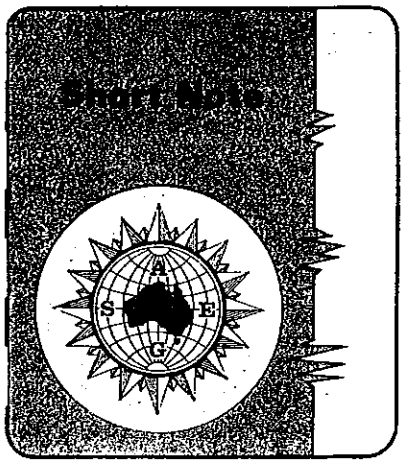

The Flemington Intrusion Fifield N.S.W.—Petrophysical and Petrological Notes

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The Flemington intrusion outcrops over an area of 65 sq. km about 10 km northwest of Fifield. It is part of the Tout Complex of Silurian age; complex and extensive aeromagnetic anomalies, over 4000 gammas, occur in this region. Rock types were sampled near Flemington homestead. (Refer to Figure 1 in other paper by E.E. & C. this issue for regional location). In Table 1 are presented the results of chemical and transmitted light microscopy studies on typical samples. These rocks are monzonites (F1B is strictly a quartz monzonite). The sample FM5B is typical of an outcrop 750 m east of Flemington homestead; sample F1B was collected 1.4 km east of FM 5B — it is typical of a large outcrop that lies in the centre of the intrusion 10 km northwest of Fifield. The rocks have a medium grain size (+ 1 mm). It should be noted that there are other rock types in the intrusion — these have not yet been sampled. Laboratory tests on the monzonite rocks (see Table 2) showed the rocks to be characterised by medium density, high susceptibility and a very pronounced susceptibility anisotropy. Natural magnetic remanence is high with Koenigsberger ratios in the range 1.6 to 65.4 indicating that induction makes only a minor contribution to the magnetic anomalies. Any quantitative interpretation and modelling of causative bodies must take into account the magnitude and direction of remanence and the effect of susceptibility anisotropy. Reflected light microscopy studies on the iron oxide minerals showed them to be mainly titaniferous magnetites with some prominent lamellae of ilmenite and exsolved lamellae of iron spinel — hercynite. The titanomagnetites contain abundant small inclusions of hercynite and ulvospinel. The titanomagnetites constitute about 3% of the monzonites, they are randomly distributed in the form of equant, anhedral grains with an average size of 0.15 mm with some grains up to 0.5 mm. Small inclusions (few microns size) of pyrite, chalcopyrite and gold were noted in association with the non opaque (pyroxene?) phases. Figure 1 illustrates the character and type of magnetite in the monzonites.

TABLE 1
Chemical Analyses & Mineralogy (%)

	FM5B	F1B		FM5B	F1B
SiO_2	51.65	52.56	Alkali Felspar	20	45
TiO_2	0.73	0.64	Plagioclase	45	25
Al_2O_3	16.43	17.59	Clinopyroxene	20	14
Fe_2O_3	4.24	3.84	Orthopyroxene	1	1
FeO	5.31	4.60	Quartz	5	10
MnO	0.19	0.17	Biotite	3	1
MgO	4.92	3.83	Opaques (mostly magnetite)	4	4
CaO	8.78	8.17	Apatite	tr.	tr.
Na_2O	3.26	2.96			
K_2O	3.59	4.02			
H_2O^+	0.42	0.37			
H_2O^-		0.05			
P_2O_5	0.54	0.57			
CO_2		0.05			
TOTAL	100.06	99.42			

TABLE 2
PHYSICAL PROPERTIES
Flemington intrusion, Narromine 1:250,000 sheet N.S.W., lat. 32°46'S, Long. 147°23'. Earth's magnetic field: 0.58 oersted, inclination — 64°, declination 10°E.

Physical Properties	Rock Type: Monzonite
Number of specimens	27
Density, dry, gms cm^{-3}, average value	2.87
Density, range of values	2.84 – 2.90
Magnetic volume susceptibility, cgs X 10^6, average	5480
Susceptibility, range	4460 – 7780
Intensity of magnetization (I) emu/cm^3 X 10^6, average	3180
Susceptibility anisotropy major/minor axis, average	1.77
Susceptibility anisotropy, range	1.57 – 2.57
Natural remanent magnetization NRM, 'Microgauss', average	43920
NRM, range.	4400 – 152270
Koenigsberger ratio, NRM/I, average	15.7
Koenigsberger ratio, range	1.6 – 65.4
Initial directions NRM*	north to northeast directions, low positive and negative inclinations*
Final directions NRM after AF cleaning	northwest to northeast directions, low to medium positive inclinations*

Note: Units used are cgs for convenience and practicality, to convert to SI multipy cgs values by following factors: density kg m^{-3}; susceptivility dimensionless but SI value = 4π cgs; intensity of magnetization amp. $metre^{-1}$ = 10^{-3} cgs (gauss or emu cm^{-3}).
*These directions exclude 1 site with very large and stable NRM (magnitude approx. 150,000 microgauss) with declination 220°, inclination —10°. In this table the directions pertain to site 2 (F1B). Site 1 (FM5B) directions were stable to AF and well grouped around (20, —55).

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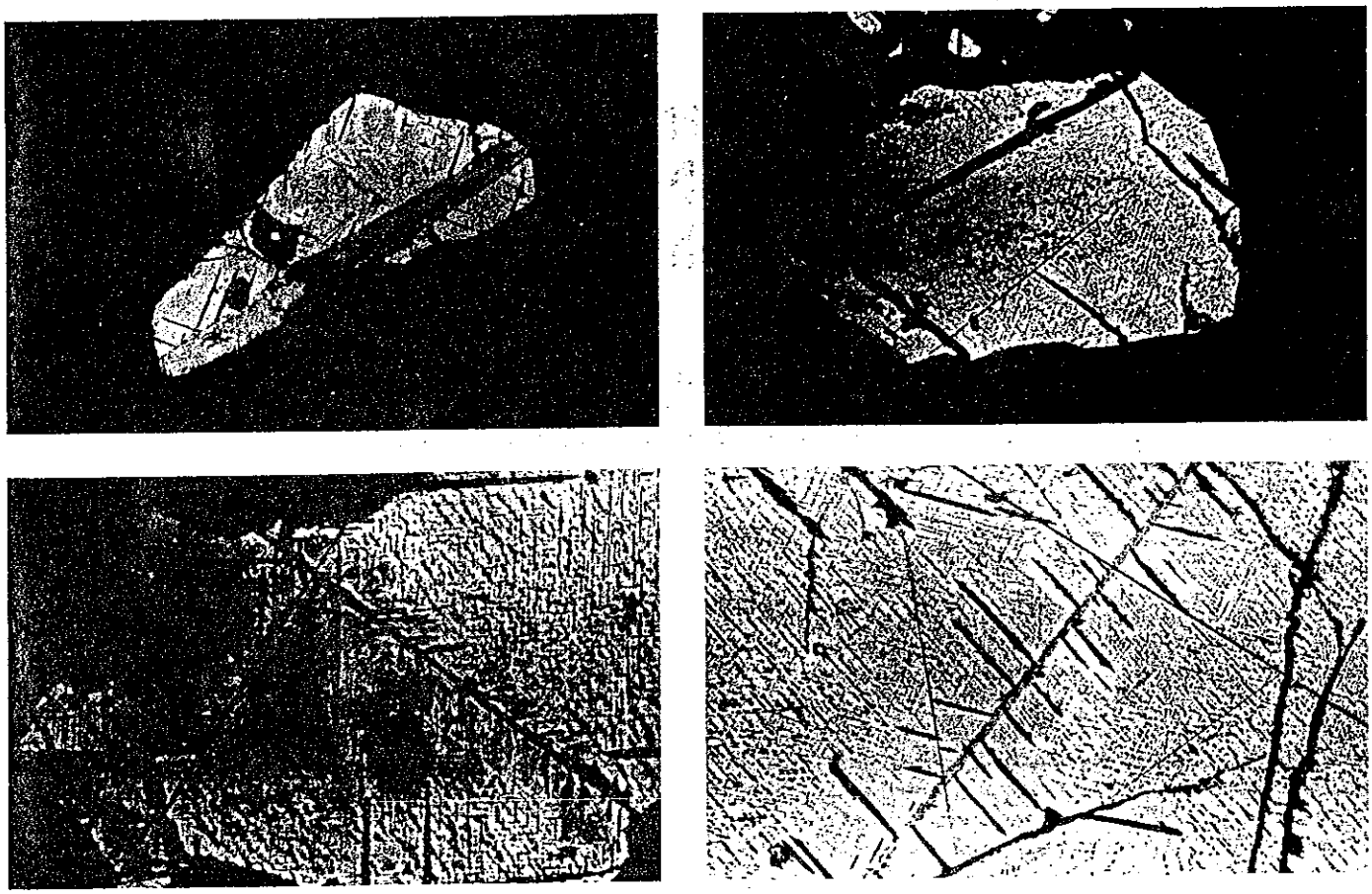

FIGURE 1

Relected light microscopy plane polarised light, photography — field of view 0.15 X 0.1 mm. Titanomagnetites in Flemington monzonites. Top left: titanomagnetite grain with broad prominent lamella of dark grey ilmenite and smaller lamellae of black hercynite in grey titanomagnetite matrix. Top right: oil immersion, grain of titanomagnetite showing large hercynite (black) lamellae, titanomagnetite (light grey) has cloth texture comprising fine exsolved inclusions of iron spinel (black) and ulvospinel (mid grey). Bottom left: oil immersion, part of large grain with two prominent ilmenite lamellae (dark grey), hercynite lamellae (black) and ulvospinel fine lamellae (mid grey) — the light grey matrix here is martite i.e. hematite (maghemite?) after magnetite (due to weathering), the darker patches on the left side are titanomagnetite relics. Bottom right; Titanomagnetite matrix containing ilmenite (dark grey), hercynite (black) and ulvospinel (mid grey). Note: Iron spinel, hercynite: $FeAl_2O_4$ ($FeO.Al_2O_3$); ilmenite: $FeTiO_3$ ($FeO.TiO_2$); ulvospinel: Fe_2TiO_4 ($2FeO.TiO_2$); magnetite: Fe_3O_4 ($FeO.Fe_2O_3$) and titanomagnetite: $x\ Fe_2TiO_4.\ (1\text{-}x)\ Fe_3O_4$ with x here about 0.5.