in the rate of penetration of dye into the sap in (3) and (4) is due to the increase in the absorption coefficient of the dye at the inner phase boundary which decreases the concentration gradient of the dye in the non-aqueous layer.

Thus the behavior of various cells toward acid and basic dyes can be very roughly imitated by altering the solutions representing the plasma membrane and the sap.

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Bacterial Structure with Particular Reference to the Capsule.

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A technic has been described by which capsules can be readily demonstrated not only on "capsulated" organisms but also on certain bacteria and under certain conditions where they are supposed not to exist.[1] More extensive studies have confirmed the earlier findings, one of the most significant of which was the observation that R types of pneumococcus are as definitely capsulated as S types. Although this method remains the most reliable general capsular stain, with either of the following methods, equally or more beautiful pictures have been obtained, notably with *B. anthracis* from the animal body: modifications of Wright's stain; MacNeal's Tetrachrome Stain; Giemsa Stain; Casares-Gil Flagella Stain. These

[1] Churchman, J. W., and Emelianoff, N. V., PROC. SOC. EXP. BIOL. AND MED., 1932, **29**, 514.