following results: C–C, 1.52 ± 0.02 Å.; C–Cl, 1.76 ± 0.02 Å.; angle between the C–Cl bond and the plane of the ring, 56 ± 2°. There were no unusual difficulties in the determination, which made use of photographs showing features out to $q = 100$, and hence we feel that these results justify confidence.

It seems probable that the angle between the C–Cl bond and the plane of the ring in other chlorocyclopropanes, including *trans*-1,2-dichlorocyclopropane, is little different from 56° and that the value 48° found by Spinrad[2] is in error, due perhaps to the presence of impurities, a possibility mentioned by Spinrad[2] and Stevens,[3] or to inadequacies of the interpretation of the dipole moment data.

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VERNER SCHOMAKER

RECEIVED MAY 1, 1946

THIN UNDISTORTED SECTIONS FOR ELECTRON MICROSCOPY

Sir:

A serious limitation on electron microscopy results from the fact that sections of only a few tenths of a micron in thickness must be obtained if they are to transmit electron beams. The invention of the high speed ultramicrotome[1] by O'Brien and McKinley in 1943 showed that under certain conditions such sections could be produced.

However, the opinion is still current that such sections may be so distorted that they are artifacts. For optical microscopy, sections are frequently exposed to great stresses and submitted to drastic treatments without losing their value. The high speed microtome should give better sections because the inertia of the material tends to conserve the structure as compared with the relatively slow dragging of an ordinary microtome.

Here the accompanying electron micrograph gives for the first time a conclusive demonstration that the high speed ultramicrotome can yield thin sections of a comparatively soft plastic body without smearing or distortion.

The specimen is from a commercial, floating, tallow coconut oil soap manufactured by drastic working in the neighborhood of 100° (water content about 20%) while air is incorporated, with subsequent cooling to room temperature during which phase changes induce further fine subdivision of the soap and of the air. It had been surmised from optical and ultraviolet microscopy that the texture was submicroscopic and possibly finely granular. Now it is apparent at a glance that this is indeed the case.

The "converter" soap is very clearly resolved into primary particles of soap about 1000 Å. in diameter, and these are seen to be loosely aggregated into an open mass enmeshing the air. No smearing of the soap is noticeable, nor any directional effects caused by the microtome except for a regular variation in thickness caused by unevenness of the microtome blade itself. Even the air spaces show no signs of having been distorted or crushed.

It is an important circumstance that these sections are caught directly upon 200-mesh wire gauze without coming into contact with any surface, and then directly examined.

Opportunity may be taken to record a suggestion made by one of us (J. W. M.) that the enclosed cell of McBain and Abrams[2] devised for liquids can to great advantage be used with such solid sections as are given by the high speed microtome. If the sections are caught directly in such a cell, which is vacuum tight and also impermeable to water vapor, while transparent to electrons, they may be preserved intact and examined without exposure to vacuum or desiccation, thus opening valuable new possibilities for the examination of solid colloids and of biological material.

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(1) O'Brien and McKinley, *Science*, **98**, 455 (1943); see also the modifications by Ladd and Braendle, *Rubber Age*, **57**, 681 (1945) and Fullam and Gessler, *Rev. of Sci. Instruments*, **17**, 23 (1946).

(2) Abrams and McBain, *J. Appl. Physics*, **15**, 607 (1944); *Science*, **100**, 273 (1944).