LETTERS TO THE EDITORS

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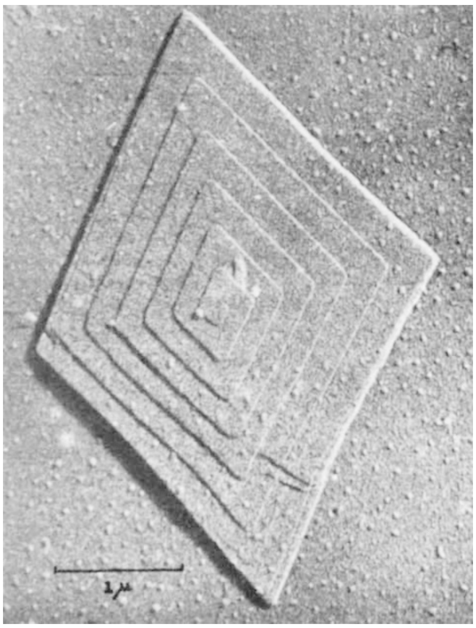
Observation of Spiral Growth-Steps in *n*-Paraffin Single Crystals in the Electron Microscope

The effect of dislocations on the growth of crystals was discussed in an article by N. F. Mott[1] published in *Nature* of February 25, 1950. Optical evidence which had been obtained by an interference method by Griffin[2] was cited in favour of spiral growth-steps ending on screw dislocations occurring in beryl crystals, thus supporting the growth mechanism which had been suggested by Frank[3] to account for crystal growth at very low supersaturation values.

Examination in the electron microscope of single crystals of the *n*-paraffin, *n*-hexatriacontane, $C_{36}H_{74}$, has given striking evidence that these crystals do grow out from a dislocation in the primary nucleus.

Small crystals of *n*-hexatriacontane, grown from a solution in petroleum ether, were shadow-cast with palladium[4] and examined in a Philips's electron microscope. The accompanying micrograph shows the simplest type of crystal observed. This, and all the other crystals examined, showed the presence of molecular steps of the type first observed by Robert and Buzon[5] in preparations of commercial paraffin. Closer examination of our micrograph shows, however, that the molecular step edge on the crystal face runs in a continuous spiral from the apex, that is, 'the growth-point', of the crystal to the base, and that the crystals are, in fact, as Frank has suggested, growing, "up a spiral staircase", and not in a series of closed terraces. This, of course, implies that during growth fresh molecules can always condense on a monomolecular edge, and that successive molecular edges do not have to be initiated on the growing crystal face. Under these conditions, growth takes place at a low degree of supersaturation in accordance with the experimental evidence of Volmer and Schultze[6].



The micrograph shown here is an example of the simplest type of spiral dislocation seen in our experiments. Other micrographs show the effects of multiple dislocations on crystal-growth, and these, together with the detailed conclusions which can be drawn from our observations, will be published elsewhere.

We wish to thank Prof. J. M. Robertson for his interest in these results. We are indebted to the Rockefeller Foundation for a grant for equipment, and to Imperial Chemical Industries, Ltd., for research fellowships. The specimen of *n*-hexatriacontane was kindly supplied by Mr. C. W. Bunn.

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Occurrence of Stripped Nuclei of Neon in Primary Cosmic Rays

Bradt and Peters[1], in their analysis of the primary cosmic radiation as observed in the out-of-the-atmosphere observations with the plate technique, have given the completely stripped nucleus of neon as one of the main components of the heavier cosmic particles. In fact, the relative abundance is given as almost the same as that of oxygen-16 (*vide* Fig. 13, p. 66, of their paper).

It appears that if the identification of the stripped nucleus of neon as one of the main constituents of primary cosmic particles be correct, and is confirmed by subsequent observations, it constitutes a very strong argument against the hypothesis that the sun is the source of cosmic particles received on the earth[2,3]. For to have stripped nuclei of neon from the sun, it must be first demonstrated that neon exists on the sun and is at least once ionized on the photosphere or the chromosphere. The evidence on these points, as will be shown presently, is absolutely negative, in spite of the fact that strong lines of Ne and Ne^+ occur within the solar range of wavelengths (3,000–10,000 A.).

It is true that the fundamental lines of Ne and Ne^+ occur in the far ultra-violet, and the lines which occur in the solar range belong to the transitions:

$$\left.\begin{array}{l} 1s^2.2s^2\,(2p^5.3s - 2p^5.3p) \text{ or higher transitions for Ne} \\ 1s^2.2s^2\,(2p^4.3s - 2p^4.3p) \text{ or higher transitions for } Ne^+. \end{array}\right\} \quad (A)$$

But the physical conditions on the sun, as we know, are such that if neon existed there at even moderate strengths the lines of Ne, Ne^+ belonging to the above-mentioned combinations could not escape detection, at least in the flash spectrum of the sun. An analogous case is afforded by He and He^+, which have their fundamental lines in the extreme ultra-violet; but of the higher transition lines, only λ 10,830·38, $1s.2p^3S_1 - 1s.2p^3P_1$ is found as an absorption line in the Fraunhofer infra-red spectrum[4]; and none of the other lines of He, $1s.(2s^{1,3}S - np^{1,3}P)$, $1s.(2p^{1,3}P - nd)$, is found ordinarily in the Fraunhofer spectrum, except when the solar atmosphere is disturbed. But the lines $1s.2p^{1,3}P - 1s.nd^{1,3}D$, which include the well-known D_3 and other higher transition lines of helium, are found in great strength in the solar chromosphere; thus proving that though helium exists in great