

OBJECTIONS TO LAPLACE'S THEORY OF SURFACE TENSION.

(Abstract.)

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Laplace's Theory of surface tension attributes the contractile force of liquid films to the attraction of the molecules immediately below the surface of the liquid for those on the surface, producing a tendency for the surface molecules to move into the interior. The magnitude of this force would depend on the curvature of the surface and would be greater at a convex surface than at a flat or concave surface. Consequently the rise of water in a capillary tube would be due to the fact that the downward pressure of the film outside the tube is greater than the downward pressure of the film inside the tube.

This theory does not call for a negative pressure under the film inside the tube. It calls for a positive pressure, but slightly less than the downward pressure outside. The liquid then would be *forced up the tube by the outside film pressure*. It would appear then that any variation of the pressure either inside or outside the tube should be followed by a change in the height of the capillary column. Some simple experiments give results that are at variance with the theory.

Take a long capillary tube with its lower end extending some distance into the water and note the height of the capillary column. Drop some soap solution on the water outside the tube and thus lower the tension outside. If the liquid is supported by the excess of pressure outside the tube, the height of the capillary column should be lessened. On the contrary the height remains constant for some time—hours even—until the solution has had time to diffuse into the tube.

Repeat the experiment this time introducing the soap solution into the capillary tube by means of a very fine capillary tube. The tension inside the tube being reduced (demanding a reduced pressure inside) and the outer pressure remaining constant, it would seem that the excess of the outside pressure would be increased and that the water should therefore rise in the capillary. Instead of rising it immediately falls.

