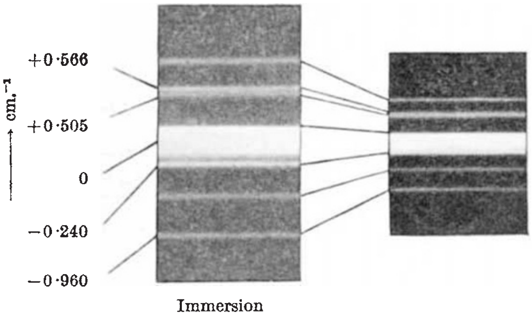

Fig. 2

to let the beam pass through a prism or a side facet in the glass plate as indicated in Fig. 1*b*. For simplicity we may assume that the refraction indices of the prism and the immersion oil are equal, otherwise the conditions of the system, Fig. 1*b*, must be treated in more detail. Fig. 2 illustrates the considerable gain in the dispersion and resolving power of a plane grating, $W = 93$ mm., when it was immersed in α-bromnaphthalene and covered by a 30°/60° dense flint glass prism. The perfect resolution of the narrow doublet 0·566/0·505 cm.$^{-1}$ in the hyperfine structure of the mercury line λ 4358 indicates that the spectroscopic resolution is well above 400,000.

Further details of this investigation will appear in *Arkiv för Fysik*.

E. Hulthén
H. Neuhaus

Physics Department,
University of Stockholm.
Dec. 14.

[1] Hulthén, E., Proc. London Opt. Conference 1950, p. 111.
[2] Hulthén, E., *Ark. Fys.*, **2**, 439 (1950).

Use of High Contrast in the Photography of Interference Fringes

In a recent communication, Hough and Goldsmith[1] have described a method of increasing the sharpness of interference fringes by high-contrast photography with controlled exposure. Although the technique does not appear to be widely known and I have no knowledge of any published material on the subject, the method is not new and has been in use here for a number of years.

For the case of infinite contrast, which is the only case in which the widths of dark and light fringes may be adequately defined, a curve relating black/white ratio to exposure for a single photographic process may be obtained by considering the intersection of the curves $I = \sin^2 x + A$ (light intensity) and $I = B$ (threshold at which the dark–light transition on the plate occurs), where I is light intensity, x is distance perpendicular to fringe direction and A and B are constants depending on fringe visibility and exposure. The lengths of the intercepts of $I = B$ below and above $I = \sin^2 x + A$ give the widths of dark and light fringes respectively. Fig. 1 shows a curve for 100 per cent fringe visibility ($A = 0$).

Experimentally it has been found that, over the exposure range 0–7, results are in good agreement with theory; but above this value measurement of fringe-widths becomes difficult, and black/white ratios greater than 5·5 are difficult to obtain. In order to obtain the best results in the over-exposure region,

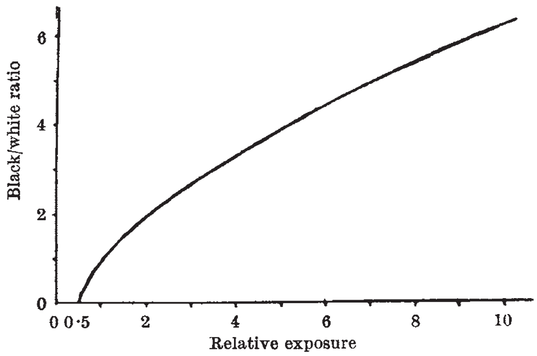

Fig. 1

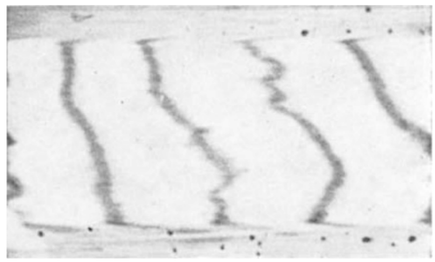
Fig. 2

two points require attention. First, developer fog must not be allowed to appear; the use of an efficient stop-bath after development is useful for this. The second condition is that the fringe-spacing must not be too small. Using Ilford *R*.40 plates, a separation between fringes of 2 mm. on the plate appears to be necessary for the best results. With a fringe-spacing of 0·5 mm. a black/white ratio of 3·5–4 seems to be the best obtainable.

Where a double photographic process (negative and print) is used, the following technique gives good results. The negative is given an exposure of about 4 and developed to only a moderately high contrast. By printing on a contrasty material with minimum exposure, a final result with white/black ratio about 6 may be obtained.

While this type of process can give much more accurate results than are normally expected from double-beam interferometry, some care must be exercised to prevent errors due to uneven illumination. A typical interferogram is reproduced herewith (Fig. 2).

D. S. Brown

Sir Howard Grubb, Parsons and Co.,
Walker Gate,
Newcastle upon Tyne 6. Jan. 8.

[1] Hough and Goldsmith, *Nature*, **172**, 1105 (1953).

Ferroelectric Structure of Potassium Dihydrogen Phosphate

Slater's theory[1] of the origin of the ferroelectricity shown by potassium dihydrogen phosphate below 120° K. is based on the assumption that the proton of the O—H—O bond is situated in a double potential well. Above the Curie point, the proton is not permanently located in either well and moves between the two, giving the structure non-polar tetragonal symmetry. Below the Curie point the proton positions are ordered in accordance with the polar orthorhombic symmetry.

© 1954 Nature Publishing Group