crystal, as measured on the Fedorov stage. The usual proceedure of plotting the results of measurements on the Fedorov stage on a piece of tracing-paper placed above a stereographic net, is rather intricate and mistakes of recording are apt to occur. A nomogram of the direction-cosines equation is simple in use and would help to check the figures at a glance. The nomogram can also be used for checking the interfacial angles between the face (*hkl*) and the faces (100), (010), and (001) for crystals with a set of rectangular crystallographic axes.

The chemical composition of leucoxene in Cainozoic bauxite from Boolarra, Victoria.

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DURING a petrological examination of samples of bauxite from Boolarra, in south Gippsland, Victoria, it was noted that some specimens of the bauxite, which is largely derived from Tertiary olivine-basalt, contained numerous grains of yellow-brown to amber-yellow leucoxene. The leucoxene is clearly pseudomorphous after ilmenite, residual particles of ilmenite being enclosed in many of the leucoxene grains. Most of the leucoxene grains are opaque, but occasional grains are translucent to transparent, though isotropic. Some of them show parallel markings suggestive of cleavage, but probably a residual structure from the replaced ilmenite. In view of the highly aluminous nature of the enclosing rock, there seemed some possibility that this mineral might be the little-known aluminium titanate, xanthitane. It was thought, therefore, that if a pure sample of the mineral could be prepared, a chemical analysis would establish its identity.

When the bauxite was treated with 1 : 1 H_2SO_4, the gibbsite which formed the bulk of it was quickly dissolved, leaving the leucoxene apparently unaltered in the relatively small residue. An attempt to separate the leucoxene from this residue in bromoform was unsuccessful, on account of the fine-grained and flocculent nature of the residue, which consisted chiefly of clay, amorphous silica, and titanium oxide. When, however, the residue was transferred to a Haultain superpanner, it was found that a distinct concentration of the coarser grains of leucoxene could be prepared. The concentrate was contaminated with a considerable amount of ilmenite and partially altered felspar. A sample of 1000 grams of bauxite was then treated in 50 gram lots, first in sulphuric acid, and then on the superpanner. The concentrate obtained was finely granular, and suitable for separation in heavy liquids. Successive treatments in bromoform of specific gravity 2·889 removed all but a small amount of the felspar from the concentrate, which was then returned to the superpanner. Successive treatments were made on the superpanner, until no more ilmenite could be separated. Microscopic examination revealed that ilmenite was still present in moderate amount, so the powder was subjected to treatment with an electromagnet until only a minute amount of free ilmenite remained in it. Microscopic examination at this stage showed that the leucoxene concentrate still contained a small proportion of ilmenite, chiefly as unaltered residuals within the leucoxene grains. A small amount of felspar was also present, but not in sufficient amount to mask the composition of the leucoxene in a chemical analysis. An attempt was made to reduce the ilmenite content still further by stewing the powder for an hour in 1 : 1 H_2SO_4, but no appreciable reduction could be detected. The amount of almost pure leucoxene obtained at this stage amounted to about 0·18 gram, of specific gravity 3·56. The refractive index of the translucent grains was determined in sulphur-selenium melts as 2·15±0·03, which is lower than that of either rutile, brookite, or anatase. When roasted in air for half an hour at bright red heat, the leucoxene became uniformly opaque. The colour changed on roasting from yellow to white with a tinge of buff.

The chemical analysis shown below (no. I) was obtained from a 0·1 gram sample of this powder.

	I.	II.
TiO_2	86·6	72·12
FeO	3·6	1·35
Fe_2O_3	—	0·50
SiO_2	1·2	24·49
Al_2O_3	0·5	nil
CaO	n.d.	nil
MgO	n.d.	nil
H_2O+	8·0	1·66
	99·9	100·12

I. Yellow leucoxene from Boolarra, Victoria.
II. White leucoxene, in Permian sandstones, Oklahoma. Silica derived from quartz. (F. Coil, 1933.)

The iron in the analysis is presumably derived from the residual ilmenite in the leucoxene, which would therefore amount to about 7·6% of the sample. The silica and alumina are derived from the felspar contaminating the sample. The leucoxene consists, therefore, of hydrated titanium oxide, $TiO_2.nH_2O$. This result confirms that of Coil[1] as to the composition of leucoxene. Presumably the water content of leucoxene is variable, since the sample of leucoxene analysed by Coil (no. II above) contained considerably less water than the Boolarra leucoxene, and had a correspondingly higher specific gravity of 4·17 (?), compared with 3·56 for the Boolarra specimen. The colour of the Oklahoma leucoxene analysed by Coil was, moreover, white, as distinct from the pronounced yellow colour of the Boolarra leucoxene.

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[1] F. Coil, Chemical composition of leucoxene in the Permian of Oklahoma. Amer. Min., 1933, vol. 18, pp. 62–65. [M.A. 5–285.]