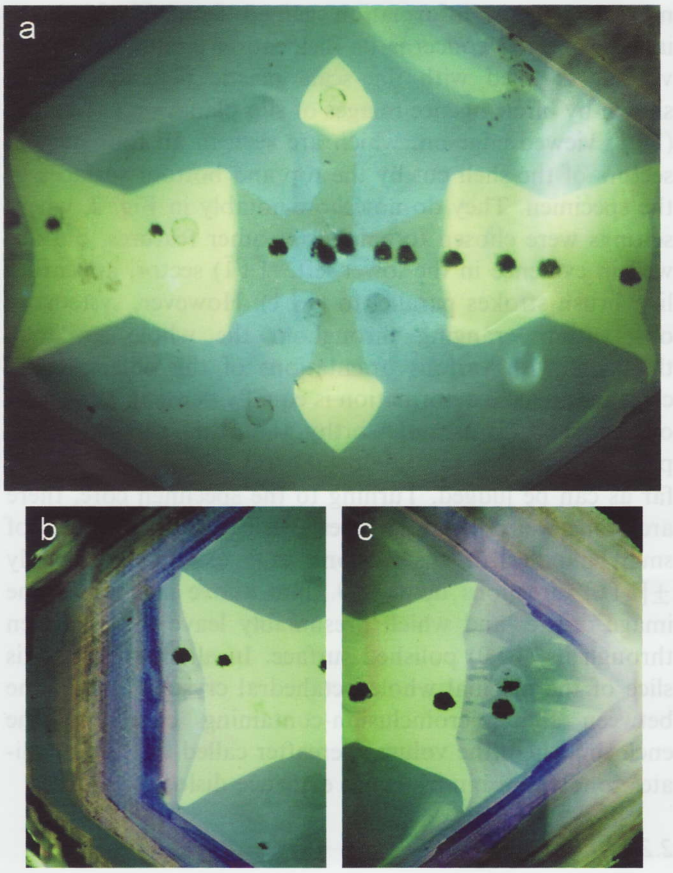

Fig. 3. CL topographs of (1 1 0) surface recorded on Kodak 200 HD film. Electron energy 30 keV, specimen current density ~0.2 μA mm^{-2}. (a, top) Central area, overall field width 1.75 mm. Note some diffuse areas of cuboid-type green-yellow CL within octahedral sectors, notably $(1\,\bar{1}\,1)$. But colourless brightness masking CL from part of the (0 0 1) cuboid and $(1\,\bar{1}\,1)$ octahedral sectors is an artefact, being light scattered by the large crack out-of-focus near the $(\bar{1}\,\bar{1}\,0)$ surface. (b, lower left) Area towards $[0\,0\,\bar{1}]$ coign, field width 0.8 mm. (c, lower right) Area towards [0 0 1] coign, field width 0.8 mm.

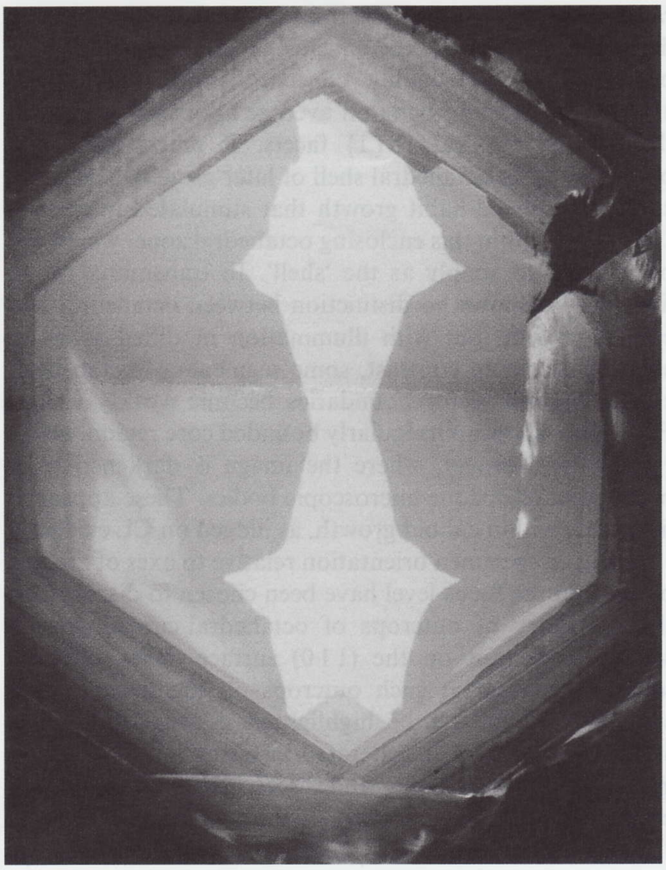

Fig. 4. CL topograph of $(\bar{1}\,\bar{1}\,0)$ surface. Spliced monochrome prints from colour originals, inverted left-to-right so that orientation of $(\bar{1}\,\bar{1}\,0)$ surface appears as if viewed vertically under Fig. 3(a). Electron beam conditions as in Fig. 3. Field width 1.8 mm.

the cube-dominant case [4,7] are instructive, but these constructions are idealisations depicting full centrosymmetry together with a constant ratio of growth rate normal to {1 0 0} to that normal to {1 1 1}, neither conditions applying in 1137. However, it is useful to note that in an ideal cubo-octahedral mixed-habit diamond all growth sector boundaries lie between octahedral and cuboid growth sectors, i.e. are o–c type. In the case of cube dominance, c–c boundaries also occur. Correspondingly, with octahedron dominance, o–o boundaries occur as well as o–c. Because (1 1 0) is a symmetry plane, a single (1 1 0)-surface CL pattern on an off-centre cut will not show whether the crystal growth centre is 'above' or 'below' the cut surface. Combining CL and optical microscopic observations suggests that the growth centre of 1137 lies below the nearer surface in Figs. 1–3, within the volume of the specimen. Consequently, the growth-direction indices in the cuboid material extending upwards and downwards from the pattern centre in Fig. 3(a) are [1 0 0] and [0 1 0], respectively. Combined observations also indicate that the shape of the core is close to cubo-octahedral, as far as can be determined from views normal to the specimen plate. At the centre of Fig. 3(a), surrounded almost completely by 'greenish' cuboid growth, is a patch of 'blue' octahedral growth comprising a roughly elliptical area with its centre on the $[0\,0\,\bar{1}]$ side of the overall vertical symmetry line of the pattern, and, attached to it, a smaller area, also roughly elliptical, with centre on the [0 0 1] side of that line. These two small areas are near-apex sections of octahedral growth 'pyramids' expanding in directions $[1\,1\,\bar{1}]$ and [1 1 1] inclined ~35° to left and right of the [1 1 0] normal. (This configuration, present in near-central (1 1 0) sections of mixed-habit growth, is seen in the X-ray topograph Fig. 1(a) of Ref. [5].)

Figs. 3(b) and (c) are informative on two matters: the sequence of topographies adopted in the terminating stages of cuboid growth in the ±[0 0 1] directions (discussed further in Section 7) and defects in the shell. CL micrographs taken all round the specimen periphery, on both (1 1 0) and $(\bar{1}\,\bar{1}\,0)$ surfaces, show that the shell is built up of growth lamellae on a fine scale, thicknesses in the range ~10 to ~50 μm, distinguishable by markedly different CL properties, but mainly those of common natural diamonds, optical type IaA/B, in which N