enstatite do not crystallize to a single phase under these conditions.

Along the join lime Tschermak's molecule-diopside, the substitution is Al-Al for Mg-Si. One would expect that replacing an Mg atom with a relatively small Al would cause a and b to decrease. Likewise, replacing an Si atom with a relatively large Al atom in the silica chains would cause a slight increase in c. These are the observed effects. β changes little in this series. The internal consistency of the data for this parameter, i.e., the lack of scatter of the points about the curve in figure 4, is remarkable considering the scale of the diagram. The parameter that changes most is b, and hence reflections with large k are most satisfactory for determinative purposes along this join.

Volumes in this solid solution series depart systematically from a straight line connecting the end members in a way that implies that they are nonlinearly related to composition. The departure from linearity, although apparently real, is not large. A straight line would fit the data within 0.5 per cent.

Edges of the unit cell change little along the diopside-enstatite join; the most conspicuous feature of figure 5 is the large decrease in β with increasing content of enstatite. The volume is essentially linear with composition over the limited range of the data.

There is a systematic difference between our results and those of Hytönen and Schairer (*Year Book 60*, p. 136). They based a determinative procedure for diopsidic pyroxenes on the positions of the (150) and (510) reflections. We did not read (510) because of possible interferences with (422) and (332), but we can calculate its position from our data. For both reflections our 2θ angles are about 0.1° larger than those reported by Hytönen and Schairer. By assuming a value for β, it is possible to calculate a and b for diopside from their data. Using the extreme values of β in table 2, it is found that $a = 9.751$ to 9.755 Å and $b = 8.937$ Å. These values are sufficiently

larger than those found by other workers to cast serious doubt on the determinative curves given by Hytönen and Schairer.

Melting relations in the system diopside-anorthite-silica. Liquidus data for this system at atmospheric pressure are shown in figure 6. Dots indicate the compositions studied by the quenching method. Except for compositions near the diopside-silica join, the figure has approximately the appearance of the simplest type of ternary diagram, that is one in which only three pure solid phases exist and liquid miscibility is complete. That this is only approximately true was first shown by Osborn (1942), who demonstrated that the join diopside-anorthite is not binary owing presumably to solid solution of alumina in the pyroxene. This result has been confirmed by Hytönen and Schairer (*Year Book 60*). To obtain more precise information on the composition of the pyroxene, careful X-ray work was done on a composition lying on the diopside-anorthite join that was equilibrated with liquid at 1260°C and on a composition lying in the ternary plane that was equilibrated with liquid at 1220°C. In both, the departure of the unit-cell parameters from those of pure diopside was small; it was greater for the composition crystallized at the higher temperature. Hytönen and Schairer (*Year Book 60*, p. 137) indicate that at 1135°C in this system (a temperature well below the solidus) the pyroxene contains about 3 per cent lime Tschermak's molecule. They considered it probable that this amount of solid solution was metastable, and our results suggest the same. Because of the small shift in properties relative to experimental error, it is not possible to determine the direction in which these pyroxenes differ from pure diopside.

In all the sixteen compositions within the triangle diopside-anorthite-silica, the third solid phase first appeared on cooling at temperatures between 1218° and 1225°C. This implies that the system diopside-anorthite-silica is very nearly ternary, and that the stable pyroxene