the figure characteristic of the pure hydrated phenol. But the effect of the alcohol upon the volume of the phenol phase is a progressive one, each added amount of alcohol increasing it. When different monatomic alcohols are compared, it is found that only the lower members bring about a decrease in the electrical resistance, all the higher ones increasing it. The lower alcohols also make the phenol phase "swell" more than the upper ones.

IV

These findings are of significance for a better understanding of certain aspects of cell behavior, more particularly the phenomena of "permeability" of "cell membranes" or of "protoplasm" in general. The attempt is still being made to understand these phenomena through some modification of Pfeffer and De Vries' osmotic concept of the living cell or Overton's lipoid membrane modification of it. The physico-chemical and biological objections which may be raised against either of these notions are too numerous to need repetition here. The living cell is capable of absorbing and secreting water, of absorbing and secreting the most varied types of dissolved materials, the two moving at times in the same direction and at times in the opposite direction. There can be no adequate physico-chemical concept of the living cell which does not contain within it the possibility of understanding all these characteristics at one and the same time. The volume of the hydrated phenol phase described above "swells" and "shrinks" when subjected to the action of alkalies or of salts, shows, in other words, the biological phenomena of plasmoptysis and plasmolysis, just as does any hydrophilic colloid (protein) or the living cell. But such a phenol system shows also the "strange" phenomena of permeability to dissolved substances so characteristic of living matter. It is quickly permeable, for example, to the most varied dyes; to another group of such or to iodine it is less permeable. While permeable to the salts, hydrated phenol takes these up most slowly and in certain instances practically not at all. Identical observations are characteristic of protoplasm and the living cell.

The high electrical resistance characteristic of living matter has always been difficult to understand as long as we held to the view that protoplasm was essentially a somewhat modified dilute solution. In spite of the conclusion that a physiological salt solution is supposed to be osmotically comparable with the salts dissolved in a living animal or its body fluids, the former will register only 1/5 to 1/35 the electrical resistance of the latter. This old biological truth can be understood only by denying to the salts found in protoplasm any large existence in uncombined form or by concluding that the cell is a different sort of solvent for these salts than is water. Experimental evidence supports both these conclusions. Aside from the fact that the electrolytes are for the most part "combined" with the protoplasmic constituents and are not "free" as in an ordinary salt solution, the high electrical resistance of protoplasm is further accounted for as soon as it is remembered that protoplasm is not a solution of protoplasmic material in water but of water in protoplasmic material, one comparable in other words, to the solution of water in phenol. The effects of acids, of alkalies, of single salts, of anesthetics, etc., all of which reduce the normal electrical resistance of living matter, are then to be understood in the same terms in which these factors reduce the electrical resistance of systems of the type, hydrated phenol. Even the physiological antagonism between different salts so characteristic of living matter reappears in the case of hydrated phenol.

V

What has been said above for phenol/water systems is true of many other mutually soluble systems. Quinoline, for example, behaves much like phenol and what has been said of these substances holds also for the lower fatty acids, the soaps and the various proteins.

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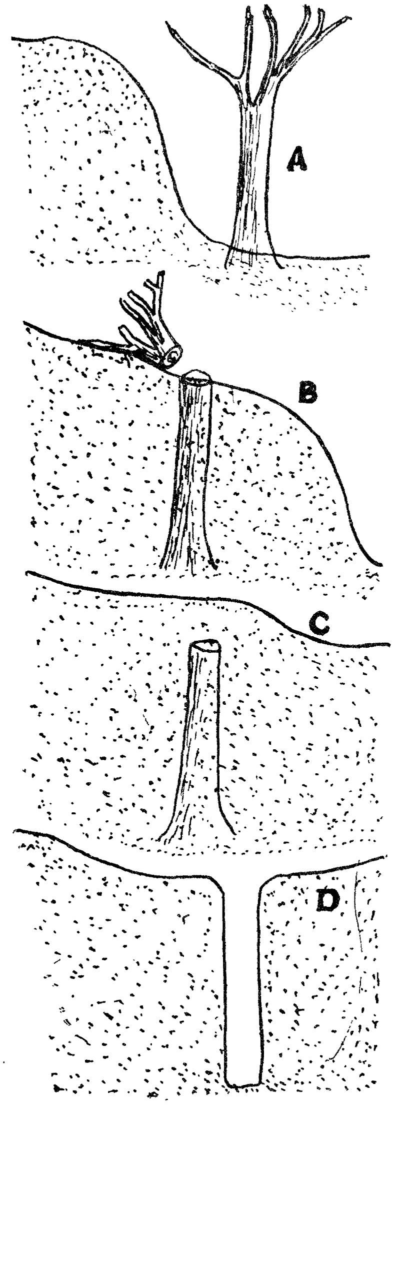
THE ORIGIN OF COLUMNAR HOLES IN WANDERING DUNES

The forests which existed on the New Jersey sand strands at Wildwood, Holly Beach, Peermont, South Atlantic City and South Seaside Park have been almost entirely destroyed, except at South Seaside Park and Peermont. The forest at the latter place has been invaded by wandering dunes, the highest of which are about forty feet, or the height of the tree tops. The formation of these dunes is due to the trees, which break the force of the wind, so that the sand accumulates on the seaward side of the forest. The accumulation of sand is followed by its encroachment on tree growth, so that the forest is narrowed gradually. The trees, which were buried by the advancing sand, have in some cases persisted without decay, especially the red cedars, and as dead trees they form a forest graveyard with the bleached stumps as monuments sticking through the dune sand, which has drifted away from such dead and buried trees with the action of the fickle wind. Fifty years hence little will remain of this forest of red cedars, hollies, post oaks, Spanish oaks, red mulberries, sour gum trees, hackberries, etc. The wandering dunes will have covered and destroyed the remaining trees. This forest destruction has been going on for a long time and between the highest dunes and the sea beach at Peermont, New Jersey, is the dune complex corresponding in area with the forest graveyard (A).



The tops of the buried trees have decayed at the surface of the dune sand (B) and the branches have been broken off and have been carried away by the wind, or have been buried in situ by the drifting sand. The trunks of the trees have been covered with sand (C). If of destructible wood (the red cedars alone remaining without much decay), the tree trunks of such species disappear by decay and there is left a cylindrical cavity the exact height and other dimensions of the tree trunk, which before decay formerly filled it. Such decay is absolute, for when the columnar hole is uncovered there are found no remains of the tree which formed it. If there are any remains of the bark and the wood of the trees, they have dropped to the bottom of the hole and have been covered by the sand which has fallen from above into the depressions. These columnar cavities are roofed with compacted sand and with the removal of the sand by wind action, there is a change in the configuration of the dunes, and in the lowering of the dunes the columnar holes are uncovered. The upper edges of the holes slope inwardly (D) and leaves and blades of grasses and the tops of the tumble grasses *(Eragrostis pectinacea)* fall into the depressions, which are sometimes six to eight feet deep and a foot in diameter.

As far as the writer is aware the origin of these holes has never been described, although Dr. Seneca Egbert, of the University of Pennsylvania, has informed him that he had discovered them over thirty years ago at Peermont by breaking through the roof of one. The accompanying sketches will make clear the sequence of events in the formation of the columnar holes in the wandering dunes at Peermont, New Jersey.

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