This type of occurrence of talc, with sodium and potassium chlorides of sedimentary deposits, does not seem to have been noted before. Its occurrence in the cleavages of halite and sylvite (Plate 23*C* of Bulletin 833) would indicate that its formation in the salines is secondary and later than their deposition. The talc has been definitely recognized in three cores from New Mexico and probably is present in several others; it seems to be rather widespread in this field.

NATURAL EX-SOLUTION INTERGROWTHS OF MAGNETITE AND HEMATITE

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The object of this note is to record three natural occurrences of ex-solution intergrowths of magnetite and hematite. Investigation of the equilibrium relationships of Fe_3O_4, Fe_2O_3 and oxygen[1] has shown that at high temperatures hematite and magnetite form a partial solid solution, which unmixes on slow cooling to form an intergrowth of hematite lamellae in the (111) directions of the magnetite, the orientation being explicable in terms of shared O-planes (the (0001) O-planes of the hematite and the (111) O-planes of the magnetite). The degree of solid solution possible increases with temperature, as indicated by the following data quoted from Greig et alia:

Temperature ° C.	Composition of Maximum Solid Solution	
	Fe_3O_4	Fe_2O_3
1075	92	8
1200	87	13
1388	75.5	24.5
1452	70	30

The ex-solution texture bears some resemblance to that resulting from the replacement of magnetite by hematite (martitization) during either hypogene or supergene oxidation of magnetite, but there are distinctive points of difference. In the ex-solution intergrowths the hematite lamellae are evenly distributed through the magnetite in blades of uniform size, and there is no concentration of the hematite at the crystal margins, or in patches or along fractures, whereas with oxidation of the magnetite,

[1] Greig, J. W., Posnjak, E., Merwin, H. E., and Sosman, R. B., *Am. Jour. Sci.*, **30**, 239–316 (1935).

the alteration to hematite proceeds from the margins, crystal boundaries and fractures into the cores of the crystals, often giving rise to a rim of hematite that extends irregularly into the magnetite crystal. Natural occurrences of such intergrowths appear to be rare, and the writer is not aware that they have been recorded previously.

Of the three to be recorded here, one occurrence is a pebble about 1 cm. across from a river gravel in the Cairns district of Queensland, Australia; the other two occur as grains in beach sands at the Vunda River and at Lautoka, both on the island of Viti Levu, Fiji. The Cairns specimen consists of a single waterworn crystal. The proportions of magnetite to hematite in the intergrowth (Fig. 1) have been measured micrometrically and are about 80:20, which from Greig's data quoted above, would indi-

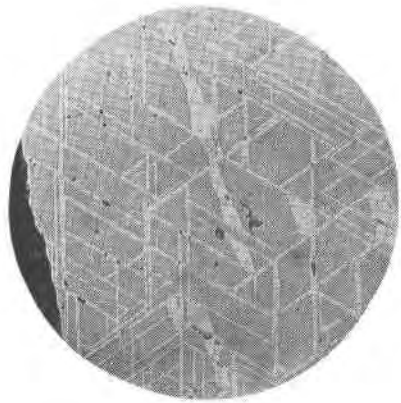

FIG. 1. Ex-solution intergrowth of hematite lamellae (white) in the (111) planes of magnetite (grey). × 40. Detrital crystal, Cairns district, Queensland.

cate that the crystal originated at a temperature of about 1300° C. The source of the crystal is unknown, it being found in a concentrate supplied by a prospector in the Cairns district.

In the other two occurrences intergrowths of this type, on a much finer scale, form grains up to 1 mm. across, which are a component of magnetite beach sands occurring in some volume on the south-eastern coast of Viti Levu. The relative proportions of magnetite to hematite vary from grain to grain, and could not be measured accurately, but are estimated to be about 85 parts of magnetite to 15 of hematite for both Vunda River and Lautoka, indicating a temperature of formation for these grains of about 1200° C. These beach sands are almost certainly derived from the volcanic rocks, chiefly andesites, of Viti Levu. In both sands magnetic minerals constitute more than 90 per cent of the total weight. The magnetic minerals are chiefly unoxidized magnetite, and the

magnetite-hematite intergrowths. The intergrowths are more abundant in the Lautoka sand than in the Vunda River sand. The non-magnetic minerals present are chiefly augite, with occasional grains of hornblende, olivine, hypersthene, biotite, quartz and feldspar.

The temperatures of formation indicated for these mineral intergrowths are unduly high for igneous rocks, and this suggests that in the natural processes giving rise to such intergrowths some additional factor enters to permit such solid solution to exist at temperatures lower than those found in the laboratory studies of Greig and his associates.

MAGNETITE CRYSTALS FROM COPPER CONVERTER

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When one of the copper converters in the smelter of Rhokana Corporation at Nkana, Northern Rhodesia, was taken out of commission for relining recently, a small mass of black crystals was found in the bottom of the converter. Such an occurrence had never been observed before by the operating staff, many of whom have had a lifelong experience in the

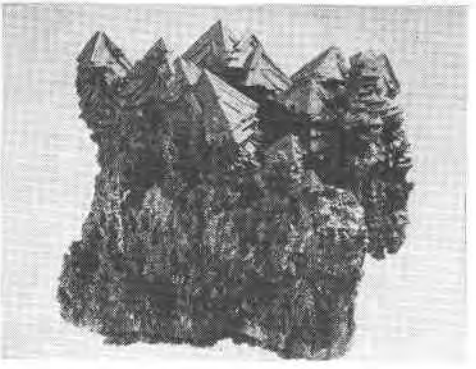

Fig. 1

copper industry, and the crystals were turned over to us for examination. Figure 1 illustrates their general appearance, showing the growth of parallel partial crystals in the direction of the crystallographic axes.

The crystals were black, octahedral, magnetic, with a hardness of ap-