ment, and in both cases the formula is obviously $Mg_3Ca(CO_3)_4$.

X-ray powder diffraction data (Table 2) are in agreement with those of Faust (1953) and Koblencz and Nemecz (1953). More diffraction lines have been recorded than reported by the previous workers, and not all can be indexed on the unit cell proposed by Faust. A spacing of 2.74 Å, not previously reported, has been persistently recorded and does not vary in intensity from sample to sample which would be expected if it were due to an impurity. This diffraction line has now been recorded in Currant Creek, Nevada material (Personal communication, Dr. George T. Faust, Feb. 1957).

Attempts to refine the unit cell proposed by Faust, to fit the observed *x*-ray diffraction data, have been unsuccessful.

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CHROMIAN MUSCOVITE FROM BAKER MOUNTAIN, VIRGINIA

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Further research concerned with possible correlation between type and color of mica and intensity of color of associated kyanite, as previously outlined by the writer (Dietrich, 1956), has been postponed indefinitely because of a shift in research objectives. The following data derived from already completed studies of chromium-bearing muscovite ("fuchsite") from Baker Mountain, Prince Edward County, Virginia, are presented here because it is believed that possibly other workers may find them of value.

1. *X*-ray investigations: The mica is of the 2M type. As compared to "pure K-muscovite" this chromian muscovite has a slightly larger $c \sin\beta$ value (10.00 Å and 10.10 Å, respectively, for 002 reflection). Partial substitution of Cr^{+3} (radius .63 Å), Fe^{+3} (radius .64 Å), and perhaps Fe^{+2} (radius .74 Å) and $V^{+5,+4,+3}$ (radii .59 Å, .63 Å, and .74 Å, respectively) for Al^{+3} (radius .57) probably accounts for this.
2. Optical properties:

Pleochroism—slight in thick cleavage fragments
Indices of refraction—α—1.553 (calc.)
β—1.591
γ—1.596
Biaxial (−)
$2V = 37° \pm 3°$
Slight dispersion $r > v$.

3. Specific Gravity: 24.8 ± .01 ?
4. Chemical data:

Analysis (*a*) and analysis reduced to atomic proportions on the basis of O=48 atoms (*b*):

	(*a*)		(*b*)	
SiO_2	47.00	Si	12.57	16.00
TiO_2	.55*			
Al_2O_3	34.58	Al	10.99	
Cr_2O_3	.17	Cr	.035	8.40
V_2O_5	.07	V	.01	
Fe_2O_3	1.02	Fe'''	.21	
FeO	.29	Fe''	.065	
Mn	tr.			
Li_2O	tr.			
MgO	1.30	Mg	.52	
CaO	.14	Ca	.04	3.98
Na_2O	1.99	Na	1.23	
BaO	.12	Ba	.01	
K_2O	7.90	K	2.70	
Rb_2O	.01	Rb		
Cl	tr.			
F	1.27	F	1.27	48.00
H_2O^+	3.60	OH	6.78	
H_2O^-	.19	O	39.95	
	100.20			

(Analyst: C. O. Ingamells, Rock Analysis Laboratory, University of Minnesota.)

* The titanium oxide was not included in the calculations made to reduce the analysis to atomic proportions because it is believed to represent contamination by rutile. Possibly a small amount of the ferric iron, vanadium, and even chromium also are carried by the rutile.

The analysis expressed as a formula is $4[(K, Na, Ca, Ba, Rb)(Al, Cr, Fe''', Fe'', Mg, V)_{2.10}(Al_{.86}\,Si_{3.14})O_{9.99}(OH, F)_{2.01}]$ which is remarkably similar to the formula that would represent the "average numbers of atoms" of the 9 analyses presented by Whitmore, *et al.* (1946, Table 3, p. 9), *i.e.*, $4[(K, etc.)_{.91}(Al, etc.)_{1.98}(Al\,Si_3)O_{9.65}(OH, F)_{2.35}]$ and also to the "ideal muscovite" formula, $4[KAl_2(AlSi_3)O_{10}(OH, F)_2]$.

The chromium content of this "chromian muscovite" is less than that reported for any muscovite termed "chromian muscovite," "fuchsite," or the like. That the indices of refraction also are lower than those of any of the previously studied specimens corroborates the suggestion (Szadeczky-Kardoss, 1937) that the indices increase with the chromium content. On the other hand, if the calculated value of α is correct, on the basis of formula

$$V_{(-)} = \frac{\dfrac{1}{\beta^2} - \dfrac{1}{\gamma^2}}{\dfrac{1}{\alpha^2} - \dfrac{1}{\gamma^2}},$$

the suggestion (*ibid.*) that the birefringence also increases with chromium content is not substantiated. The data presented by Whitmore, *et al.* (1946, Table 4, p. 11) also point out the lack of agreement between observed values and the suggested relationship between birefringence and chromium content.

Actually, the chromium content is so low that perhaps the mineral is nearer "pure muscovite" chemically than are many "muscovites" which are impure because of other elemental contaminations. Here, for example, despite the fact that this muscovite contains more than nine times as much iron as chromium, it probably would be referred to by no one as ferri- (or ferro-) muscovite. However, the perhaps less significant, though more readily apparent, fact that the muscovite is definitely abnormally greenish in color has led nearly all previous workers to use some connotation related to its chromium content. Further, it is not impossible that some of the greenish color is dependent upon, or at least contributed to by, the vanadium content. In any case, here is another fine example of the fact that certain elements are strong pigmenting agents even in extremely small amounts.

It is of at least passing interest that the Baker Mountain material contains lithium and barium. Partridge (1937, p. 458) noted that these elements are characteristic of the Mashishimala, Northeast Transvaal, material. Perhaps, instead, they are characteristic of chromium- and/or vanadium-bearing muscovite.

The chromium-bearing muscovite, herein described, occurs with kyanite, rutile, quartz, and minor zircon. Its distribution ranges from a role of the predominant mineral (up to nearly 100 per cent) of schistose segregates through a major constituent of a kyanite schist to a relatively minor constituent of a kyanite-bearing quartzite. The rutile occurs in nearly all cases as small (less than 1×1×1 mm.) grains intimately associated with the mica. Zircon is present in microscopically distinguishable grains, as inclusions in the mica, only. In some specimens kyanite and the mica are associated in such an intimate manner that the mica occurs along cleavage planes of individual kyanite laths. It was because of these relationships that the material had to be hand-sorted and checked microscopically prior to chemical analysis. Despite this care, the analyst reported that at one stage he detected a small residue containing kyanite, rutile, and zircon.

Although no corundum occurs with this suite, the paragenesis appears to fit best "Type 3" of Whitmore *et al.* (1946, p. 18), of which it is suggested that it represents formation at high temperature and high pressure with the chromium likely having " . . . origin in solutions derived from some magmatic source." Jonas (1932) who has made the most complete study of the deposit suggested essentially the same conditions but, although she did not mention the chromium separately, appeared to favor the derivation of constituent elements from the original sediment. She thought the suggestion of Taber (1913) that the kyanite-bearing rock might have been formed as a result of contact metamorphism associated with intrusion of the "Columbia granite" to be an unlikely answer.

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A COMPLEX FORM OF NATURAL NEPHELINE FROM IIVAARA, FINLAND

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In a paper dealing with the petrology of the cancrinite-ijolite from the alkaline massif of Iivaara in northern Finland, Lehijärvi (1956) described a nepheline with 19.8 atomic %K/(K+Na+Ca). The same nepheline sample was also used by Smith and Sahama (1954) in developing an *x*-ray method for determining the composition of natural nephelines. Another sample of nepheline that, according to a personal communication of Mr. Lehijärvi, originates from an exactly similar rock specimen (this Institute collection No. 9341) from the same locality, was investigated by single crystal *x*-ray methods. The result of this study is briefly summarized in the following.

In addition to the strong reflections that correspond to the ordinary nepheline structure with $a_0 = 10$ Å and $c_0 = 8.4$ Å, a series of rotation and Weissenberg photographs revealed a pattern of weak extra reflections which are observable only on strongly exposed photographs. These weak