peaks. Apparently what Krishnan and Ramanathan meant was the *centre of the side* of the band with peak at 1285 cm.$^{-1}$. But this is an equally untenable position. All the arguments in my earlier letter still hold if one replaces "minimum of absorption" by "centre of the long-wave side of the absorption maximum". Even their much milder statement in the above letter that "the absorption associated with the 1332 cm.$^{-1}$ frequency is an integral part of the 8 μ band" is open to question, as it depends on (*a*) the resolving power of the spectrometer used, and (*b*) the temperature at which the measurements are made.

It is quite possible that at very low temperatures these bands may sharpen so much that the 1332 cm.$^{-1}$ frequency cannot even be said to lie on the side of a band.

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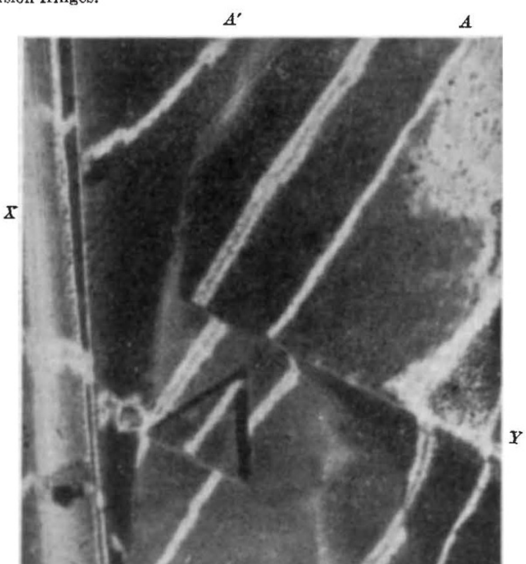
Topography of the Face of a Diamond Crystal

WE have applied the multiple-beam interference technique described earlier[1] to the study of the topography of a natural octahedron face of a diamond, thus revealing considerable information about growth, etch, face curvature, etc. We have settled a fifty-year-old controversy concerning the origin of the beautifully regular shallow-pit triangular markings shown by such faces. Miers[2] cautiously stated that these are *supposed* to be due to etching and shows them pointing to the octahedron edge. Fersmann and Goldsmidt[3] asserted that etch or solution can be responsible both for the triangles and the curved faces. Williams[4] proposed on rather slender grounds that the triangular pits and curved faces arise from growth and not from solution.

We have now proved that a typical characteristic triangular pit is due to *growth.*

During the progress of the work, a novel interference method has been developed which will be described as a 'crossed fringe' technique. This simplifies and speeds up the analysis.

The optical flat is first set as near parallel as possible to the diamond face, giving maximum fringe dispersion and maximum sensitivity. All the visible mercury radiations are used, the result being the production of multiple-beam interference fringes which reveal in a striking manner much *sub-microscopic* topographical detail. It is not possible from such a picture to obtain much numerical information about the heights (depths) of features. However, an area of uniform tint means that such an area is of uniform height (depth) to within a very small fraction of a light wave. A change of only $\lambda/200$ can produce a tint alteration. The flat is then slightly tilted relative to the crystal, leading to the formation of sharp, widely spaced multiple-beam fringes[1]. These are photographed superposed on the high dispersion fringes.



The accompanying reproduction illustrates the technique, which permits of a rapid exact evaluation of the structure. The area represented is about 1 sq. mm. Attention is directed to the extreme fringe sharpness, *AA'* being successive orders for the green line of mercury, with the yellow doublet between.

Among other features, the reproduction shows a clearly marked triangle in the lower half. (Fringe displacement to the right here means an elevation.) The fringe from *A* continues unbroken until reaching the ridge *XY* at which it is displaced to the right. But the fringe *through* the triangle is quite clearly a linear continuation of *A*, hence the triangle base is at the same level as the large uniform area above *XY*. The depth of this particular triangle is only 440 A. Other triangles, of different depths, show the same effect. It is completely unreasonable to postulate a hypothetical etching that takes place down to the somewhat removed outside level. Nor can one suppose that simultaneous etch continues down to hypothetical abnormally resisting layers (at different levels for different features). This would be a highly improbable state of affairs indeed.

It is certain therefore that the area below *XY* has grown in the form of three plane waves inclined at 60° to each other. The arresting of such growth can lead to the formation of equilateral triangles (which may be and are occasionally truncated to hexagons). The triangle shown thus arises entirely through failure of the completion of the growth sheets, below *XY*, and etching has nothing to do with it. This particular triangle points to the octahedron edge.

A number of these triangular growth-pits have been measured, and depths ranging from some 60 to 600 A. found, that is, some 30–300 atom layers.

We have also found in addition distinct evidence of the existence of etching or solution, leading to the formation of irregular shallow hollows of arbitrary orientation. This will be discussed elsewhere.

Successive stepped growth-sheets are also clearly visible, and it is of considerable interest that these frequently grow in a stepped pyramid leading effectively to a curvature of the vicinal face, at times considerable. We believe that the well-known curvature of diamond faces and edges is also probably a *growth* effect.

We note that a previous attempt has been made to examine diamond topography by interference, but this[5] was effectively only a two-beam interference method and as such was completely inadequate for the purpose, showing only the coarsest of features and revealing little not already shown by the microscope.

A full report of the analysis of the mass of detail revealed by the precision multiple-beam 'crossed fringes' will be communicated elsewhere. Particular attention is directed to the very considerable saving in labour due to this technique.

We thank Mr. P. Grodzinski of the Diamond Trading Company for the loan of the diamond and for mounting it for us.

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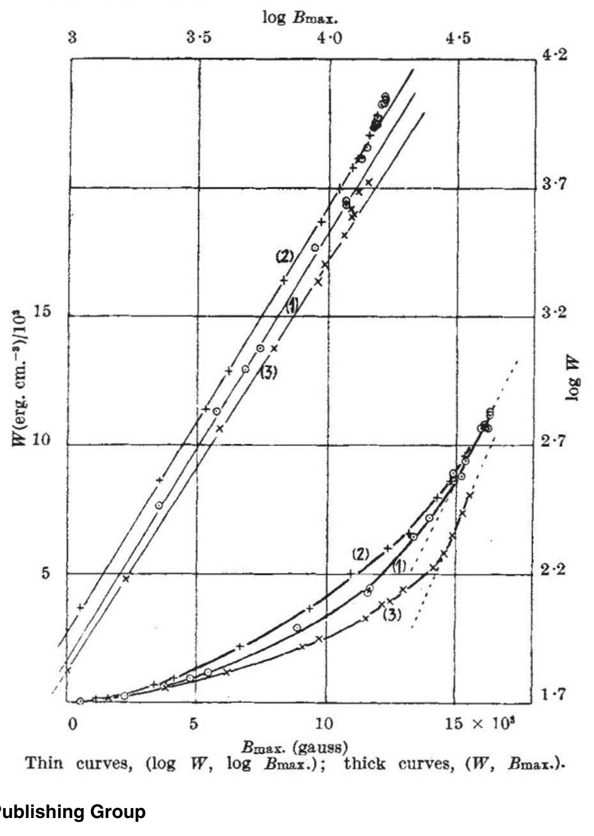
[1] Tolansky, *Nature*, **152**, 722 (1943); *Proc. Roy. Soc.*, A, **184**, 41 (1945).
[2] Miers, "Mineralogy" (1902).
[3] Fersmann and Goldsmidt, "The Diamond" (1911).
[4] Williams, "Genesis of the Diamond" (1932).
[5] Kayser, *Indust. Diamond Rev.*, **4** (Jan. 1944).

Loss Due to Magnetic Hysteresis in Silicon-Steel Sheets

WE have determined magnetic hysteresis loops by the ring-ballistic method for three different sheets of silicon-steel in an extensive range of values of magnetic flux-density $B_{max.}$ ($B_{max.}$ is the flux-density corresponding to the cusp of the loop). From these loops we have derived the energy loss W, in ergs per cubic centimetre per cycle for different values of $B_{max.}$, and by plotting those values against the corresponding values of $B_{max.}$ we obtained the accompanying curves for three sheets of steel.



Thin curves, (log W, log $B_{max.}$); thick curves, (W, $B_{max.}$).