with this organism. It is possible, however, that the basicity of aniline may be favorable; larvæ anæsthetized with alcohols showed some degree of protection, but less marked than with aniline. The after-treatment of poisoned larvæ with aniline solutions proved ineffective.

Treatment with basic substances appears to us to offer the most promising means of counteracting the action of this poison. A substance whose physical properties, solubilities, and rate of hydrolysis resemble those of "mustard," but which yields on hydrolysis a *base, e. g.,* ammonia, instead of an acid, ought theoretically to counteract the action of "mustard" within the cell. Such a compound could be introduced into the lungs in the form of a spray, or applied to the skin in the usual manner. High lipoid-solubility or surface-activity, favoring rapid penetration of cells, would be essential in such a substance. We recommend a systematic search for an organic compound having these properties. Physiological experimentation with such a compound, if it is obtainable, should in our opinion yield important results.

By the use of intravitam staining, and by the injection of aqueous "mustard" solution directly into the body of the starfish egg, strong evidence was afforded that free acid is liberated within the cell.

The intravitam stain used was neutral red. Eggs were treated with solutions of "mustard" oil (in sea-water) sufficiently concentrated to cause subsequent abnormal development, and were then transferred to an extremely dilute solution of neutral red in sea-water. Normal eggs were simultaneously treated with the neutral red solution. For a period of at least half an hour controlled and treated eggs were colored to about the same degree. The treated eggs later became progressively more intensely stained, so that in an hour after the treatment the greater intensity in color of the "gassed" eggs over that of the control was easily recognizable.

The effect of "mustard" and its decomposition-products on the cell-interior was tested by the introduction of a drop of the gas solution into the body of the fertilized egg by means of a micro-pipette. The following results were obtained:

1. Eggs injected with distilled water quickly recover and continue their normal development.

2. Eggs injected with a freshly made saturated aqueous solution of "mustard gas" show no immediate injurious effects but subsequently are inhibited in their development.

3. Eggs injected with a saturated solution which has been allowed to stand at room temperature for over two hours undergo cytolysis, the immediate destructive effect being more marked than that following the injection of the undecomposed solution.

4. Eggs injected with an aqueous solution of hydrochloric acid of the same strength as the decomposed gas solution exhibit approximately the same effect, viz., a more or less extended cytolysis.

These experiments lend substantial support to the view, previously expressed by Marshall and Smith, that mustard gas, in virtue of its lipoid-solubility, penetrates rapidly into the cell-interior where it liberates hydrochloric acid which, in the free state, is relatively incapable of penetrating the cell.

R. S. Lillie,
G. H. A. Clowes,
R. Chambers
The Marine Biological Laboratory,
Wood's Hole, Mass.

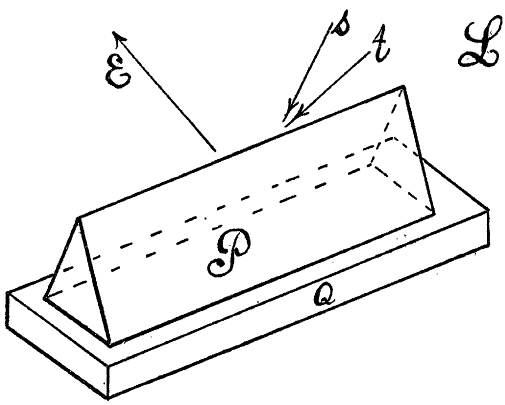
SPECIAL ARTICLES

ON HERSCHELL'S FRINGES

Herschell's fringes, as produced by the familiar apparatus consisting of a right-angled prism reposing with its broad face on a plate of obsidian, present the well-known group of achromatic fringes running parallel to the arc or limit of total reflection. Observation is made in a direction normal to the edge of the prism.

It occurred to me that the phenomenon could be made much more striking and of wider scope, if a long 60°prism were used and observation made in a plane of symmetry *parallel* to the edge of the prism. In the interest of variety, moreover, it is preferable not to employ strictly accurate surfaces; so that the prisms with which grandfather used to decorate his gas fixtures will, as a rule, suffice admirably. In the figure P is such a prism (truncated) on a plate of obsidian Q, the long edges being normal to a white window curtain at L near by, illuminated with sun light or day light; or any light toward the front, overhead, is good.

The rays that are wanted, s, will enter symmetrically at a mean angle of about 30° to the vertical and after reflection at the base of the prism and the plate, reach the eye in the direction E. The rays totally reflected, t, come from a greater angle to the vertical and are not wanted.



The limit of total reflection here (also easily recognized) is usually a sharp parabolic or cuspidal apex. The light seen through either face enters by the opposed face. On looking down from a steeper angle and with properly selected faces, brilliant groups of complete confocal ellipses (major axis one half to over two inches), of confocal hyperbolae may be seen in each of the roof faces. To find advantageous combinations, the three faces of each prism should be examined in succession, and it is well to rub P on Q to improve the contact. On moving the eye fore and aft or using different pressures, any type of ellipse with white or colored disc may be produced at pleasure. It is usually preferable to use a shorter plate Q than is given in the figure, about one half the length of the prism.

When well produced the ellipses may also be seen by side light, with different patterns in the two roof-faces.

The type of interference figure clearly depends on micrometric differences of the faces in contact. The ellipses are Newton's rings modified by the color dispersion of the glass. The hyperbolae, however, are about equally frequent; but their character is less easily stated. They probably originate in cylindrics. The case of the 45°–90° prism, with the right angled faces respectively horizontal (on the plate) and vertical, is also interesting; for here the ellipses are apt to be *circles* with each of the two groups seen after two reflections, one in each of the orthogonal faces. The light should enter nearly normal to the oblique face. As it leaves in the same way, one should observe through a horizontal slot in a white screen.

I may add a similar observation: If a cylindrical lens (say 1 diopter) is placed on a plate and illuminated with homogeneous light, the interference pattern consists of a succession of equidistant arrow heads along the line of contact, all pointing in its direction. Now these are the very forms observed in the interferences of reversed spectra along the line of coincidence of spectra, except that the latter are apt to be far narrower than the former. It seems therefore, as if the effect of color variation in one case and of the cylindric increase of thickness of air film, in the other, were formally capable of like treatment.

Carl Barus

Brown University,
Providence, R. I.

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