markedly on the pressure. This relation is simple at 46·5 cm.; approximately, $\Delta i/i$ is a constant, dependent upon the light-band.

At this pressure, it was interesting to observe, for example, at 9·0 kV. that, in the dark, i gave a deflexion of 400 units; under (ii) white, it was reduced to 2; corresponding to a light-effect of about 93 per cent. This, together with the fact that it has been observed in some compound and elementary gases, with the exception so far of the rare gases and metallic vapours, indicate a hitherto unrecognized and fairly widespread factor in the electrical discharge and photo-electric phenomena.

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[1] Joshi, *Curr. Sci.*, **8**, 548 (1939). Joshi and Narasimhan, *ibid.*, **9**, 536 (1940). Joshi and Deo, *ibid.*, **11**, 306 (1943).
[2] Joshi and Deshmukh, NATURE, **147**, 806 (1941).
[3] Joshi and Deo, NATURE, **151**, 561 (1943).
[4] Joshi and co-workers, *Proc. Indian Sci. Cong., Phys. Sec. Abst.*, 17 (1940); *Chem. Sec. Abst.*, 34, 35 (1941); *Phys. Sec. Abst.*, 36, 38 (1942); *Chem. Sec. Abst.*, 50, 51, 55–70 (1942).
[5] Joshi, *Proc. Indian Sci. Cong.*, Pres. Address, Chem. Sec. (1943).
[6] Joshi, *Benares Hindu Univ. J.*, **8**, 99 (1943).
[7] Halban and Siedentoff, *Z. phys. Chem.*, **103**, 71 (1922). Elliott, *Proc. Roy. Soc.*, A, **123**, 629 (1929).

An Interferometric Procedure for the Examination of Crystal Surfaces

IN a recent communication[1], Dr. S. Tolansky has described an interferometric method for the study of crystal surfaces. He includes two pictures showing the surface structures of mica and selenite.

This method has been used to great advantage in our laboratories for several years, especially for selecting suitable crystals for X-ray crystallography. In a paper[2] published in the proceedings of the Swedish Academy of Sciences for 1933, some fifty pictures from different crystals, calcite, topaz, quartz, gypsum, mica, rock-salt, sylvine and carborundum were reproduced. All these crystals, even the most perfect ones, gave contour patterns of the cleavage faces showing that the surfaces were split up into a great number of regions with different heights. In calcite, for example, the steps were of the order 0·1 μ and less. It was mentioned in the paper that the method made it possible to measure the steps with an accuracy of 5 A.

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[1] Tolansky, S., NATURE, **152**, 722 (1943).
[2] Siegbahn, Manne, *Ark. f. Mat., Astr. o. Fysik.*, **23**, A, No. 12 (1933).

PROF. SIEGBAHN has very kindly sent me a reprint of his paper referred to in his letter; the journal in which it appeared is not available here and I was completely unaware of the existence of the paper.

I cannot agree, however, with Prof. Siegbahn's implication that his method and mine are the same. They are, in fact, very different optical procedures, since Prof. Siegbahn employs the classical *two* interfering beams, whereas I make use of the far more powerful *multiple-beam* interference. As a result of this the resolution in the two cases is of a different order. One can consider as an analogy that his resolution is to mine as the resolving power of a 2-line grating is to that of a 40-line grating. The intensity distributions within the two types of fringes are so fundamentally different that the multiple-beam procedure gives an accuracy of an entirely higher order.

While both methods reveal the coarser details of crystal surfaces equally well (and Prof. Siegbahn's paper contains many beautiful reproductions of fringes revealing coarser details), yet the more precise multiple-beam procedure reveals in addition subtle fine structure details far beyond the possibility of the simpler two-beam method. This difference is entirely a question of fringe width, and the employment of very high reflecting coefficients in my method is responsible for the improvement.

Prof. Siegbahn states in his paper that when his fringes are measured with a photometer, their *positions* can be determined to within 1/500 of an order (despite the very unfavourable $\sin^2$-intensity distribution). This is only 5 A. It is, of course, quite evident that the smallest *step* which he can resolve is much greater than this figure, which is the error in setting on a fringe. With my method, I can readily measure directly (without a microphotometer) actual steps so small as 30 A. in height with an accuracy of 1 A. It is more than probable that with a microphotometer this would be reduced by a factor of 2. Such *resolution* simply cannot be approached with fringes produced by two interfering beams, hence the two procedures cannot be considered equivalent.

While, therefore, the two-beam method is quite sufficiently sensitive for the purpose of selecting suitable crystals for X-ray crystallography, as a method of high precision for revealing the fine structure topographical details of crystal surfaces, it cannot compare with the multiple-beam procedure that I have independently developed. This is perhaps most clearly revealed in a more recent publication of mine[1].

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[1] NATURE, **153**, 195 (1944).

Metabolism of Acetoacetic Acid

IN a recent publication Breusch[1] has reported experiments suggesting a condensation of the $-CH_2.COOH$ group of β-ketonic acids with oxaloacetic acid, resulting in the formation of citric acid.

Shortly after the theory of the citric acid cycle was first put forward by Krebs and Johnson[2], and following the observation of Korányi and Szent-Györgyi of the antiketogenic effect of succinic acid[3], I performed a number of experiments designed to test this very hypothesis. Acetoacetic acid was incubated with slices of rat brain and kidney with and without the addition of various members of the citric acid cycle. The observed effects on oxygen uptake, formation of citric acid and disappearance of total acetone bodies were, however, so small as to be inconclusive. The theory was abandoned on the strength of the following experiment in which the anaerobic disappearance of total acetone bodies was measured by a modified Messinger titration[4,5].

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