smaller central obstruction are being developed, and full details will be published shortly.

We wish to thank Dr. C. R. Burch for much valuable advice given us during this work. Already an objective of 0·55 N.A. with 35 per cent central obstruction has been tested and appears satisfactory.

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A Transmission-Type Interferometer Microscope

It is well known that the phase-contrast microscope cannot give a faithful representation of optical path-differences as variations of intensity in the image when the detail considered is coarse. This is because light is diffracted by coarse detail through only small angles, and hence the necessary separation of direct and diffracted beams cannot be complete. The edges of large details are therefore emphasized, giving a characteristic appearance to phase-contrast images.

This would be avoided if an interferometer were employed in which two fields of view, one containing the image of the light source only, the other containing the image of the light source with the object superimposed, are caused to interfere with each other. The optical thickness of the object then modifies the phase difference between the two fields and gives rise to intensity variations in the resultant.

A method for realizing such an interferometer, employing only one objective and one condenser, has been developed. The illuminating cone from the condenser (Fig. 1) is intercepted by a nearly plane-parallel glass plate of which the top surface is half-silvered and the bottom surface bears a small, fully silvered central spot. Part of the beam traverses the plate and illuminates the object, and part suffers two internal reflexions and emerges upwards past the object. The diameter of this second beam in the object plane can be made several millimetres, so the presence of the object, if small, does not disturb it.

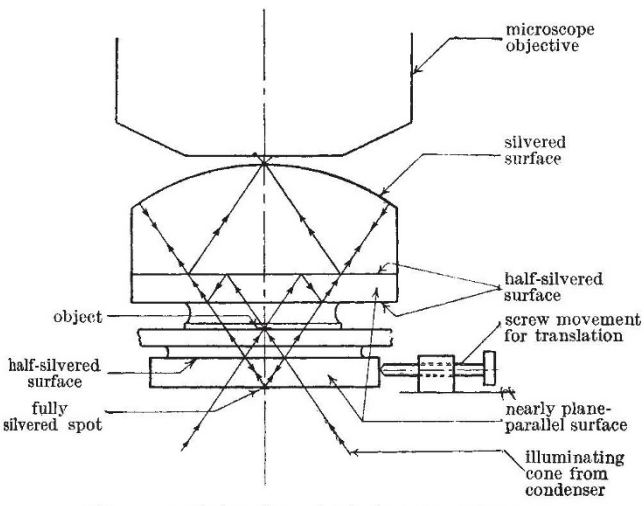
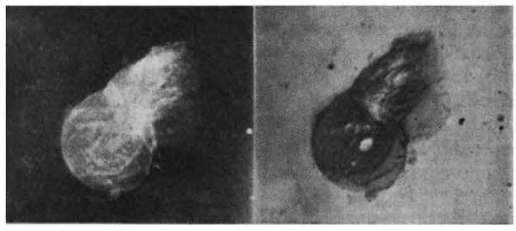


Fig. 1. Optical system of interferometer microscope



(*a*) (*b*)

Fig. 2. Epithelial cells (*a*) with effective 'dark-ground' contrast; (*b*) same cells with different phase adjustment, giving 'bright-ground' contrast. × 225

A second plate is placed above the object. Both surfaces of this plate are half-silvered. Part of the beam which illuminates the object suffers two internal reflexions, whereas part of the beam which was twice reflected in the lower plate traverses the upper plate directly. If the two plates are of identical thickness and correctly aligned, the two emerging beams are coincident. These two beams are collected by an objective system of a type previously described[1]. The two superimposed images thus presented to the observer contain, respectively, the image of the light source and the image of the light source with the object superimposed, and interference will take place between them.

If the two plates are made with a very slight wedge angle, the phase difference between the two interfering fields can be very conveniently varied by translating one plate laterally by a screw movement. The necessary additions to a microscope with a rotating and centring stage are quite small, as the screw movement referred to above can be provided by one of the centring screws.

Figs. 2*a* and *b* are two photographs of a pair of epithelial cells with different values of phase difference between the interfering fields. The apparent 'relief' effect in Fig. 2*b* is due to the fact that the two fields made a small angle with each other and so the phase difference varies across the object; objective N.A. 0·75, condenser N.A. 0·5.

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[1] *Nature*, **163**, 400 (1949).

Mechanism of the Formation of Pearlite in Steels

For the sake of simplicity, we shall consider the case of an eutectoid steel; if the steel is cooled slowly from the austenitic region, a well-known pearlite structure is formed in crossing the A_1 line, that is, 726°, and remains as such down to room temperature. During heating, just the reverse change will take place. The mechanism of formation of this remarkable structure, referred to as 'pearlitic', is not yet known, at least so far as I know. My view regarding the mechanism of formation of the lamellar structure is as follows.