and then subsequently less rapidly. Optical examination of surface traces on the same specimen indicated that about half was transformed by a strain of 13%.

A study of the crystallography of the transformation, including an x-ray diffraction determination of the structure of the γ phase, has been initiated in this Department. It is of interest that Weaire (1968) has predicted on the basis of pseudopotential theory that the γ structure might be obtained from face-centred cubic by the opposite rhombohedral distortion to that which produces the α structure (regarded as face-centred rhombohedral). Another possibility considered by Weaire (1968) is a distorted hexagonal close-packed structure with c/a about 2·0.

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Step Growth on Ice during the Freezing of Pure Water

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Abstract

Ice has been observed to grow from its pure melt by the propagation of steps across the freezing interface. The heights of the steps range from 0·1 to 4 microns and the distance between steps from 5 to 20 microns. The concentration of steps and their behaviour appear to be completely independent of crystal orientation.

Several workers have obtained indirect experimental evidence which indicates that when ice grows in the direction of the c axis into supercooled water it does so by the propagation of steps across the basal plane (Hillig 1958 Michaels, Brian and Sperry 1966). Hillig and Turnbull (1956) found that the growth of ice normal to the c axis was proportional to the 1·7 power of the supercooling of the water. They concluded from this result that growth in this direction also was probably controlled by step growth. In this note we described the results of experiments in which steps have been observed to move across the freezing interface of polycrystalline ice growing slowly from pure water.

The experimental apparatus consisted of a stainless-steel box with glass cover-plate (fig. 1). The box was cooled by means of a thermoelectric module attached to the bottom of the box. The entire assembly was mounted on the micrometer stage of a microscope so that the ice–water interface could be conveniently viewed. Prior to freezing, a vacuum system was used to remove all air from the box. The water was singly distilled and was passed through an ion exchange column. After the water had been slightly supercooled it was nucleated either by giving the box a sharp rap or by passing a rod cooled in liquid nitrogen over the surface of the water. A short time after the freezing was initiated the ice–water interface became parallel to the bottom of the box and the polycrystalline ice consisted of grains about 0·3 mm^2 in area. The freezing rates were in the range of 0·1 to 1 micron sec^{-1}.

When the water above the ice was essentially isothermal, steps were observed to move over the entire freezing interface (fig. 2). Some of these steps originated at grain boundaries while others grew from spiral