of this kind clearly cannot be taken as detailed confirmation of the proposed model. It is felt, however, that the general features of the model are perhaps suggestive of the true state of affairs. Although the model is based upon trial and error calculations, it is not completely arbitrary. The "banding," which is seen to be roughly parallel to the (210) direction, is closely related to the presence in the diffraction pattern of a dominant (210) peak. Some improvement in the agreement can be achieved by slight modifications of the model and by adjustment of the form factor for magnetic scattering.

It was felt, however, that further refinement was unwarranted in view of the uncertainty in the experimental intensities. Furthermore, small undetected departures from the completely normal spinel structure may have some effect on the superlattice pattern.

It is worth noting that the anomaly in the paramagnetic diffuse scattering at liquid nitrogen temperatures referred to earlier may be interpreted[9] as arising from a short-range ferromagnetic interaction. This is not inconsistent with the picture suggested here of an antiferromagnetic alternation of ferromagnetic bands.

New Low-Temperature Ferromagnets

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Certain of the complex cyanides of elements of the $3d$ transition group appear to be ferromagnetic at very low temperatures.

WE have observed large positive susceptibilities and ferromagnetic remanence at liquid helium temperatures in a number of complex cyanides of iron transition group metals.

The apparatus is the same as that used in previous work on superconductivity.[1] It measures the change in mutual inductance of two coils surrounding a sample in powder form; for the measurement of remanence, the sample was pulled out and the current pulse from one coil observed. It is incapable of precision measurements on ferromagnetic substances, both because of the small fields available and of the difficulty of calibration. On the other hand, purely paramagnetic susceptibilities of the order of magnitude expected in these substances would be nearly unobservable with our sensitivity.

Our results are shown in Table I. The entries are the temperatures of maximum observed susceptibility. For each entry not zero, a remanence was also observed.

TABLE I. Absolute temperature of maximum susceptibility of cyanides.

	K^+	Zn^{++}	Cr^{+++}	Mn^{++}	Fe^{+++}	Fe^{++}	Co^{++}	Ni^{++}	Cu^{++}
Ferricyanide (Fe(CN)₆)⁻³	0			2°	15°	3.5°	12°	19°	11°
Ferrocyanide (Fe(CN)₆)⁻⁴			2°		3.5°				
Cobalticyanide				0	0		0	0	0
Manganicyanide	0	0	0	35±5°		0	16°	17°	0
Chromicyanide		0		0	0	0	0	0	0

0's indicate that the substance was tested with negative results down to 1°K; some may be ferromagnetic at lower temperatures.

The field used in the measurement of susceptibility was about 10 oersteds. The maximum moment was about 0.2 to 2/cc. For all the substances in Table I, the observed remanence was about $B_r \sim 5$ gauss but, of course, this must be understood as an extreme limit for the saturation remanence.

The materials were precipitated by slowly adding 25 cc of solution 0.2 molar in the potassium salts of the anions to 50 cc of solutions 0.2 molar in the cations, and isolating and washing the precipitates in the centrifuge. The existence, as chemical individuals, of some of the substances ostensibly produced in these reactions has been questioned. It is also well known that such precipitates often contain potassium, and that the valence states of the heavy metal ions are ambiguous. This is particularly so for Prussian and Turnbull's blues:

$$(Fe^{+3})_4[(Fe(CN)_6)^{-4}]_3 \text{ and } (Fe^{+2})_3[(Fe(CN)_6)^{-3}]_2.$$
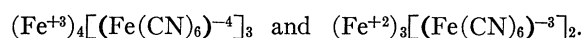
We can merely point to the use of excess cation and of comparable conditions of precipitation to justify the nominal formulas of Table I.[2]

Measurements of Curie points and magnetizations are to be published by R. M. Bozorth, H. J. Williams, and D. E. Walsh.

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[1] B. T. Matthias and J. K. Hulm, Phys. Rev. 87, 799 (1952).

[2] Weiser, Milligan, and Bates, J. Phys. Chem. 46, 99 (1943).