

THE APPENDIX

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APPENDIX SECTION A

SAMPLE DESCRIPTION

AND CLASSIFICATION

LOCALITY MAPS

K E Y

(a) KIMBERLEY MINES

B - BULTFONTEIN MINE  
DB - DE BEERS MINE  
DTP - DU TOITS PAN MINE  
K - The old KIMBERLEY MINE  
W - WESSELTON MINE

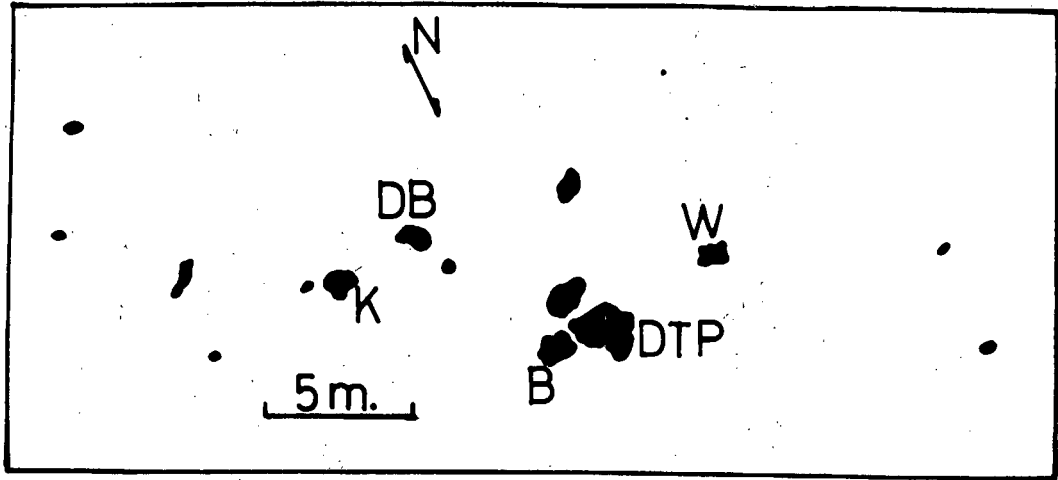
(b) 1 KIMBERLEY MINES  
2 BELLSBANK  
3 ROBERTS VICTOR  
4 KOFFIEFONTEIN  
5 JAGERSFONTEIN  
6 MONASTERY  
7 CROWN

(NEWLANDS IS IN THE SAME DISTRICT AS BELLSBANK.

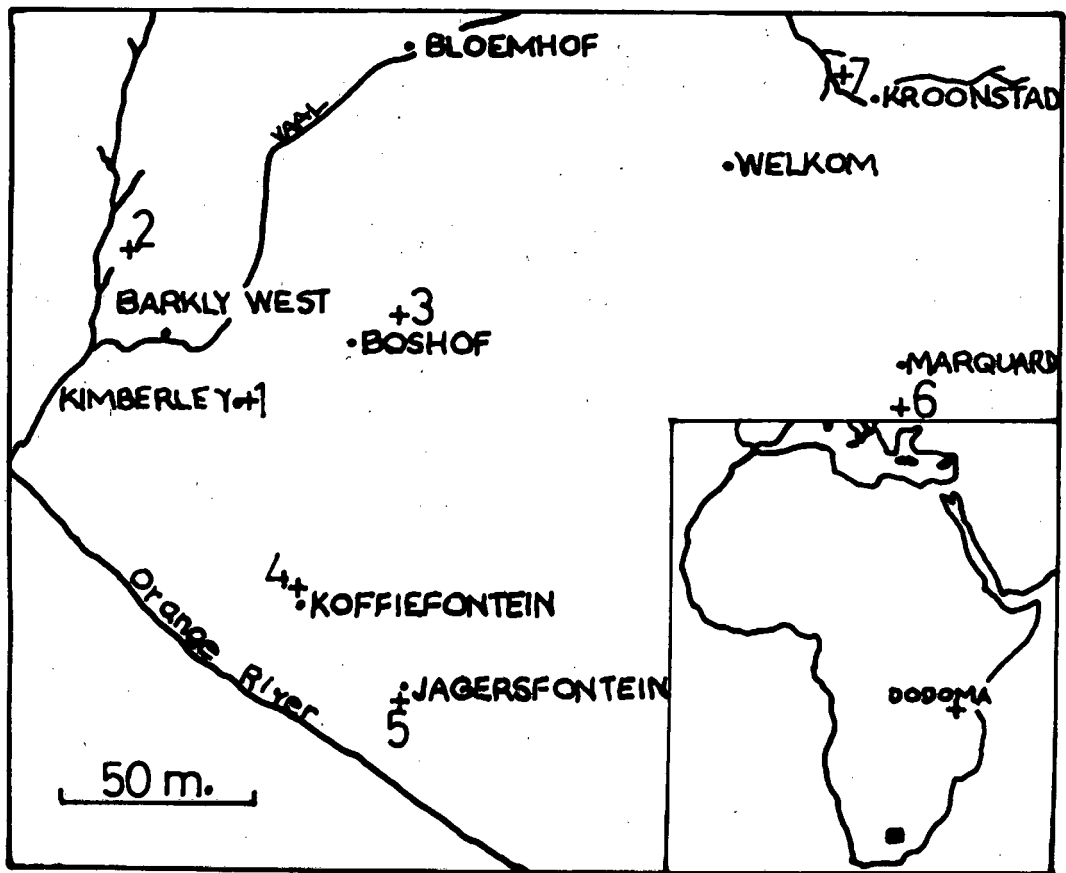
SOUTHERN FISSURES IS 20m FROM KIMBERLEY IN THE  
DIRECTION OF BOSHOFF).

# Kimberlite diatremes in the Kimberley area

(a)



(b)



Sample Locality

## (a) Kimberlites and associated xenoliths

<u>Prefix to Sample No.</u>	<u>Collection</u>	<u>Locality</u>
RV	Williams	Roberts Victor
KRV	Berg	Roberts Victor
CR	Williams	Crown
JAG	Williams	Jagersfontein
KJAG	Berg	Jagersfontein
TAN	Williams	Tanganyika
AA	Berg	Unknown
BULT	Williams	Bultfontein
KBULT	Berg	Bultfontein
WESS	Williams	Wesselton
KWESS	Berg	Wesselton
DB	Williams	De Beers
KDB	Berg	De Beers
KDT	Berg	Du Toit's Pan
KK	Berg	Koffiefontein
KN	Berg	Newlands
KBEL	Berg	Bellsbank
XSF	Gurney	Southern Fissures
MON 1	Gurney	Monastery

A map overleaf shows the geographical location of most of these kimberlites. Southern Fissures, which is not marked on this map, is a narrow dyke of kimberlite 20 miles from Kimberley in the direction of Boshoff.

## (b) Olivine Melilitites

<u>Sample No Prefix</u>	<u>Locality</u>
SU	Sutherland
ASH	Ashton
SR	Spiegel River

## (c) Other samples

The locality of occurrence of the miscellaneous samples is contained in Table A 2.

TABLE A 1

<u>SAMPLE NO.</u>	<u>ECLOGITE CLASSIFICATION</u>	<u>MODAL COMPOSITION</u>					<u>SIZE OF</u>
		<u>GARNET</u>	<u>DIOPSIDE</u>				<u>SAMPLE</u>
							<u>Kg.</u>
RV 372	Eclogite with corundum	33	65	Cor	2		0.12
RV 374	Eclogite	47	53				0.50
RV 377	Eclogite	69	31				0.30
RV 378	Eclogite	34	66				0.50
RV 379	Eclogite	46	54				0.25
RV 380	Eclogite	56	44				0.40
RV 381	Eclogite	53	47				0.30
RV 390/4	Eclogite	57	43				0.30
KRV 1	Eclogite	47	53				2.5
KRV 2	Eclogite	48	52				3.5
KRV 3	Eclogite	47	53				3.5
KRV 4	Eclogite	39	61				2.5
KRV 5	Eclogite	50	50				3.5
KRV 6	Eclogite	36	64				2.5
KRV 7	Eclogite	59	41				3.5
KRV 8	Eclogite	41	59				2.0
CR - 1	Eclogite						0.034
JAG 41	Eclogite	45	55				0.12
JAG 351	Eclogite	47	53				0.85
TAN 1	Eclogite	49	51				0.25
TAN 501	Eclogite	35	65				0.35
TAN 503	Eclogite with kyanite	49	45	Ky	6		0.20
AA 3	Eclogite						

TABLE A 1

<u>SAMPLE NO.</u>	<u>PERIDOTITE CLASSIFICATION</u>	<u>MODAL COMPOSITION</u>				<u>SIZE OF SAMPLE</u>
		<u>OLIVINE</u>	<u>ENSTATITE</u>	<u>GARNET</u>	<u>DIOPSIDE</u>	<u>Kg</u>
BULT 1	Garnet Harzburgite	75	16	9		0.25
BULT 2	Garnet Lherzolite	63	31	3	3	0.15
BULT 3	Harzburgite					0.12
BULT 4	Harzburgite					0.35
BULT 6	Garnet Harzburgite					0.50
BULT 7	Garnet Lherzolite	50	32	9	9	0.20
BULT 8	Harzburgite	72	28			0.80
BULT 9	Harzburgite	54	46			0.35
BULT 10	Garnet Lherzolite	73	19	4	4	0.18
BULT 11	Garnet Harzburgite	64	33	3		0.30
BULT 15	Harzburgite					0.40
BULT 17	Harzburgite	70	30			0.65
BULT 18	Garnet Harzburgite	67	27	6		0.35
BULT 19	Harzburgite					0.37
BULT 20	Garnet Lherzolite	51	41	8	0	1.0
BULT 21	Garnet Harzburgite	61	35	4		0.60
BULT 22	Garnet Lherzolite	49	30	11	10	1.0
BULT 23	Garnet Harzburgite					0.45
BULT 25	Harzburgite					0.70
KBULT 1	Harzburgite					2.6
KBULT 2	Garnet Lherzolite	70	21	8	1	2.7
KBULT 3	Harzburgite					2.4

TABLE A 1

<u>SAMPLE NO.</u>	<u>PERIDOTITE CLASSIFICATION</u>	<u>MODAL COMPOSITION</u>				<u>SIZE OF SAMPLE</u>
		<u>OLIVINE</u>	<u>ENSTATITE</u>	<u>GARNET</u>	<u>DIOPSIDE</u>	<u>Kg</u>
KBULT 4	Garnet Lherzolite	62	27	10	1	1.8
KBULT 5	Lherzolite					1.4
KBULT 6	Harzburgite					1.0
KBULT 8	Harzburgite					1.4
KBULT 11	Garnet Lherzolite					2.2
KBULT 13	Garnet Harzburgite	64	22	14		1.0
KBULT 14	Garnet Lherzolite					0.8
KBULT 15	Lherzolite					1.0
KBULT 16	Garnet Lherzolite	79	13	8	0	1.2
KBULT 17	Harzburgite					2.2
KBULT 18	Garnet Harzburgite					Not Known
KBULT 19	Garnet Harzburgite					4.4
KBULT 20	Garnet Lherzolite	64	28	7	1	5.7
KBULT 21	Garnet Harzburgite					2.8
KBULT 22	Lherzolite					3.9
KBULT 23	Garnet Harzburgite	71	20	9		1.0
KBULT 24	Harzburgite					1.0
WESS 152	Pyroxenite					1.0
KWESS 1	Garnet Lherzolite	75	18	7	1	1.6
KWESS 2	Harzburgite	86	14			1.2
KWESS 4	Garnet Lherzolite	57	34	8	1	2.6

TABLE A 1

<u>SAMPLE NO.</u>	<u>PERIDOTITE CLASSIFICATION</u>	<u>MODAL COMPOSITION</u>				<u>SIZE OF SAMPLE</u>
		<u>OLIVINE</u>	<u>ENSTATITE</u>	<u>GARNET</u>	<u>DIOPSIDE</u>	<u>Kg</u>
KWESS 5	Garnet Lherzolite	67	25	7	1	1.2
KWESS 7	Harzburgite	78	22			0.8
KWESS 8	Garnet Lherzolite	61	28	8	2	1.2
KWESS 10	Lherzolite	76	20		4	0.6
KWESS 12	Garnet Lherzolite					1.3
KWESS 13	Garnet Lherzolite	81	12	6	1	0.8
KWESS 14	Garnet Harzburgite	61	32	7		1.3
KWESS 15	Harzburgite	79	21			1.8
KWESS 16	Garnet Lherzolite	67	24	8	1	2.3
KWESS 17	Garnet Harzburgite	58	32	10		2.4
KWESS 18	Garnet Harzburgite	75	19	6		1.8
KWESS 19	Garnet Lherzolite	47	38	11	5	1.6
KWESS 20	Garnet Lherzolite	52	40	8	0	1.8
KWESS 21	Garnet Lherzolite	64	30	6	0	1.8
KWESS 22	Lherzolite	63	36		1	0.8
DB 101	Lherzolite	78	20		4	1.0
DB 102	Garnet Lherzolite					0.25
DB 103	Garnet Harzburgite	61	35	4		1.0
DB 104	Garnet Lherzolite	42	46	10	2	0.5
DB 105	Garnet Lherzolite	62	34	3	1	1.0
DB 109	Garnet Harzburgite					0.35

TABLE A 1

<u>SAMPLE NO.</u>	<u>PERIDOTITE CLASSIFICATION</u>	<u>MODAL COMPOSITION</u>				<u>SIZE OF SAMPLE</u>
		<u>OLIVINE</u>	<u>ENSTATITE</u>	<u>GARNET</u>	<u>DIOPSIDE</u>	<u>Kg</u>
KDB	1 Garnet Lherzolite	71	23	6	0	2.5
KDB	2 Garnet Harzburgite	62	33	5		3.1
KDB	3 Harzburgite	56	44			3.1
KDB	4 Garnet Lherzolite	67	27	3	3	3.0
KDB	5 Lherzolite					1.1
KDB	7 Garnet Lherzolite	46	33	10	11	1.2
KDT	1 Harzburgite					1.8
KDT	4 Garnet Lherzolite	66	25	8	1	2.1
KDT	6 Garnet Harzburgite					2.3
KDT	7 Garnet Lherzolite	66	30	4	0	2.0
KDT	8 Garnet Lherzolite	54	43	3	0	3.1
KDT	9 Lherzolite					2.7
KDT	10 Lherzolite					3.0
KDT	12 Lherzolite	57	43		0	2.0
KDT	13 Garnet Lherzolite	68	26	4	2	2.5
KDT	16 Lherzolite	70	30		0	2.0
KDT	17 Garnet Lherzolite					1.7
KDT	18 Lherzolite	63	37		0	1.0
KDT	19 Harzburgite	86	14			2.2
KDT	20 Harzburgite	89	11			1.2

TABLE A 1

<u>SAMPLE NO.</u>	<u>PERIDOTITE CLASSIFICATION</u>	<u>MODAL COMPOSITION</u>				<u>DIOPSIDE</u>	<u>SIZE OF SAMPLE</u>
		<u>OLIVINE</u>	<u>ENSTATITE</u>	<u>GARNET</u>	<u>Kg</u>		
JAG 32	Garnet Lherzolite	66	30	3	1	0.10	
JAG 368	Garnet Harzburgite					0.30	
KJAG 12	Harzburgite					3.2	
KJAG 13	Lherzolite	74	24		2	3.2	
KJAG 14	Lherzolite					2.9	
KJAG 15	Harzburgite					2.4	
KJAG 16	Harzburgite					3.7	
KJAG 17	Harzburgite					3.7	
KJAG 18	Harzburgite					3.1	
KJAG 19	Harzburgite	59	41			3.9	
KJAG 20	Harzburgite					5.6	
KRV 9	Garnet Lherzolite	67	29	2	2	1.0	
KRV 10	Garnet Lherzolite	71	22	1	6	1.0	
AA 1	Harzburgite					0.1	
AA 2	Garnet Harzburgite					0.2	
AA 4	Lherzolite					0.2	
AA 5	Harzburgite					0.3	

TABLE A IKIMBERLITE CLASSIFICATION

<u>SAMPLE NO.</u>	<u>CLASSIFICATION</u>	<u>SIZE OF SAMPLE</u> <u>Kg</u>
KBULT 25	Kimberlite	Very large
KBULT 26	Kimberlite	1.7
KBULT 27	Kimberlite	5.5
KBULT 28	Kimberlite	6.0
KBULT 29	Kimberlite	4.0
KBULT 30	Kimberlite	1.75
KBULT 31	Kimberlite	1.25
KBULT 34	Kimberlite	1.5
KBULT 35	Kimberlite	1.0
KBULT 36	Kimberlite	1.9
KBULT 37	Kimberlite	1.9
KBULT 38	Kimberlite	1.1
KBULT 39	Kimberlite	2.5
KWESS 23	Kimberlite	15.0
KWESS 24	Kimberlite	1.75
KWESS 25	Kimberlite	2.75
KWESS 26	Kimberlite	2.0
KWESS 27	Kimberlite	3.0

TABLE A 1KIMBERLITE CLASSIFICATION

<u>SAMPLE NO.</u>	<u>CLASSIFICATION</u>	<u>SIZE OF SAMPLE</u> <u>Kg</u>
KDB 8	Kimberlite	1.0
KDB 9	Kimberlite	1.0
KDB 10	Kimberlite	3.0
KDB 11	Kimberlite	4.5
KDB 12	Kimberlite	5.7
KDB 13	Kimberlite	4.2
KDB 14	Kimberlite	1.7
KDB 15	Kimberlite	1.6
KDB 16	Kimberlite	1.2
KDB 17	Kimberlite	0.80
KDB 18	Kimberlite	0.75
KDT 24	Kimberlite	2.0
KDT 25	Kimberlite	2.7
KDT 26	Kimberlite	1.2
KDT 27	Kimberlite	1.4
KDT 28	Kimberlite	1.4
KDT 29	Kimberlite	0.5

TABLE A 1KIMBERLITE CLASSIFICATION

<u>SAMPLE NO.</u>	<u>CLASSIFICATION</u>	<u>SIZE OF SAMPLE Kg</u>
KJAG 1	Kimberlite	2.5
KJAG 2	Kimberlite	4.0
KJAG 3	Kimberlite	2.5
KJAG 4	Kimberlite	2.3
KJAG 5	Kimberlite	3.0
KJAG 6	Kimberlite	1.7
KJAG 7	Kimberlite	5.0
KJAG 9	Kimberlite	1.5
KJAG 10	Kimberlite	2.5
KJAG 11	Kimberlite	1.6
KRV 11	Kimberlite	0.2
KRV 12	Kimberlite	0.5
KRV 13	Kimberlite	0.2
KRV 14	Kimberlite	0.15
KRV 15	Kimberlite	0.15
KRV 16	Kimberlite	0.15
KRV 17	Kimberlite	2.0
KRV 18	Kimberlite	2.0

TABLE A 1KIMBERLITE CLASSIFICATION

<u>SAMPLE NO.</u>	<u>CLASSIFICATION</u>	<u>SIZE OF SAMPLE</u> <u>Kg</u>
KK 1	Kimberlite	4.0
KK 2	Kimberlite	1.8
KK 3	Kimberlite	7.5
KK 4	Kimberlite	5.0
KK 5	Kimberlite	6.5
KN 1	Kimberlite	5.0
KN 2	Kimberlite	5.5
KN 3	Kimberlite	3.5
KN 4	Kimberlite	3.3
KN 5	Kimberlite	2.8
KN 6	Kimberlite	2.0
KBEL 1	Kimberlite	1.1
KBEL 2	Kimberlite	1.2
XSF 2	Kimberlite	2.6
XSF 7	Kimberlite	1.6
MON 1	Kimberlite	3.1

TABLE A 2MISCELLANEOUS SAMPLES

<u>SAMPLE NO.</u>	<u>LOCALITY</u>	<u>CLASSIFICATION</u>	<u>SIZE OF SAMPLE</u>
EK. PEG.	Grytingevag, Norway	Eclogite	0.20
EK. ALM.	Sunnmore, Norway	Eclogite	0.20
43	Sordm <sup>o</sup> re Norway	Eclogite	0.35
106	Sordm <sup>o</sup> re Norway	Eclogite	0.35
B 51	Sikohu Japan	Eclogite	0.065
B 64	Sikohu Japan	Eclogite	0.035
A 30	Japan	Eclogite	0.025
36460	Bavaria, Germany	Eclogite	0.125
39097	S.W. of Nantes, France	Eclogite	0.075
G 25 A	Loch Duich, Scotland	Eclogite	0.075
GS 1775	Bavaria, Germany	Eclogite	0.075
BD 65/45	Harris, Hebrides	Eclogite	0.500
Hof.B.S.	Bavaria, Germany	Eclogite	0.10

Six small specimens of kimberlite were obtained from the occurrences at Prairie Creek, Arkansas, U.S.A.

They were numbered U18, U19, U20, 5543, Ark. 2 and Ark 3.

TABLE A 3

<u>SAMPLE NO.</u>	<u>CLASSIFICATION</u>	<u>SIZE OF SAMPLE</u> <u>Kg</u>
SU 1	Olivine Melilitite	3.5
SU 2	Olivine Melilitite	6.3
SU 3	Olivine Melilitite	4.2
SU 4	Olivine Melilitite	3.0
SU 5	Olivine Melilitite	3.0
SU 6	Olivine Melilitite	2.7
SU 7	Olivine Melilitite	5.0
ASH 1	Olivine Melilitite	6.0
ASH 2	Olivine Melilitite	4.5
ASH 3	Olivine Melilitite	2.5
SR 1	Olivine Melilitite	2.0
SR 2	Olivine Melilitite	1.3
SR 3	Olivine Melilitite	2.5

APPENDIX SECTION B

ANALYTICAL RESULTS (PREFERRED VALUES)

TABLE B 1POTASSIUM, RUBIDIUM, CESIUM AND LITHIUM CONTENTS OF  
ECLOGITES (PREFERRED VALUES)

<u>SAMPLE NO.</u>	<u>K</u> %	<u>Rb</u> p.p.m.	<u>Cs</u> p.p.m.	<u>Li</u> p.p.m.	<u>K/Rb</u>	<u>K/Cs</u>
RV 372	0.16	2.9	10.7	20	552	150
RV 374	0.59	21.8	1.0	9	271	5,900
RV 377	0.45	12.2	0.63	11	369	7,140
RV 378	0.26	7.5	16.4	17	347	159
RV 379	0.40	11.0	8.5	11	364	471
RV 380	0.34	10.8	6.2	15	315	548
RV 381	0.17	3.8	0.71	10	447	2,390
RV 390/4	0.43	9.4	7.2	12	457	597
KRV 1	0.20	5.6	2.6	7	357	769
KRV 2	0.31	8.3	3.3	9	373	939
KRV 3	0.43	19.4	0.59	15	222	7,288
KRV 4	0.22	6.9	2.4	20	319	110
KRV 5	0.13	3.5	5.8	19	371	228
KRV 6	0.76	27.1	4.3	8	280	1,767
KRV 7	0.22	6.1	8.1	10	361	272
KRV 8	0.30	6.4	12.8	9	469	256
CR - 1	0.25	6.7	2.5	3	373	1,000
JAG 41	0.13	5.3	0.39	5	245	3,330
JAG 351	0.10	3.0	0.10	2	333	10,000
TAN 1	0.09	2.5	0.09	3	360	10,000
TAN 501	0.12	4.8	0.16	3	250	7,500
TAN 503	0.055	2.3	0.07	4	239	7,860
AA 3	0.33	10.8	8.5	20	306	388

TABLE 2

POTASSIUM, RUBIDIUM, CESIUM AND LITHIUM CONTENTS OF  
PERIDOTITES (PREFERRED VALUES)

<u>SAMPLE</u> <u>NO.</u>	<u>K</u> <u>%</u>	<u>Rb</u> <u>p.p.m.</u>	<u>Cs</u> <u>p.p.m.</u>	<u>Li</u> <u>p.p.m.</u>	<u>K/Rb</u>	<u>K/Cs</u>
BULT 1	0.038	2.9	N.D.	<2	138	
BULT 2	0.075	4.2	0.17	<2	179	4,410
BULT 3	0.060	3.5	N.D.	<2	171	
BULT 4	0.30	9.4	0.35	<2	319	8,570
BULT 6	0.051	3.0	0.20	<2	170	2,550
BULT 7	0.11	6.0	0.34	<2	183	3,240
BULT 8	0.16	6.0	0.11	3	267	14,500
BULT 9	0.030	1.8	N.D.	<2	167	
BULT 10	0.053	2.3	N.D.	<2	230	
BULT 11	0.063	2.8	N.D.	2	225	
BULT 15	0.030	2.3	N.D.	<2	130	
BULT 17	0.075	3.4	0.31	<2	221	2,420
BULT 18	0.027	1.3	0.08	<2	208	3,375
BULT 19	0.66	33.4	0.57	<2	198	1,158
BULT 20	0.061	2.1	N.D.	<2	290	
BULT 21	0.042	2.5	N.D.	<2	168	
BULT 22	0.12	4.8	0.24	<2	250	500
BULT 23	0.043	2.3	N.D.	<2	187	
BULT 25	0.020	1.4	N.D.	<2	143	
KBULT 1	0.015	0.6	N.D.	<2	250	
KBULT 2	0.073	3.3	N.D.	<2	221	
KBULT 3	0.13	6.0	0.38	<2	217	3,420
KBULT 4	0.040	1.9	N.D.	<2	211	
KBULT 5	0.11	5.0	0.32	<2	220	3,440
KBULT 6	0.16	5.8	0.30	<2	276	5,330
KBULT 11	0.017	0.7	N.D.	<2	242	

POTASSIUM, RUBIDIUM, CESIUM AND LITHIUM CONTENTS OF  
PERIDOTITES (PREFERRED VALUES)

<u>SAMPLE</u> <u>NO.</u>	<u>K</u> <u>%</u>	<u>Rb</u> <u>p.p.m.</u>	<u>Cs</u> <u>p.p.m.</u>	<u>Li</u> <u>p.p.m.</u>	<u>K/Rb</u>	<u>K/Cs</u>
KBULT 13	0.019	0.7	N.D.	< 2	271	
KBULT 14	0.098	2.6	0.19	< 2	377	5,200
KBULT 15	0.26	12.2	0.40	< 2	213	6,500
KBULT 16	0.030	2.2	N.D.	3	136	
KBULT 17	0.34	13.5	0.35	< 2	252	9,710
KBULT 18	0.017	0.9	N.D.	< 2	189	
KBULT 19	0.031	1.7	N.D.	< 2	182	
KBULT 20	0.043	2.0	N.D.	< 2	215	
KBULT 21	0.030	1.7	N.D.	< 2	176	
KBULT 22	0.19	20.0	0.38	< 2	95	5,000
KBULT 23	0.048	1.8	N.D.	< 2	267	
KBULT 24	0.045	3.3	N.D.	< 2	136	
WESS 152	0.19	9.4	-	-	202	
KWESS 1	0.018	0.8	0.10	< 2	225	1,800
KWESS 2	0.042	2.4	0.27	3	175	1,550
KWESS 4	0.016	0.8	N.D.	3	200	
KWESS 5	0.14	7.0	1.1	3	200	1,272
KWESS 7	0.055	4.5	0.56	< 2	122	982
KWESS 8	0.074	4.1	0.67	3	180	1,100
KWESS 10	0.77	29.0	5.2	2	266	1,480
KWESS 12	0.12	4.7	0.33	2	255	3,640
KWESS 13	0.028	2.2	N.D.	< 2	128	
KWESS 14	0.14	9.0	0.49	< 2	156	2,860
KWESS 15	0.018	1.5	0.55	< 2	120	330
KWESS 16	0.015	0.6	N.D.	< 2	250	
KWESS 17	0.015	0.6	N.D.	< 2	250	
KWESS 18	0.10	5.0	0.77	< 2	200	1,300

POTASSIUM, RUBIDIUM, CESIUM AND LITHIUM CONTENTS OF  
PERIDOTITES (PREFERRED VALUES)

<u>SAMPLE</u> <u>No.</u>		<u>K</u> <u>%</u>	<u>Rb</u> <u>p.p.m.</u>	<u>Cs</u> <u>p.p.m.</u>	<u>Li</u> <u>p.p.m.</u>	<u>K/Rb</u>	<u>K/Cs</u>
KWESS	19	0.20	14.0	3.1	5	143	645
KWESS	20	0.029	1.2	N.D.	< 2	242	
KWESS	21	0.36	22.9	4.0	3	157	900
KWESS	22	0.60	36.2	4.8	6	166	1,250
DB	101	0.31	13.3	0.97	6	233	3,200
DB	102	0.10	5.9	1.3	< 2	169	770
DB	103	0.17	10.0	0.42	< 2	170	4,050
DB	104	0.095	6.0	1.9	3	158	500
DB	105	0.12	8.0	6.5	< 2	150	174
DB	109	1.1	64.7	8.1	11	170	1,358
KDB	1	0.024	1.4	0.8	3	171	300
KDB	2	0.050	2.8	N.D.	< 2	179	
KDB	3	0.010	0.5	N.D.	< 2	200	
KDB	4	0.021	1.1	N.D.	< 2	191	
KDB	5	0.24	10.9	2.8	< 2	220	857
KDB	7	0.22	9.8	3.3	< 2	224	667
KDT	1	0.15	13.5	0.25	< 2	111	600
KDT	4	0.073	5.5	0.18	< 2	133	4,060
KDT	6	0.087	6.6	1.0	< 2	131	870
KDT	7	0.039	2.3	0.47	< 2	170	830
KDT	8	0.16	10.0	0.60	< 2	160	2,670
KDT	9	0.16	11.1	0.17	< 2	144	9,410
KDT	10	0.62	24.3	0.21	< 2	255	29,500
KDT	12	0.050	4.8	0.10	< 2	104	5,000
KDT	13	0.065	4.3	0.56	< 2	151	1,160
KDT	16	0.22	11.7	0.46	< 2	188	4,780
KDT	17	0.22	10.0	0.27	< 2	220	8,150

POTASSIUM, RUBIDIUM, CESIUM AND LITHIUM CONTENTS OF  
PERIDOTITES (PREFERRED VALUES)

<u>SAMPLE</u> <u>NO.</u>	<u>K</u> <u>%</u>	<u>Rb</u> <u>p.p.m.</u>	<u>Cs</u> <u>p.p.m.</u>	<u>Li</u> <u>p.p.m.</u>	<u>K/Rb</u>	<u>K/Cs</u>
KDT 18	0.016	1.2	N.D.	< 2	133	
KDT 19	0.18	7.3	0.21	< 2	247	8,570
KDT 20	0.22	13.7	0.31	< 2	161	8,000
JAG 32	0.19	12.1	N.D.	< 2	157	
JAG 368	0.25	15.8	0.17	3	158	14,700
KJAG 12	0.10	5.8	0.12	< 2	172	8,330
KJAG 13	0.048	2.5	N.D.	< 2	192	
KJAG 14	0.41	14.5	0.38	< 2	283	10,800
KJAG 15	0.19	11.4	0.20	< 2	167	9,500
KJAG 16	0.040	2.4	N.D.	< 2	167	
KJAG 17	0.30	12.1	0.34	< 2	248	8,820
KJAG 18	0.33	15.6	0.37	< 2	212	8,920
KJAG 19	0.025	1.2	N.D.	< 2	208	
KJAG 20	0.070	3.2	N.D.	< 2	219	
KRV 9	0.32	14.2	0.41	N.D.	227	
KRV 10	0.17	13.2	0.38	N.D.	129	
AA 1	0.094	5.1	N.D.	< 2	184	
AA 2	0.058	3.1	N.D.	< 2	187	
AA 4	0.12	5.8	N.D.	< 2	207	
AA 5	0.021	1.3	0.07	3	161	3,000

N.D. Not determined due to cyanogen interference.

TABLE B 3POTASSIUM, RUBIDIUM, CESIUM and LITHIUM CONTENTS OF KIMBERLITE  
(PREFERRED VALUES)

<u>SAMPLE NO.</u>	<u>K%</u>	<u>Rb</u> <u>p.p.m.</u>	<u>Cs</u> <u>p.p.m.</u>	<u>Li</u> <u>p.p.m.</u>	<u>K/Rb</u>	<u>K/Cs</u>
K BULT 25	1.6	111	12	8	144	1330
K BULT 26	1.6	81	7	16	198	2290
K BULT 27	1.4	84	76	13	167	1080
K BULT 28	1.2	79	12		152	1000
K BULT 29	1.7	82	26	34	207	654
K BULT 30	1.1	77	13	17	143	850
K BULT 31	1.5	95	25	47	158	600
K BULT 34	1.4	96	74	11	146	190
K BULT 35	1.6	87	10	13	184	1600
K BULT 36	1.6	72	8		222	2000
K BULT 37	1.6	85	31	7	188	516
K BULT 38	1.8	109	27		165	670
K BULT 39	1.3	80	51	10	163	255
K WESS 23	2.0	107	32	15	187	625
K WESS 24	1.7	101	46	13	168	370
K WESS 25	1.4	88	45	17	159	311
K WESS 26	1.3	83	32	8	157	406
K WESS 27	1.5	98	17	58	153	882
KDB 9	1.2	55	22	11	218	545
KDB 10	0.5	21	10		238	500
KDB 11	1.2	78	26	8	128	462
KDB 12	0.4	26	25		154	160
KDB 13	0.4	30	34		133	118
KDB 14	1.0	79	41	21	127	244
KDB 15	1.1	91	V.H.		121	
KDB 16	0.9	78	V.H.		115	

POTASSIUM, RUBIDIUM, CESIUM and LITHIUM CONTENTS OF KIMBERLITE  
(PREFERRED VALUES)

<u>SAMPLE NO.</u>		<u>K%</u>	<u>Rb</u> <u>p.p.m.</u>	<u>Cs</u> <u>p.p.m.</u>	<u>Li</u> <u>p.p.m.</u>	<u>K/Rb</u>	<u>K/Cs</u>
KDB	17	0.8	80	V.H.		100	
KDB	18	0.8	79	V.H.		101	
KDT	24	1.0	74	3	5.0	135	3333
KDT	25	0.6	60	1.6	7.0	100	3750
KDT	26	0.9	69	3	5.0	130	3000
KDT	27	0.9	89	2		101	4500
KDT	28	1.3	101	4	4.0	129	3250
KDT	29	0.6	67	6	6.0	90	1000
KJAG	1	1.9	98	21	13	194	905
KJAG	2	1.3	71	5		186	2600
KJAG	3	1.6	87	6	11	184	2670
KJAG	4	2.2	107	13		206	1692
KJAG	5	0.6	51	8		118	750
KJAG	6	1.0	86	6		116	1670
KJAG	7	2.1	92	15		228	1400
KJAG	9	1.7	81	9	10	210	1900
KJAG	10	1.7	80	6	6	213	2833
KJAG	11	1.4	75	6	6	187	2333
KRV	11	3.1	130	6	45	240	5170
KRV	12	3.0	113	6	51	265	5000
KRV	13	1.7	73	5	19	233	3400
KRV	14	3.3	135	5	59	244	6600
KRV	15	2.8	121	5	46	231	5600
KRV	16	3.2	133	8	36	241	4000

V.H. - Very High

TABLE B 4

POTASSIUM and RUBIDIUM CONTENT and K/Rb RATIOS  
in some additional SOUTH AFRICAN KIMBERLITES

<u>SAMPLE NO</u>	<u>POTASSIUM</u> <u>%</u>	<u>RUBIDIUM</u> <u>ppm.</u>	<u>K/Rb</u>
KK 1	1.2	84	142
KK 2	0.4	25	160
KK 3	1.1	85	129
KK 4	1.1	64	172
KK 5	0.7	41	171
KN 1	1.0	70	143
KN 2	1.0	71	141
KN 3	1.5	104	144
KN 4	1.5	110	136
KN 5	1.2	88	136
KN 6	1.0	65	154
KBEL 1	1.2	99	121
KBEL 2	1.6	135	119
XSF 2	2.0	101	198
XSF 7	2.3	118	195
MON 1	1.0	84	119
KBEN 1	0.22	16	138
KBEN 2	0.21	15	140
KBEN 3	0.15	11	136

TABLE B 6POTASSIUM and RUBIDIUM CONTENT and K/Rb RATIO OF MISCELLANEOUS SAMPLES (PREFERRED VALUES)

<u>SAMPLE NO.</u>	<u>K %</u>	<u>Rb p.p.m.</u>	<u>K/Rb</u>
EK. PEG.	0.015	0.66	227
EK. ALM.	0.019	0.22	860
43	0.05	0.23	217
106	0.022	0.35	629
B 51	0.025	1.0	250
B 64	0.08	2.3	348
A 30	0.011	N.D.	
36460	0.12	4.1	293
39097	0.62	1.5	413
G 25A	0.11	2.0	550
GS1775	0.06	1.0	600
BD65/45	0.11	2.8	393
Hof.B.S.	0.065	2.1	310

TABLE B 7POTASSIUM and RUBIDIUM CONTENT AND K/Rb RATIOS  
in 6 AMERICAN KIMBERLITES

<u>SAMPLE NO</u>	<u>POTASSIUM</u> <u>%</u>	<u>RUBIDIUM</u> <u>ppm.</u>	<u>K/Rb</u>
U 18	2.0	60	330
U 19	2.3	68	340
U 20	3.9	90	430
5543	2.6	57	460
ARK2	2.2	57	386
ARK3	1.9	61	311

TABLE B 8ZINC CONTENT OF ECLOGITES DETERMINED BY  
X.R.F. METHOD

<u>SAMPLE NO.</u>	<u>ZINC</u> <u>p.p.m.</u>
RV 372	13
RV 374	51
RV 377	20
RV 378	78
RV 379	65
RV 380	51
RV 381	48
RV 390/4	77
KRV 1	69
KRV 2	72
KRV 3	34
KRV 4	55
KRV 5	47
KRV 6	55
KRV 7	67
KRV 8	66
CR - 1	50
JAG 351	12
TAN 1	64
TAN 501	61
TAN 503	33
AA 3	65

TABLE B 9

ZINC CONTENT OF PERIDOTITES AND PYROXENITES  
DETERMINED BY X.R.F. METHOD

<u>SAMPLE</u> <u>NO.</u>	<u>ZINC</u> p.p.m.	<u>SAMPLE</u> <u>NO.</u>	<u>ZINC</u> p.p.m.
BULT 1	31	K BULT 11	34
BULT 2	37	K BULT 13	33
BULT 3	31	K BULT 14	37
BULT 4	33	K BULT 15	35
BULT 6	32	K BULT 16	36
BULT 7	39	K BULT 17	34
BULT 8	32	K BULT 18	31
BULT 9	31	K BULT 19	35
BULT 10	33	K BULT 20	37
BULT 11	30	K BULT 21	33
BULT 15	30	K BULT 22	35
BULT 17	32	K BULT 23	35
BULT 18	32	K BULT 24	34
BULT 19	35		
BULT 20	37	WESS 152	30
BULT 21	30	K WESS 1	35
BULT 22	37	K WESS 2	32
BULT 23	33	K WESS 4	35
BULT 25	33	K WESS 5	33
		K WESS 7	37
K BULT 1	23	K WESS 8	38
K BULT 2	30	K WESS 10	47
K BULT 3	33	K WESS 12	39
K BULT 4	33	K WESS 13	35
K BULT 5	33	K WESS 14	32
K BULT 6	31	K WESS 15	31
K BULT 8	36	K WESS 16	31

ZINC CONTENT OF PERIDOTITES AND PYROXENITES  
DETERMINED BY X.R.F. METHOD

<u>SAMPLE</u> <u>NO.</u>	<u>ZINC</u> p.p.m.	<u>SAMPLE</u> <u>NO.</u>	<u>ZINC</u> p.p.m.
K WESS 17	32	KDT 17	36
K WESS 18	35	KDT 18	31
K WESS 19	41	KDT 19	35
K WESS 20	32	KDT 20	47
K WESS 21	45		
K WESS 22	47	JAG 32	38
		JAG 368	39
DB 101	33		
DB 102	34	KJAG 12	33
DB 103	34	KJAG 13	22
DB 104	43	KJAG 14	33
DB 105	32	KJAG 15	31
DB 109	46	KJAG 16	31
		KJAG 17	33
KDB 1	36	KJAG 18	33
KDB 2	30	KJAG 19	35
KDB 3	30	KJAG 20	33
KDB 4	38		
KDB 5	32	KRV 9	37
KDB 7	43	KRV 10	38
KDT 1	36	AA 1	32
KDT 4	36	AA 2	38
KDT 6	33	AA 4	37
KDT 7	33	AA 5	33
KDT 8	36		
KDT 9	38		
KDT 10	35		
KDT 12	32		
KDT 13	36		
KDT 16	37		

TABLE B 10ZINC CONTENT OF KIMBERLITES DETERMINED BY X.R.F. METHOD

<u>SAMPLE</u> <u>No.</u>	Zinc p.p.m.	<u>SAMPLE NO</u> <u>No.</u>	Zinc p.p.m.
KBULT 25	58	KDT 24	54
KBULT 26	58	KDT 25	54
KBULT 27	58	KDT 26	53
KBULT 28	63	KDT 27	55
KBULT 29	60	KDT 28	53
KBULT 30	65	KDT 29	51
KBULT 31	60		
KBULT 34	64	KJAG 1	54
KBULT 35	63	KJAG 2	55
KBULT 36	65	KJAG 3	59
KBULT 37	66	KJAG 4	54
KBULT 38	66	KJAG 5	48
KBULT 39	64	KJAG 6	65
		KJAG 7	47
KWESS 23	63	KJAG 9	53
KWESS 24	61	KJAG 10	54
KWESS 25	64	KJAG 11	52
KWESS 26	63		
KWESS 27	61	KRV 11	64
		KRV 12	66
KDB 9	58	KRV 13	38
KDB 10	57	KRV 14	63
KDB 11	57	KRV 15	61
KDB 12	58	KRV 16	66
KDB 13	60	KRV 17	40
KDB 14	57	KRV 18	42
KDB 15	56		

TABLE B 11FURTHER ZINC CONTENT OF KIMBERLITES  
DETERMINED BY X.R.F. METHOD

<u>SAMPLE NO.</u>	<u>Zinc p.p.m.</u>
KK 1	53
KK 2	53
KK 3	67
KK 4	48
KK 5	50
KN 1	47
KN 2	57
KN 3	41
KN 4	49
KN 5	57
KN 6	46
U 18	64
U 19	72
U 20	95
5543	60
ARK 2	60
ARK 3	65

TABLE B 12ZINC CONTENT OF OLIVINE MELILITITES DETERMINED  
BY X.R.F. METHOD

<u>SAMPLE NO.</u>	<u>ZINC</u> p.p.m.
SU 1	86
SU 2	86
SU 3	89
SU 4	80
SU 5	100
SU 6	80
SU 7	87
ASH 1	110
ASH 2	110
ASH 3	109
SR 1	102
SR 2	101
SR 3	102

TABLE B 13ZINC CONTENT OF MISCELLANEOUS SAMPLES DETERMINED  
BY X.R.F. METHOD

<u>SAMPLE NO.</u>	<u>ZINC p.p.m.</u>
E.K. PEG.	184
E.K. ALM.	16
43	83
106	6
817	5
B 51	60
B 63	96
B 64	61
A 30	186
36460	85
39097	78
G 25 A	135
GS 1775	180
BD 65/45	170
Hof. B.S.	65

TABLE B 14THORIUM, URANIUM and POTASSIUM CONTENT OF KIMBERLITES

<u>SAMPLE NO.</u>	<u>Th.</u> ppm.	<u>U.</u> ppm.	<u>K</u> %	<u>Th/U</u>	<u>X</u> $\frac{K/U}{10^{-4}}$	<u>X</u> $\frac{Th/K_4}{10}$
KBULT 25	12.4	3.0	1.6	4.13	0.533	7.75
KBULT 26	12.3	2.9	1.6	4.24	0.551	7.69
KBULT 27	14.1	3.2	1.4	4.41	0.438	10.07
KBULT 28	9.4	1.9	1.2	4.95	0.632	7.83
KBULT 29	14.9	3.6	1.7	4.14	0.472	8.76
KBULT 30	10.6	2.4	1.1	4.42	0.458	9.64
KBULT 31	8.2	1.9	1.5	4.32	0.789	5.47
KBULT 34	10.5	1.6	1.4	6.56	0.875	7.50
KBULT 35	15.9	4.0	1.6	3.98	0.400	9.94
KBULT 36	15.9	3.1	1.6	5.13	0.516	9.94
KBULT 37	16.5	3.6	1.6	4.58	0.444	10.31
KBULT 38	10.5	2.5	1.8	4.20	0.720	5.83
KBULT 39	16.4	4.5	1.3	3.64	0.289	12.62
AVERAGE	12.9	2.9	1.5	4.52	0.547	8.72
KWESS 23	9.8	2.2	2.0	4.45	0.909	4.90
KWESS 24	9.0	1.9	1.7	4.74	0.894	5.29
KWESS 25	8.8	1.8	1.4	4.89	0.778	6.29
KWESS 26	8.1	1.6	1.3	5.06	0.813	6.23
KWESS 27	9.1	1.8	1.5	5.06	0.833	6.07
AVERAGE	9.0	1.9	1.6	4.84	0.845	5.76
KDB 9	16.9	4.2	1.2	4.02	0.285	14.08
KDB 11	10.8	2.6	1.2	4.15	0.460	9.03
KDB 12	22.7	6.1	0.4	3.72	0.066	56.7
KDB 15	9.6	2.3	1.1	4.17	0.478	8.72
AVERAGE	15.0	3.8	1.0	4.02	0.322	22.13

Table B 14 (Continued)

THORIUM, URANIUM and POTASSIUM CONTENT OF KIMBERLITES

<u>SAMPLE NO</u>	<u>Th.</u> <u>ppm.</u>	<u>U.</u> <u>ppm.</u>	<u>K</u> <u>%</u>	<u>Th/U</u>	X $\frac{K/U}{10^{-4}}$	X $\frac{Th/K}{10^{-4}}$
KDT 24	11.4	2.8	1.0	4.07	0.357	11.40
KDT 28	11.3	2.7	1.3	4.19	0.481	8.69
KDT 29	11.8	2.7	0.6	4.37	0.223	19.6
AVERAGE	11.5	2.7	1.0	4.21	0.354	13.23
KJAG 1	8.6	2.1	1.9	4.10	0.905	4.53
KJAG 2	21.2	4.0	1.3	5.30	0.325	16.31
KJAG 3	20.9	4.8	1.6	4.35	0.333	13.06
KJAG 4	11.3	2.8	2.2	4.04	0.786	5.14
KJAG 5	5.2	1.0	0.6	5.20	0.600	8.67
KJAG 6	21.9	4.7	1.0	4.66	0.213	21.9
KJAG 7	15.2	3.8	2.1	4.00	0.553	7.24
KJAG 9	13.2	3.2	1.7	4.13	0.531	7.76
KJAG 10	12.6	2.8	1.7	4.50	0.607	7.41
KJAG 11	8.22	1.9	1.4	4.32	0.737	5.86
AVERAGE	13.8	3.1	1.65	4.46	0.559	9.78
KRV 12	31.4	5.1	3.0	6.16	0.588	10.47
KRV 13	50.6	7.1	1.7	7.13	0.239	29.76
AVERAGE	41.5	6.1	2.4	6.65	0.414	20.12
KK 1	17.7	3.7	1.2	4.78	0.324	14.75
KK 2	20.3	4.6	0.4	4.41	0.087	50.75
KK 3	17.4	3.3	1.1	5.27	0.333	15.82
KK 4	20.2	4.1	1.1	4.93	0.268	18.36
KK 5	9.8	3.8	0.7	2.58	0.184	14.00
AVERAGE	17.1	3.9	0.9	4.39	0.239	22.74

Table B 14 (Continued)

THORIUM, URANIUM and POTASSIUM CONTENT OF KIMBERLITES

<u>SAMPLE NO.</u>	<u>Th</u> <u>ppm.</u>	<u>U.</u> <u>ppm.</u>	<u>K</u> <u>%</u>	<u>Th/U</u>	X $\frac{K/U}{10^4}$	X $\frac{Th/K}{4_{10}}$
KN 1	39.8	4.0	1.0	9.95	0.250	39.8
KN 2	32.4	4.1	1.0	7.90	0.244	32.4
KN 3	25.2	3.3	1.5	7.64	0.455	16.8
KN 4	35.3	4.6	1.5	7.67	0.326	23.53
KN 5	38.9	5.0	1.2	7.78	0.240	32.42
AVERAGE	34.3	4.2	1.2	8.19	0.303	28.99
KBEL 1	60.5	7.5	1.2	8.07	0.160	50.4
XSF 2	25.1	3.6	2.0	6.97	0.555	12.55
XSF 7	26.3	5.0	2.3	5.26	0.460	11.43
AVERAGE	25.9	4.3	2.2	6.12	0.508	11.99
MON 1	14.4	3.3	1.0	4.36	0.303	14.4

APPENDIX SECTION C

MASS ABSORPTION COEFFICIENTS USED FOR RUBIDIUM  
AND ZINC DETERMINATIONS BY X.R.F. ANALYSIS

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MASS ABSORPTION COEFFICIENTS - ECLOGITES

<u>SAMPLE NO.</u>	<u><math>\mu</math></u>
RV 372	11.45
RV 374	16.36
RV 377	12.95
RV 378	16.24
RV 379	15.36
RV 380	15.69
RV 381	13.54
RV 390/4	16.73
KRV 1	15.89
KRV 2	15.30
KRV 3	15.33
KRV 4	15.31
KRV 5	16.27
KRV 6	15.12
KRV 7	15.79
KRV 8	16.21
CR - 1	13.33
JAG 41	14.35
JAG 351	13.71
TAN 1	16.91
TAN 501	17.12
TAN 503	13.72
AA 3	15.88

MASS ABSORPTION COEFFICIENTS - PERIDOTITES

<u>SAMPLE NO.</u>	<u><math>\mu</math></u>
BULT 1	9.89
BULT 2	10.41
BULT 3	10.21
BULT 4	10.27
BULT 6	10.23
BULT 7	11.04
BULT 8	10.18
BULT 9	10.05
BULT 10	10.66
BULT 11	9.86
BULT 15	9.98
BULT 17	10.24
BULT 18	9.72
BULT 19	10.62
BULT 20	10.83
BULT 21	9.86
BULT 22	10.71
BULT 23	10.30
BULT 25	10.18
KBULT 1	9.13
KBULT 2	10.12
KBULT 3	10.33
KBULT 4	10.30
KBULT 5	10.13
KBULT 6	9.97
KBULT 8	10.10
KBULT 11	10.15
KBULT 13	9.84

MASS ABSORPTION COEFFICIENTS - PERIDOTITES

<u>SAMPLE NO.</u>	<u><math>\mu</math></u>
KBULT 14	10.41
KBULT 15	9.82
KBULT 16	10.06
KBULT 17	10.14
KBULT 18	9.76
KBULT 19	9.64
<b>KBULT 20</b>	<b>10.12</b>
KBULT 21	9.83
KBULT 22	10.02
KBULT 23	9.90
KBULT 24	10.07
WESS 152	13.39
KWESS 1	10.21
KWESS 2	9.90
KWESS 4	10.39
KWESS 5	10.44
KWESS 7	9.94
KWESS 8	10.94
KWESS 10	11.42
KWESS 12	10.78
KWESS 13	10.53
KWESS 14	10.25
KWESS 15	10.39
KWESS 16	9.88
KWESS 17	9.90
KWESS 18	10.45
KWESS 19	11.05
KWESS 20	9.91
KWESS 21	10.49
KWESS 22	11.00

MASS ABSORPTION COEFFICIENTS - PERIDOTITES

<u>SAMPLE NO.</u>	<u><math>\mu</math></u>
DB 101	10.23
DB 102	10.16
DB 103	10.32
DB 104	12.18
DB 105	10.12
DB 109	11.41
KDB 1	10.45
KDB 2	9.84
KDB 3	9.87
KDB 4	10.83
KDB 5	9.83
KDB 7	11.49
KDT 1	10.34
KDT 4	10.60
KDT 6	9.97
KDT 7	10.27
KDT 8	10.27
KDT 9	10.62
KDT 10	10.53
KDT 12	10.05
KDT 13	10.43
KDT 16	10.27
KDT 17	10.28
KDT 18	10.02
KDT 19	10.50
KDT 20	10.80

MASS ABSORPTION COEFFICIENTS - PERIDOTITES

<u>SAMPLE NO.</u>	<u><math>\mu</math></u>
JAG 32	10.45
JAG 368	11.27
KJAG 12	10.28
KJAG 13	8.75
KJAG 14	10.36
KJAG 15	10.33
KJAG 16	9.69
KJAG 17	10.33
KJAG 18	10.17
KJAG 19	10.10
KJAG 20	10.10
KRV 9	10.67
KRV 10	10.36
AA 1	10.24
AA 2	10.42
AA 4	10.62
AA 5	9.92

JJG/LS

MASS ABSORPTION COEFFICIENTS - KIMBERLITES

<u>SAMPLE NO.</u>	<u><math>\mu</math></u>
KBULT 25	13.56
KBULT 26	11.96
KBULT 27	12.09
KBULT 28	11.53
KBULT 29	12.17
KBULT 30	11.37
KBULT 31	12.55
KBULT 34	11.90
KBULT 35	12.41
KBULT 36	12.36
KBULT 37	12.60
KBULT 38	11.91
KBULT 39	12.72
KWESS 23	12.55
KWESS 24	12.07
KWESS 25	12.06
KWESS 26	12.01
KWESS 27	12.08
KDB 8	13.65
KDB 9	12.30
KDB 10	14.20
KDB 11	13.30
KDB 12	14.10
KDB 13	14.30
KDB 14	11.60
KDB 15	12.61

MASS ABSORPTION COEFFICIENTS - FURTHER KIMBERLITESSAMPLE NO. $\mu$ 

KK	1.	12.60
KK	2.	12.59
KK	3	13.80
KK	4	12.39
KK	5	12.15
KN	1	12.30
KN	2	12.65
KN	3	12.12
KN	4.	12.20
KN	5	12.69
KN	6	12.28
U	18	13.18
U	19	12.05
U	20.	12.11
5543		12.15
ARK	2.	11.68
ARK	3	12.93
KBEL	1.	12.78
KBEL	2	13.13
XSF	2	12.87
XSF	7	13.16
MON		16.45

MASS ABSORPTION COEFFICIENTS - MELILITITESSAMPLE NO. $\mu$ 

SU	1	16.64
SU	2	16.44
SU	3	16.67
SU	4	16.58
SU	5	18.40
SU	6	16.07
SU	7	17.25
ASH	1	18.55
ASH	2	18.66
ASH	3	18.61
SR	1	17.92
SR	2	17.66
SR	3	17.96

JJG/LS

MASS ABSORPTION COEFFICIENTS - MISCELLANEOUS

<u>SAMPLE NO.</u>	<u>μ</u>
EK. PEG.	13.96
EK. ALM.	12.50
43	17.66
106	13.04
B 51	16.4
B 63	11.9
A 30	15.3
36460	14.8
39097	16.1
G 25 A	15.9
GS 1775	14.7
BD 65/45	17.5
HOF. B.S.	12.4

POWDERS

Gr - 1	11.80
AF - 7	10.55
Salt 1	15.87
JAG 41	14.34
EK. PEG.	13.80

A P P E N D I X

SECTION D

## Preparation of Synthetic Standards for Rubidium, Cesium and Lithium Determinations in Eclogites

Preliminary work had shown that the eclogite samples from the Roberts Victor Mine contained concentrations of cesium considerably higher than was expected from their ultrabasic character and potassium content. The optical spectrographic procedure outlined earlier was suitable for the detection and estimation of Li, Rb, and Cs in these and other ultrabasic samples. However, a difficulty was presented by the lack of suitable standards, particularly for lithium and cesium.

It was decided to prepare an eclogite type matrix, to which would be added known and variable amounts of various trace elements. In this way, a series of suitable "Eclogite standards" was prepared.

The procedure adopted, the reasons for it, and the precautions taken are set out below. It was realised that the use of synthetic standards of this type could lead to such pitfalls as systematic shifts in working curves, or contamination from "hidden blanks".

Every effort was made to avoid these errors and to check that they had not occurred.

An average eclogite major element composition was calculated from the analyses available in the literature.

The following matrix was then decided on for the synthetic standards:-

SiO <sub>2</sub>	48%
Al <sub>2</sub> O <sub>3</sub>	15%
Fe <sub>2</sub> O <sub>3</sub>	12.5%
MgO	12.0%
CaO	11.0%
Na <sub>2</sub> O	<u>1.5%</u>
	<u>100.0%</u>

After investigating the purity of the various materials available, it was decided:-

- (1) To use specially purified naturally occurring quartz as the source of SiO<sub>2</sub>.
- (2) To add the iron, magnesium and aluminium as JOHNSON MATTHEY SPECURE OXIDES.
- (3) To add the calcium and sodium as JOHNSON MATTHEY SPECURE CARBONATES.

Naturally occurring quartz, clean by appearance, was ground up to -200 in a Siebtechnik "Shatterbox", with a Ni-Cr steel grinding vessel. The resulting powder was purified by hot acid leaching (3N and 6N HCl) over a two month period. The purified powder was extensively washed in de-ionised distilled water, and dried at 120°C for 48 hours.

The purity of all the components of the base mix was examined spectrographically.

The materials were all examined:-

- (a) In their pure state
- (b) Mixed 1:1 with graphite
- (c) Mixed 1:3 with quartz
- (d) Mixed 4:1 with  $\text{CaF}_2$

The most sensitive instrumental settings and conditions were used over wavelength ranges from  $2500\text{\AA}$  to  $8600\text{\AA}$ . Argon, argon/oxygen or air atmospheres were used as required. An attempt was made to identify every observed spectral line on the photographic plates. Special purity electrodes were used.

Table No. D 1 summarises the results obtained.

The concentration levels of most of the trace impurities were of the order reported by JOHNSON MATTHEY in the "Certificates of Purity" which accompany their products. The only trace impurity of consequence found in the constituents of the synthetic standard was the lithium content of the quartz which was not reduced by further leaching with acid. Purer silica could not be obtained.

The potassium present in the  $\text{MgO}$ ,  $\text{CaF}_2$  and  $\text{Al}_2\text{O}_3$  was of the order of 5ppm. and only detectable on the most sensitive potassium doublet at  $7665$  and  $7699\text{\AA}$ . It was not detectable on

K 6939<sup>8</sup>A and did not affect the use of the standards.

The constituents of the Synthetic Standard Matrix were dried at 125°C for 24 hours in specially cleaned new vitreosil dishes in sealed ovens.

The materials were allowed to cool in a dessicator, weighed out and mixed in a clean glass container by shaking for an hour in a mechanical vibrator.

Six rubber balls were used to assist the mixing. Subsequent to this the material was ground 4gm at a time in a mechanical agate mortar, and re-shaken for one hour. The grinding was essential to mix the extremely fine powders intimately.

The weighed out contents of the Synthetic Matrix were:

48.03542gm	SiO <sub>2</sub>
15.11400gm	Al <sub>2</sub> O <sub>3</sub>
12.59724gm	Fe <sub>2</sub> O <sub>3</sub>
12.07046gm	MgO
19.52041gm	CaCO <sub>3</sub>
2.58522gm	Na <sub>2</sub> CO <sub>3</sub>

This mix was sintered at 1000°C for twelve hours. Due to the risk of loss of volatiles, the standards were not sintered after the introduction of the trace elements. The weights of the mix taken before and after sintering, were consistent with

that which would have been obtained if more than 95% of the CO<sub>2</sub> present had been driven off.

Trace elements were added to the synthetic matrix by using the Jarrell-Ash Company Master S.Q. powder which contains 45 elements at concentration levels of 1.30%. The initial mix was to produce a concentration level of 1000ppm. of all these elements and subsequent dilutions by  $\sqrt{1}$  produced standards with 316, 100, 31.6, 10, 3.16, 1.00, 0.32 and 0.1ppm. respectively.

All these standards were prepared by mixing a standard with a known weight of the matrix. All mixing was done by grinding the two powders together in an agate mortar for one hour. Potassium was also added as K<sub>2</sub>SO<sub>4</sub>, specpure, for use as an internal standard.

The synthetic matrix and the potassium sulphate were both tested for purity and found to be satisfactory, except that, as expected, a lithium blank was present in the former. Atomic absorption methods subsequently showed the blank to be 7.5ppm. This was not satisfactory for determinations of lithium and standards were obtained for this element by determining lithium in several natural rocks by atomic absorption analysis.

The synthetic standards have only been used when the optical spectrographic procedure utilised an internal standard. The synthetic powders have a lower density than naturally occurring

rocks with the same composition, and both should be weighed out carefully if no internal standard is to be used.

When used as recommended, with an internal standard, it must be borne in mind that any sample will have its plotting point on the working curve determined by the concentration ratio of the elements concerned, and not by the concentration of either one of them. Hence two samples with widely differing absolute potassium and rubidium concentrations, will plot in identical points, if the K/Rb ratios are the same.

The standards served their purpose well. A small amount of rubidium contamination, was thought to account for the fact that the 0.1ppm. standard did not fall on any of the working curves obtained in the several spectrographic runs. However, with the use of the natural rocks, whose determinations are set out in Table 2, as standards in subsequent work, this was not a serious disadvantage.

TABLE D 1

<u>MATERIAL</u>	<u>TRACE ELEMENT DETECTED</u>	<u>REPORTED BY JOHNSON MATTHEY</u>
SiO <sub>2</sub>	Mg, Cu, Al, Ca, Na, Li	
Fe <sub>2</sub> O <sub>3</sub> Spec Pure	Si, Ca, Mn, Ni	Si (3ppm) Mn (2ppm) Ni (2ppm)
MgO Spec Pure	Cu, Sr, Ca, Na, K, Si, Fe	Ca (5ppm) Si (3ppm) Fe (2ppm) Cu (1ppm) Na (1ppm) Al (1ppm)
Al <sub>2</sub> O <sub>3</sub> Spec Pure	Mg, Si, Cu, Ca, Na, K, Fe	Si (3ppm) Fe (2ppm) Na (2ppm) Mg (1ppm) Cu (<1ppm)
Na <sub>2</sub> CO <sub>3</sub> Spec Pure	Mg, Cu, Al, Ca, Si	Ca (2ppm)
CaCO <sub>3</sub> Spec Pure	Sr, Na, Mg, Fe, Cu, Pb, Si	Sr (5ppm) Mg (3ppm) Na (2ppm) Fe (1ppm) Cu (< 1ppm).
CaF <sub>2</sub> Buffer	Mg, Cu, Si, Fe, Al, Sr, Ba, K, Na, Li	
Li <sub>2</sub> CO <sub>3</sub>	Mg, Na, Ca, Al, Si, Cu, K, Rb.	
"Special" Electrodes	Mg, Ca, Na, Si	
N.C.C. Reg. Elect.	Mg, Ca, Na, Ag, Cu, Si, Fe, B, Al.	

TABLE I

POTASSIUM AND SODIUM VALUES REPORTED BY WILLIAMS (1932)  
COMPARED WITH MORE RECENT DATA

<u>SAMPLE NO.</u>	<u>K%</u>				<u>Na%</u>	
	<u>WILLIAMS 1932</u>	<u>HEIER SPEC.</u>	<u>BERG F.P.</u>	<u>THIS WORK</u>	<u>WILLIAMS 1932</u>	<u>BERG F.P.</u>
RV 374	NIL	0.67	0.66	0.59	2.66	1.01
RV 377	0.90	0.45	0.46	0.45	TRACE	0.66
RV 378	0.76		0.26	0.26	3.89	2.39
RV 379	0.82		0.40	0.40	0.86	1.32
RV 380	0.95	0.30	0.34	0.34	1.01	1.86
RV 381	0.33		0.16	0.17	0.56	1.04
RV 390/4	0.66		0.42	0.43	TRACE	1.30
TAN 501	NIL	0.13	0.12	0.12	NIL	1.24
TAN 503	NIL		0.05	0.055	3.28	0.94
JAG 351	0.42	0.10	0.09	0.10	1.64	1.19
JAG 368	0.04		0.255	0.25	NIL	0.22
BULT 3	NIL		0.056	0.060	2.14	0.06
BULT 15	NIL		0.026	0.030	NIL	0.07
BULT 23	NIL		0.041	0.045	NIL	0.07

TABLE 2

COMPARATIVE DATA FOR RUBIDIUM IN SOME MAFIC AND ULTRAMAFIC  
ROCK TYPES

<u>SAMPLE NO.</u>	<u>ROCK TYPE</u>	<u>Rb, p.p.m.</u> <u>O.S.<sup>1</sup></u>	<u>Rb, p.p.m.</u> <u>I.D.<sup>2</sup></u>
Lieb 50	Norite	0.20	0.22
5087	Norite	2.1	2.07
EG 4427	Gabbro	2.2	2.25
ET3/169	Pyroxenite	0.29	0.27
ET3/270	Pyroxenite	0.25	0.28
7228	Pyroxenite	0.75	0.75

- 1 optical spectrography, method outlined in this study.  
Analyst A.J. Erlank
- 2 isotope dilution - Mass Spectrometric analysis,  
Analyst H.L. Allsopp, Bernard Price Institute,  
Johannesburg.

TABLE 3

ENRICHMENT FACTORS REQUIRED  
FOR QUANTITATIVE DETERMINATIONS

<u>ELEMENT</u>	(p.p.m.)		(p.p.m.)	<u>APPROXIMATE</u>
	<u>ABUNDANCE IN ULTRAMAFICS</u>		<u>DETECTION LIMIT</u>	<u>ENRICHMENT</u>
	<u>TUREKIAN &amp;</u>	<u>VINOGRADOV</u>	<u>AHRENS &amp; TAYLOR</u>	<u>FACTOR REQUIRED</u>
	<u>WEDEPOHL</u>			
Rb	0.2	2	1	2
Cs	0.X	0.1	2	100
Li	0.X	1	0.5	NIL
Bi	No Data	0.001	20	10,000
Cd	0.X	0.005	10	10,000
Sn	0.5	0.5	10	100
Pb	1		5	10
Zn	50	30	3	NIL
Tl	0.06	0.01	1	100
Ag	0.06		0.5	10

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TABLE 4

K/Rb and K/Cs determinations in Eclogites using the ion-exchange pre-enrichment technique, compared with the preferred values for these ratios reported later in this study.

SAMPLE NO.	PRE-ENRICHMENT VALUES		PREFERRED VALUES	
	<u>K/Rb</u>	<u>K/Cs</u>	<u>K/Rb</u>	<u>K/Cs</u>
RV 372	470	180	552	150
RV 374	330	6000	271	5900
RV 377	284	5500	369	7140
RV 378	-	285	347	159
RV 379	340	510	364	471
RV 380	203	455	315	548
RV 381	375	1700	447	2390
RV 390/4	635	400	457	597
KRV 1	540	1320	357	769
KRV 2	185	425	373	939
KRV 3	-	4800	222	7288
KRV 4	165	240	319	110
KRV 5	261	205	371	228
KRV 6	-	1310	280	1767
KRV 7	395	320	361	272
KRV 8	335	205	469	256
TAN 501	272	7200	250	7500
TAN 503	230	8500	239	7860
JAG 351	125	4410	333	10000

Analyst: J.J. GURNEY

TABLE 5

Duplicate determinations of the K/Cs ratio in eclogites using the ion-exchange pre-enrichment technique, and optical spectrography.

Sample Number	K/Cs (a)	K/Cs (b)	a/b	Sample Number	K/Cs (a)	K/Cs (b)	a/b
RV 372	220	140	1.57	KRV 3	5863	3737	1.56
RV 374	6900	5100	1.35	KRV 4	288	193	1.49
RV 377	7500	3500	2.14	KRV 5	216	192	1.13
RV 378	321	248	1.29	KRV 6	1434	1186	1.21
RV 379	575	442	1.30	KRV 7	385	258	1.49
RV 380	470	420	1.12	KRV 8	363	306	1.19
RV 381	2505	906	2.76				
RV 390 /4	543	254	2.14	TAN 501	7500	6900	1.09
KRV 1	1352	1296	1.04	TAN 503	8690	7320	1.19
KRV 2	636	216	2.94	JAG 351	4700	4100	1.15

Average a/b      1.53

Analyst: J.J. GURNEY

TABLE 6

TIN, ZINC, CADMIUM, THALLIUM and BISMUTH ANALYSES  
IN ECLOGITE, PERIDOTITE and DUNITE. (Data from  
BROOKS, (1960) and BROOKS & AHRENS, (1961).

<u>SAMPLE</u>	<u>Sn</u> p.p.m.	<u>Zn</u> p.p.m.	<u>Cd</u> p.p.m.	<u>Tl</u> p.p.m.	<u>Bi</u> p.p.m.
Peridotite	0.9	29			1.2
Eclogite	0.7	64			0.07
Lherzolite	0.3	220		0.12	0.03
Dunite	1.3	225			
Olivine bomb.		77			
Eclogite				0.03	0.02
Eclogite			0.03	0.56	
Eclogite			0.02	0.06	0.10
Eclogite				0.14	0.03
Eclogite				0.07	

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TABLE 7OPTIMUM ARCING CONDITIONS

Spectrograph	Jaco 3.4-meter plane grating spectrograph. Dispersion 5A./mm.
Filter	Spex Industries filter 9023R
Excitation	Anode excitation
Wavelength	6400 to 8900A.
Lens System	Three lens systems to give maximum intensity with uniform illumination
Current	7.5 amperes d.c.
Slit	30 microns
Plate	Kodak I - N plate, backed (plate cut in two pieces)
Electrodes	Anode, National Carbon Company, regular graphite (L 4306) Cavity 3.15 x 6 mm. Wall thickness 0.8mm Cathode morganite carbon
Electrode packing	Sample depth 5 mm.
No of superimposings	As required (3 superimposings will give a detection limit of 0.1ppm for all three elements).
Sectoring	Hilger 7 step sector with 2:1 ratio
Buffer/Carrier	20% CaF <sub>2</sub> (B.D.H. extra pure)
Internal standard	K 6939 A.
Analysis lines	Rb 7800, 7974 A. Li 8126, 6707 A. Cs 8521. A.
Developer	Kodak D. 19b developer (5 minutes)
Fixer	Amfix untrarapid fixer (5 minutes)
Calibration	Self-calibration method (AHRENS & TAYLOR, 1961).

TABLE 8EXPERIMENTAL PRECISION

	Rb			Cs			Li		
	a	b	c	a	b	c	a	b	c
Concentration, p.p.m.	2-16	7.3	7.3	0.6-11	2.4	2.4	1-29	15	15
No. of Samples	12	1	1	12	1	1	22	1	1
Rock type	Eclogite			Eclogite			Basalt	Eclogite	
Relative stan- dard deviation, %	5.5	4.9	6.0	5.3	4.7	7.7	6.8	7.6	11.2

a samples arced in duplicate, K internal standard

b sample arced 12 times, K internal standard

c sample arced 12 times, no internal standard

Analyst: J.J. GURNEY

TABLE 9CESIUM DATA FOR THE STANDARD ROCK W-1<sup>1</sup>

<u>ANALYST</u>	<u>METHOD OF ANALYSIS</u>	<u>Cs, ppm</u>
Cabell & Smales (1957)	Neutron activation	1.08 <sup>2</sup>
Taylor (1965)	Spark Source Mass Spectro- graphy	0.75
Gurney & Erlank (1966)	Optical spectrography	0.80
Nicholls et al. (1967)	Spark Source Mass Spectro- graphy	0.95
Gordon et al. (1968)	Instrumental neutron acti- vation	0.83
Gast(1968)	Isotope dilution	0.89

1 United States Geological Survey Standard Diabase rock.

2 Recommended figure, Fleischer & Stevens (1962).

TABLE 10COMPARATIVE DATA FOR LITHIUM IN SOME ULTRAMAFIC ROCK TYPES

<u>SAMPLE NO.</u>	<u>ROCK TYPE</u>	<u>Li</u> <u>O. S.</u> <sup>1</sup>	<u>Li</u> <u>A. A.</u> <sup>2</sup>
RV 377	Eclogite	10.8	11.0
KRV 3	Eclogite	14.6	14.5
KRV 8	Eclogite	9.6	8.0
JAG 351	Eclogite	2.0	2.4
EK 43	Eclogite	6.3	5.7
DB 104	Peridotite	2.6	2.8
JAG 368	Peridotite	2.9	3.2
AA 5	Peridotite	3.0	3.0
ASH 1	Melilitite Basalt	4.6	6.2

1 Optical spectrography, this study.

2 Atomic absorption, this study.

Analyst: J.J. GURNEY

TABLE 11

INSTRUMENTAL SETTINGS FOR ATOMIC ABSORPTION ANALYSIS

<u>ELEMENT</u>	<u>ANALYSIS LINE</u>	<u>ACETYLENE</u> <u>FLOW</u> Litres/mm	<u>AIR</u> <u>FLOW</u> Litres/mm	<u>LAMP CURRENT</u>	<u>TYPE OF LAMP</u>
K	4044 Å	8.8	8.8	350ma	Discharge lamp
Li	6707 Å	6.5	8.0	8ma	Hollow cathode lamp
Zn	2138 Å	4.3	7.7	10ma	Hollow cathode lamp

TABLE 12

INITIAL POTASSIUM DETERMINATIONS BY ATOMIC ABSORPTION ANALYSIS

<u>SAMPLE NO.</u>	<u>% K</u> <u>Atomic Abs.</u>	<u>%K</u> <u>Flame Phot.</u>	<u>%K</u> <u>Various</u>	<u>Comments</u>
W - 1	0.537 (Ave of 5)			
RV 374	0.588	0.66	0.67	K. Heier (F.P. and Spec.)
RV 377	0.458	0.46	0.45	
RV 320	0.340	0.34	0.32	
JAG 351	0.096	0.094	0.10	
TAN 501		0.12	0.13	
817	0.059		0.060	P. Hahn Weinheimer F.P.
BULT 11	0.059	0.060	0.064	I. McDougall (F.P.)
AF - 7	0.060		0.641	A.M. Stueber (I.D.)
D.B.104	0.096	0.094	0.102	I. McDougall F.P.
ET3/169	0.033	0.033		
KRV 16	3.26	3.37		
KRV 13	1.69	1.67	1.57	J. Gurney (X.R.F.fusion)
SU 3	0.61		0.63	
SU 4	2.15		2.17	
ASH 1	1.31		1.32	
Gr - 1	0.062		0.0643	A.M. Stueber (I.D.)

Analyst  
J.J.  
Gurney

Analyst  
G.W.  
Berg

Analyst  
See under  
Comments

TABLE 13POTASSIUM CONTENT OF ECLOGITES FROM KIMBERLITESPOTASSIUM CONTENT (% K)

<u>SAMPLE NO.</u>	<u>X.R.F. W.R.</u>	<u>X.R.F. FUSION</u>	<u>ATOMIC ABSORPTION</u>	<u>FLAME PHOTO-METER</u>	<u>PREFERRED VALUE</u>
RV 372	0.16			0.16	0.16
RV 374	0.59	0.588	0.584	0.66	0.59
RV 377	0.45	0.423	0.458	0.46	0.45
RV 378	0.26			0.26	0.26
RV 379	0.40			0.40	0.40
RV 380	0.34			0.34	0.34
RV 381	0.17			0.16	0.17
RV 390/4	0.43			0.42	0.43
KRV 1	0.19			0.20	0.20
KRV 2	0.31			0.31	0.31
KRV 3	0.43	0.427	0.421	0.43	0.43
KRV 4	0.22			0.22	0.22
KRV 5	0.13	0.127	0.131	0.12	0.13
KRV 6	0.77			0.75	0.76
KRV 7	0.22			0.22	0.22
KRV 8	0.30	0.297	0.293	0.29	0.30
CR - 1	0.240	0.255	0.250		0.25
JAG 41	0.14	0.137	0.126	0.14	0.13
JAG 351	0.10	0.098	0.096	0.094	0.10
TAN 1	0.10	0.083			0.09
TAN 501	0.12			0.12	0.12
TAN 503	0.055			0.050	0.055
AA 3	0.33			0.33	0.33

XRF and A.A. analyses were performed by J.J. GURNEY

The flame photometric analyses were performed by G.W. BERG.

TABLE 14POTASSIUM CONTENT OF PERIDOTITES AND PYROXENITES FROM KIMBERLITES

<u>SAMPLE NO.</u>	<u>POTASSIUM CONTENT IN % K</u>				
	<u>X.R.F.</u> <u>W.R.</u>	<u>X.R.F.</u> <u>Fusion</u>	<u>Atomic</u> <u>Absorption</u>	<u>Flame</u> <u>Photometer</u>	<u>Preferred</u> <u>Value</u>
BULT 1	0.039			0.036	0.038
BULT 2	0.075			0.074	0.075
BULT 3	0.064			0.056	0.060
BULT 4	0.30			0.305	0.30
BULT 6	0.054			0.048	0.051
BULT 7	0.116			0.106	0.11
BULT 8	0.162	0.170	0.162	0.16	0.16
BULT 9	0.030			0.030	0.030
BULT 10	0.053			0.053	0.053
BULT 11	0.066	0.067	0.059	0.060	0.063
BULT 15	0.034			0.026	0.030
BULT 17	0.075			0.074	0.075
BULT 18	0.027			0.027	0.027
BULT 19	0.660			1.68	0.66
BULT 20	0.062			0.060	0.061
BULT 21	0.043			0.040	0.042
BULT 22	0.122			0.111	0.12
BULT 23	0.046	0.043	0.043	0.041	0.043
BULT 25	0.021			0.021	0.021
KBULT 1	0.015		0.014		0.015
KBULT 2	0.076	0.070			0.073
KBULT 3	0.127		0.137		0.13
KBULT 4	0.045	0.035	0.039		0.040
KBULT 5	0.108	0.108	0.110		0.11
KBULT 6	0.155		0.162		0.16
KBULT 8	0.59		0.580		0.59
KBULT 11	0.017		0.16		0.017

POTASSIUM CONTENT OF PERIDOTITES AND PYROXENITES FROM KIMBERLITES

<u>SAMPLE NO.</u>	<u>POTASSIUM CONTENT IN % K</u>				
	<u>X.R.F. W.R.</u>	<u>X.R.F. Fusion.</u>	<u>Atomic Absorption</u>	<u>Flame Photometer</u>	<u>Preferred Value</u>
KBULT 13	0.019				0.019
KBULT 14	0.098				0.098
KBULT 15	0.26				0.26
KBULT 16	0.028	0.029	0.033		0.030
KBULT 17	0.34				0.34
KBULT 18	0.017				0.017
KBULT 19	0.032		0.030		0.031
KBULT 20	0.043				0.043
KBULT 21	0.030				0.030
KBULT 22	0.192				0.19
KBULT 23	0.048				0.048
KBULT 24	0.045				0.045
WESS 152	0.193			0.190	0.19
KWESS 1	0.017	0.019			0.018
KWESS 2	0.045	0.038			0.042
KWESS 4	0.016				0.016
KWESS 5	0.149	0.133	0.130		0.14
KWESS 7	0.062	0.047			0.055
KWESS 8	0.074				0.074
KWESS 10	0.77				0.77
KWESS 12	0.117				0.12
KWESS 13	0.028				0.028
KWESS 14	0.139				0.14
KWESS 15	0.019	0.016	0.018		0.018
KWESS 16	0.015	0.015	0.016		0.015
KWESS 17	0.015				0.015
KWESS 18	0.099		0.101		0.10
KWESS 19	0.199				0.20
KWESS 20	0.029				0.029
KWESS 21	0.36				0.36
KWESS 22	0.60				0.60

POTASSIUM CONTENT OF PERIDOTITES AND PYROXENITES FROM KIMBERLITES

		<u>POTASSIUM CONTENT IN % K</u>				
<u>SAMPLE</u>		<u>X.R.F.</u>	<u>X.R.F.</u>	<u>Atomic</u>	<u>Flame</u>	<u>Preferred</u>
<u>NO.</u>		<u>W.R.</u>	<u>Fusion.</u>	<u>Absorption</u>	<u>Photometer</u>	<u>Value</u>
DB	101	0.31			0.315	0.31
DB	102	0.100			0.105	0.10
DB	103	0.166			0.169	0.17
DB	104	0.096	0.091	0.098	0.094	0.095
DB	105	0.114			0.121	0.12
DB	109	1.05			1.17	1.1
KDB	1	0.024				0.024
KDB	2	0.050	0.050			0.050
KDB	3	0.011	0.008			0.010
KDB	4	0.021				0.021
KDB	5	0.24				0.24
KDB	7	0.22				0.22
KDT	1	0.152				0.15
KDT	4	0.071	0.074	0.073		0.073
KDT	6	0.087				0.087
KDT	7	0.039				0.039
KDT	8	0.158				0.16
KDT	9	0.161				0.16
KDT	10	0.62				0.62
KDT	12	0.050	0.047	0.52		0.050
KDT	13	0.070	0.061	0.63		0.065
KDT	16	0.22				0.22
KDT	17	0.22				0.22
KDT	18	0.016	0.016			0.016
KDT	19	0.182	0.183			0.18
KDT	20	0.22				0.22

Table 14 (Continued)

<u>POTASSIUM CONTENT OF PERIDOTITES AND PYROXENITES FROM KIMBERLITES</u>					
<u>POTASSIUM CONTENT IN % K</u>					
<u>SAMPLE</u>	<u>X.R.F.</u>	<u>X.R.F.</u>	<u>Atomic</u>	<u>Flame</u>	<u>Preferred</u>
<u>NO.</u>	<u>W.R.</u>	<u>Fusion.</u>	<u>Absorption</u>	<u>Photometer</u>	<u>Value</u>
JAG 32	0.187			0.191	0.19
JAG 368	0.24			0.255	0.25
KJAG 12	0.100				0.10
KJAG 13	0.048	0.047			0.048
KJAG 14	0.41				0.41
KJAG 15	0.186				0.19
KJAG 16	0.040				0.040
KJAG 17	0.30				0.30
KJAG 18	0.33				0.33
KJAG 19	0.027	0.027			0.027
KJAG 20	0.070				0.070
KRV 9	0.32				0.32
KRV 10	0.165				0.17
AA 1	0.095			0.093	0.094
AA 2	0.057			0.058	0.058
AA 4	0.115				0.12
AA 5	0.020			0.021	0.021

XRF and A.A. analyses by J.J. GURNEY

Flame photometric analyses by G.W. BERG

TABLE 15

COMPARISON OF POTASSIUM & RUBIDIUM VALUES REPORTED  
IN THIS WORK AND THOSE OBTAINED BY OTHER WORKERS

SAMPLE NO.	THIS WORK			PREVIOUS WORK			ANALYST & METHOD
	K%	Rb ppm	K/Rb	K%	Rb	K/Rb.	
+ RV 374	0.59	21.8	271	0.67	22.8	294	HEIER Rb - X.R.F. K - $\gamma$ Spec.
+ RV 377	0.45	12.2	369	0.45	12.9	349	
+ RV 380	0.34	10.8	315	0.30	10.7	280	
+ JAG 351	0.10	3.0	333	0.10	3.8	263	
+ TAN 501	0.12	4.8	250	0.13	6.2	210	
Gr - 1	0.062	2.2	282	0.0643	2.42	266	A.M. STUEBER K & Rb - I.D.
AF - 7	0.060	4.2	143	0.0641	4.48	143	
817	0.059	-	-	0.06	-	-	Hahn-Weinheimer F.P.
BULT 11	0.065	-	-	0.064	-	-	I. McDougall F.P.
DB 104	0.095	-	-	0.102	-	-	
+ RV 380	0.34	10.8	315	0.35	10.7	327	Heier Rb - X.R.F. K - F.P.
+ TAN 501	0.12	4.8	250	0.11	6.2	177	

+ This work was carried out on separate pieces of the same sample.

TABLE 16INSTRUMENTAL OPERATING CONDITIONS FOR XRF ANALYSIS

Elements	K	K	Rb	Rb	Rb	Zinc	<i>u</i>
Method	W.R.	Fusion	W.R.	W.R.	W.R.	W.R.	W.R.
Conc. Range (p.p.m.)	100 - 35000	100 - 80000	2 - 25	2 - 10	20 - 150	5 - 250	n/a
Target Tube	Cr	Cr	Mo	Mo	Mo	Au	Mo
K V	50	50	50	50	50	60	50
M A	32	32	20	20	20	32	20
Analysing Crystal	LiF 200	LiF 200	LiF 110	LiF 110	LiF 110	Topaz	LiF 200
Collimator	Fine	Fine	Fine	Fine	Fine	Fine	Fine
Counter	Flow	Flow	Sc+D	Sc+D	Sc+D	F+Sc +D	Sc+D
Counting Time	3x20'	3x20'	3x40'	3x100'	3x40'	3x40'	N/A
Vacuum	Yes	Yes	No	Yes	No	Yes	No
Peak Position	136.7	136.7	37.91	37.91	37.91	63.92	21.17
No. of Background Settings	1	1	4	4	4	2	0
	K	K	Rb	Rb	Rb	Zinc	<i>u</i>

Zinc - A gold peak at 56.20 was measured to enable the calculation of a correction due to target tube impurity.

Mass Absorption Coefficient - a fixed count of 128,000 counts was measured.

Sc + D Scintillation counter with discrimination.

TABLE 17SOME POTASSIUM CONTENTS OF KIMBERLITE DETERMINED  
BY GAMMA SPECTROMETRY

<u>SAMPLE NO.</u>	<u>K% GAMMA SPEC.</u>	<u>K% PREF. VALUE</u>
KBULT 25	1.7	1.6
KBULT 26	1.7	1.6
KBULT 27	1.6	1.4
KBULT 28	1.4	1.2
KBULT 29	1.9	1.7
KBULT 30	1.3	1.1
KBULT 31	1.7	1.5
KBULT 34	1.4	1.4
KBULT 35	1.5	1.6
KBULT 36	1.4	1.6
KBULT 37	1.6	1.6
KBULT 38	2.1	1.8
KBULT 39	1.3	1.3
KWESS 23	2.3	2.0
KWESS 24	1.9	1.7
KWESS 25	1.6	1.4
KWESS 26	1.5	1.3
KWESS 27	1.7	1.5

Table 17 (Continued)

<u>SAMPLE NO.</u>	<u>K% GAMMA SPEC.</u>	<u>K% PREF. VALUE</u>
KDB 9	1.2	1.2
KDB 11	1.2	1.2
KDB 12	0.4	0.4
KDB 15	1.1	1.1
KDT 24	0.9	1.0
KDT 28	1.3	1.3
KDT 29	0.6	0.6
KJAG 1	2.1	1.9
KJAG 2	1.2	1.3
KJAG 3	1.6	1.6
KJAG 4	2.4	2.2
KJAG 5	0.8	0.6
KJAG 6	0.9	1.0
KJAG 7	2.3	2.1
KJAG 9	1.7	1.7
KJAG 10	1.7	1.7
KJAG 11	1.7	1.4
KRV 12	3.1	3.0
KRV 13	1.7	1.7

Table 17 (Continued)

<u>SAMPLE NO.</u>	<u>K% GAMMA SPEC.</u>	<u>K% PREF. VALUE</u>
KK 1	1.3	1.2
KK 2	0.3	0.4
KK 3	1.3	1.1
KK 4	1.2	1.1
KN 1	1.0	1.0
KN 2	1.0	1.0
KN 3	1.4	1.5
KN 4	1.5	1.5
KN 5	1.6	1.2
KBEL 1	1.3	1.2
XSF 2	2.1	2.0
XSF 7	2.4	2.3
MON 1	1.0	1.0

COMPARISON OF RUBIDIUM VALUES IN ECLOGITES,  
OBTAINED BY X.R.F. AND O.S. METHODS

<u>SAMPLE</u> <u>No.</u>	<u>RUBIDIUM (p.p.m.)</u>		
	<u>O.S.</u>	<u>X.R.F.</u>	<u>PREFERRED VALUE</u>
RV 372	2.9	1.5	2.9
RV 374	21.7	22.0	21.8
RV 377	11.8	12.5	12.2
RV 378	7.9	7.0	7.5
RV 379	11.8	10.2	11.0
RV 380	10.7	10.8	10.8
RV 381	3.4	4.1	3.8
RV 390/4	8.7	10.0	9.4
KRV 1	5.5	5.7	5.6
KRV 2	8.8	7.8	8.3
KRV 3	<b>S.A.</b>	19.4	19.4
KRV 4	7.3	6.4	6.9
KRV 5	3.5	3.4	3.5
KRV 6	<b>S.A.</b>	27.1	27.1
KRV 7	5.9	6.3	6.1
KRV 8	7.6	5.2	6.4
CR - 1	6.8	6.5	6.7
JAG 41	5.0	5.5	5.3
JAG 351	2.5	3.5	3.0
TAN 1	2.1	2.9	2.5
TAN 501	3.8	5.7	4.8
TAN 503	2.1	2.5	2.3
AA 3	11.1	10.4	10.8

Rb line self-absorbing - **S.A.**  
(O.S. determination)

X.R.F. — Ave of 4

Analyst: J.J. GURNEY

TABLE 19

RUBIDIUM CONTENT OF PERIDOTITES

<u>SAMPLE</u> <u>No.</u>	<u>X.R.F.</u>	<u>Rb p.p.m.</u>		<u>PREFERRED</u> <u>VALUE</u>
		<u>O.S.</u> <u>(a)</u>	<u>O.S.</u> <u>(b)</u>	
BULT 1	3.1	2.7		2.9
BULT 2	4.6	3.8		4.2
BULT 3	3.6	3.3		3.5
BULT 4	9.4			9.4
BULT 6	2.6	2.3		3.0
BULT 7	6.1	6.1		6.1
BULT 8	6.2	5.7		6.0
BULT 9	2.1	1.5	1.8	1.8
BULT 10	2.4		2.1	2.3
BULT 11	2.5	2.6	3.2	2.8
BULT 15	2.2	2.4	2.3	2.3
BULT 17	3.1	3.5		3.4
BULT 18	1.4		1.1	1.3
BULT 19	33.4			33.4
BULT 20	1.8	2.3		2.1
BULT 21	2.5	2.8		2.5
BULT 22	4.1	5.5		4.8
BULT 23	2.7	2.3	1.8	2.3
BULT 25	1.7		1.0	1.4
KBULT 1	N.D.		0.6	0.6
KBULT 2	2.7	3.8		3.3
KBULT 3	6.0	6.0		6.0
KBULT 4	1.4	2.3		1.9
KBULT 5	4.4	5.6		5.0
KBULT 6	6.0	5.6		5.8
KBULT 11	N.D.		0.7	0.7
KBULT 13	N.D.		0.7	0.7
KBULT 14	2.8	2.4		2.6

Table 19 (Continued)

<u>RUBIDIUM CONTENT OF PERIDOTITES</u>				
<u>SAMPLE</u> <u>NO.</u>	<u>X.R.F.</u>	<u>Rb p.p.m.</u>		<u>PREFERRED</u> <u>VALUE</u>
		<u>O.S.</u> <u>(a)</u>	<u>O.S.</u> <u>(b)</u>	
KBULT 15	12.2			12.2
KBULT 16	N.D.		2.2	2.2
KBULT 17	13.5			13.5
KBULT 18	N.D.		0.9	0.9
KBULT 19	2.1		1.3	1.7
KBULT 20	2.4		1.5	2.0
KBULT 21	1.2		2.2	1.7
KBULT 22	20.0			20.0
KBULT 23	1.8		1.7	1.8
KBULT 24	3.1	3.5		3.3
WESS 152	9.4			9.4
KWESS 1	N.D.		0.8	0.8
KWESS 2	2.3	2.5		2.4
KWESS 4	N.D.		0.8	0.8
KWESS 5	7.0			7.0
KWESS 7	4.4	4.5		4.5
KWESS 8	4.5	3.7		4.1
KWESS 10	29.0			29.0
KWESS 12	5.4	4.0		4.7
KWESS 13	2.2	2.2	2.4	2.2
KWESS 14	9.0			9.0
KWESS 15	1.5		1.4	1.5
KWESS 16	N.D.		0.6	0.6
KWESS 17	N.D.		0.6	0.6
KWESS 18	5.3	4.7		5.0
KWESS 19	14.0			14.0
KWESS 20	N.D.		1.2	1.2
KWESS 21	22.9			22.9
KWESS 22	36.2			36.2

		<u>RUBIDIUM CONTENT OF PERIDOTITES</u>			
		Rb p.p.m.			
<u>SAMPLE</u>		<u>X.R.F.</u>	<u>O.S.</u>	<u>O.S.</u>	<u>PREFERRED</u>
<u>NO.</u>			<u>(a)</u>	<u>(b)</u>	<u>VALUE</u>
DB	101	13.3			13.3
DB	102	5.1	6.7		5.9
DB	103	10.0			10.0
DB	104	6.0	6.0		6.0
DB	105	8.0	8.0		8.0
DB	109	64.7			64.7
KDB	1	1.4		1.3	1.4
KDB	2	3.7		2.0	2.8
KDB	3	N.D.		0.5	0.5
KDB	4	N.D.		1.1	1.1
KDB	5	10.9			10.9
KDB	7	9.8			9.8
KDT	1	13.5			13.5
KDT	4	5.9	5.1		5.5
KDT	6	6.2	6.9		6.6
KDT	7	2.0	2.6		2.3
KDT	8	10.0			10.0
KDT	9	11.1			11.1
KDT	10	24.3			24.3
KDT	12	4.3	5.2		4.8
KDT	13	4.4	4.1		4.3
KDT	16	11.7			11.7
KDT	17	10.0			10.0
KDT	18	N.D.		1.2	1.2
KDT	19	7.6	6.9		7.3
KDT	20	13.7			13.7

Table 19 (Continued)

<u>RUBIDIUM CONTENT OF PERIDOTITES</u>				
Rb p.p.m.				
<u>SAMPLE NO.</u>	<u>X.R.F.</u>	<u>O.S.</u> (a)	<u>O.S.</u> (b)	<u>PREFERRED VALUE</u>
JAG 32	12.1			12.1
JAG 368	15.8			15.8
KJAG 12	5.8	5.7		5.8
KJAG 13	3.1	1.8		2.5
KJAG 14	14.5			14.5
KJAG 15	11.4			11.4
KJAG 16	2.7		2.0	2.4
KJAG 17	12.1			12.1
KJAG 18	15.6			15.6
KJAG 19	N.D.		1.2	1.2
KJAG 20	3.4	2.9		3.2
KRV 9	14.2			14.2
KRV 10	13.2			13.2
AA 1	5.8	4.4		5.1
AA 2	2.8	3.3		3.1
AA 4	4.1	7.5		5.8
AA 5	N.D.	1.3		1.3

## X.R.F. determinations:

Above 15 p.p.m. - 2 determinations  
 3 - 10 p.p.m. - 5 determinations  
 Less than 3 p.p.m. - 10 determinations

(a) Potassium used as internal standard.

(b) Potassium too low for use as internal standard.

Rubidium line intensity ( $7947\overset{\circ}{\text{A}}$ ) used alone.

Analyst: J.J. GURNEY

INSTRUMENTAL SETTINGS FOR OPTICAL SPECTROGRAPHIC  
DETERMINATIONS OF Rb, Cs and Li

- |     |                    |   |
|-----|--------------------|---|
| (a) | Eclogite           | As in Table 7   |
| (b) | Peridotite         | As in Table 7   |
| (c) | Kimberlite         | As in Table 7 except:<br>Slit 15 microns<br>No superimposing<br>Electrodes pre-heated to 450°<br>for 4 hours. |
| (d) | Olivine Melilitite | As in Table 7 except:<br>No superimposing   |
| (e) | Basalt             | As in Table 7   |
-

TABLE 21DETERMINATIONS OF LITHIUM IN ULTRA-BASIC ROCKS

		<u>Atomic Absorption</u>	<u>Optical Spectrography</u>
RV	374		
RV	377	11.0	10.8
KRV	3	14.5	14.6
KRV	5	22.1	15.6
KRV	6	7.2	7.9
KRV	7	10.2	10.5
KRV	8	8.0	9.6
JAG	351	2.4	2.0
TAN	503	4.5	3.7
EK	43	5.7	6.3
BULT	8	3.3	2.7
BULT	11	3.0	2.6
KBULT	16	3.5	3.1
KDB	9	13.6	9.3
KDB	10	4.8	-
KDB	12	4.1	-
DB	104	2.8	2.6
JAG	368	3.2	2.9
AA	5	3.0	3.0
ASH	1	6.2	4.6

Analyst: J.J. Gurney

TABLE 22

COMPARISON OF ZINC DETERMINATIONS BY X.R.F.  
(REYNOLDS CORRECTION), X.R.F. (ADDITION  
METHOD) and ATOMIC ABSORPTION

<u>SAMPLE NO.</u>	<u>ROCK</u> <u>TYPE</u>	<u>X.R.F.</u> <u>(REYNOLDS)</u>	<u>X.R.F.</u> <u>(ADDITION.)</u>	<u>ATOMIC</u> <u>ABSORPTION</u>
BULT 8	Peridotite	32	36	31
BULT 11	"	30	36	30
K BULT 16	"	36	40	34
WESS 1	"	35	39	36
KDB 1	"	36	42	34
KJAG 12	"	33		31
KDT 1	"	36		36
WESS 152	Pyroxenite	30		33
KRV 1	Eclogite	69	57	66
3	"	34	30	34
5	"	47	41	45
7	"	67	55	64
KDB 10	Kimberlite	57	50	53
KRV 11	"	64	59	62
KDT 25	"	54		55
KBULT 25	"	58		56
ASH 1	"	110		104

Analyst: J.J. GURNEY

TABLE 23MAJOR ELEMENT CONTENT OF KIMBERLITES (After DAWSON, 1960)

	<u>ULTRABASIC ROCKS</u> <u>(VINOGRADOV)</u>	<u>BASALTIC</u> <u>KIMBERLITE</u>	<u>MICACEOUS</u> <u>KIMBERLITE</u>
SiO <sub>2</sub>	40.6	35.2	31.1
TiO <sub>2</sub>	0.05	2.32	2.03
Al <sub>2</sub> O <sub>3</sub>	0.85	4.4	4.9
FeO	12.6	9.8	10.5
MnO	0.19	0.11	0.10
MgO	42.9	27.9	23.9
CaO	1.0	7.6	10.6
K <sub>2</sub> O	0.04	0.98	2.1
Na <sub>2</sub> O	0.77	0.32	0.31
H <sub>2</sub> O		7.4	5.9
CO <sub>2</sub>	0.04	3.3	7.1
P <sub>2</sub> O <sub>5</sub>	0.04	0.72	0.66
Mg/Fe	3.4	2.2	1.8
K/Na	0.05	3.4	7.5

TABLE 24POTASSIUM, RUBIDIUM, and CESIUM

## (a) Kimberlites (Average Values)

	$\frac{K}{\%}$	$\frac{Rb}{ppm.}$	$\frac{Cs}{ppm.}$	$\frac{K}{Rb}$	$\frac{K}{Cs}$
BULFFONTEIN	1.5 (13)	88 (13)	29 (13)	173	1003
WESSELTON	1.6 ( 5)	95 ( 5)	34 ( 5)	165	519
DE BEERS	0.8 (10)	62 (10)	26 ( 6)	144	340
DU TOITS PAN	0.9 ( 6)	77 ( 6)	4 ( 6)	114	3157
JAGERSFONTEIN	1.6 (10)	83 (10)	10 (10)	184	1875
ROBERTS VICTOR	2.9 ( 6)	118 ( 6)	6 ( 6)	242	4960
OTHER	1.2 (18)	84 (18)	-	149	-
OVERALL	1.4 (68)	84 (68)	- (46)	165	-

## (b) Peridotites (Average Values)

	$\frac{K}{\%}$	$\frac{K}{Rb}$	$\frac{K}{Cs}$
BULFFONTEIN	0.098 (38)	211	4957
WESSELTON	0.145 (14)	191	1470
DE BEERS	0.205 (12)	186	1320
DU TOITS PAN	0.161 (14)	165	6430
JAGERSFONTEIN	0.178 (11)	208	10200
ROBERTS VICTOR	0.245 ( 2)	178	4470
OVERALL	0.14	196	-

Analyst: J.J. GURNEY

TABLE 25

Na, K, Rb and Cs in the purest available alteration products

	<u>Na</u> <u>%</u>	<u>K</u> <u>%</u>	<u>Rb</u> <u>ppm.</u>	<u>Cs</u> <u>ppm.</u>	<u>K/Rb</u>	<u>K/Cs</u>
RV 378 pyx. alteration (Est 75% zeolite)	3.51	0.51	14	75	364	68
RV 372 pyx. alteration (Est 40% zeolite)	3.29	0.27	3.4	18	794	150
KRV 4 secondary alt. (Est. 10% zeolite)	1.78	1.0	27	12	370	833

TABLE 26

Na and K in Eclogites and their separated pyroxenes

	<u>PYROXENE</u>		<u>WHOLE ROCK</u>	
	Na (%)	K (%)	Na (%)	K (%)
RV 377		0.03		0.46
RV 374		0.11		0.66
TAN 501		0.03		0.12
TAN 503		0.04		0.05
RV 372	4.44	0.05	3.16	0.16
JAG 351		0.02		0.09
RV 381		0.10		0.16
RV 378		0.12	2.39	0.26
KRV 4		0.11	2.19	0.22

(After BERG 1968)

TABLE 27ZINC CONTENTS OF SOME SOUTH AFRICAN DOLERITES  
AND SOME SEPARATED MINERALS

	<u>WHOLE ROCK</u>	<u>PYROXENE</u>	<u>PLAGIOCLASE</u>
	<u>ppm.</u>	<u>ppm.</u>	<u>ppm.</u>
D/S 50	80	184	16
D/S 88	103	134	18
D/S 106	98	150	16

Analyst: J.J. GURNEY

TABLE 28

ZINC CONTENTS OF FIVE SOUTHERN AFRICAN GRANITES  
AND SOME SEPARATED MINERALS

	<u>WHOLE ROCK</u> <u>ppm.</u>	<u>BIOTITE</u> <u>ppm.</u>	<u>PLAG. &amp; QUARTZ</u> <u>ppm.</u>	<u>KFELSPAR</u> <u>ppm.</u>
B 23	61	502		
SWAZI II	61	560		
O.G. 2	68	633		
BOTHA'S HILL	66	815		
G.R. 2		554	8	2

Analyst: J.J. GURNEY

TABLE 29

ZINC CONTENTS OF 4 SOUTH AFRICAN NORITOIDS  
AND SOME SEPARATED MINERALS

		<u>WHOLE ROCK</u>	<u>HYPERSTHENE</u>	<u>BIOTITE</u>	<u>PLAGIOCLASE</u>	<u>MAGNETI-</u>
		<u>ppm.</u>	<u>ppm.</u>	<u>ppm.</u>	<u>ppm.</u>	<u>TIC</u>
						<u>FRACTION</u>
						<u>ppm.</u>
NOR	1	210	533	270	8.3	1330
NOR	2	299	451		13	
NOR	3			339	15	
NOR	8	225		331	13	


Analyst: J.J. GURNEY

TABLE 30ZINC CONTENT OF 3 SOUTH WEST AFRICAN GABBROES  
AND SOME SEPARATED MINERALS

	<u>WHOLE ROCK</u> <u>ppm.</u>	<u>PYROXENE</u> <u>ppm.</u>	<u>PLAGIOCLASE</u> <u>ppm.</u>
Me 6	92	136	6
Me 7	39	161	
Me 9	71	125	

Analyst: J.J. GURNEY

TABLE 31ZINC CONTENTS OF ROCKS FROM THE BUSHVELD IGNEOUS COMPLEX

<u>SAMPLE TYPE</u>	<u>ZINC ppm.</u>	<u>MAFIC INDEX</u>
Pyroxenite	81	
Pyroxenite	78	
Norite	46	
Norite	44	
Gabbro	40	
Gabbro	38	
Hyperite	37	
Hyperite	29	
Anorthosite	13	
Anorthosite	11	
Anorthosite	10	
Anorthosite	7	

Analyst: J.J. GURNEY

TABLE 32MASS ABSORPTION VALUES FOR STANDARD ROCKS

G - 1	9.70
W - 1	15.09
K <sub>2</sub> SO <sub>4</sub>	18.90
CaF <sub>2</sub>	21.30
NaFels	7.35
Syenite	14.10
B R	16.91
T - 1	11.51
Sulphide	27.3
Ore	
G R	10.8
Argill. Lime	15.0

The working curve for calculating the mass absorption values of the ultramafic samples was based on W - 1, G - 1, CaF<sub>2</sub> and NaFelspar, with W - 1 as the primary standard, assuming the mass absorption coefficient values quoted above.

TABLE 33ANALYSES OF STANDARD ROCKS, DETERMINED DURING  
THE COURSE OF THIS STUDY

ELEMENT	SAMPLE NO.	CONTENT (ppm)	METHOD	NUMBER OF DETERMINATIONS	PRIMARY STANDARD
Cs	W - 1	0.8	O.S.	6	Synthetic
Rb	W - 1	22.9	XRF	6	G-1 220ppm.
Rb	W - 1	21.8	XRF	13	G-1 220ppm.
Rb	W - 1	21.8	XRF	6	G-1 220ppm.
Rb	W - 1	22.0	XRF	6	G-1 220ppm.
K	W - 1	5,370	A.A.	5	Synthetic
Zn	G - 1	45	X.R.F.	3	W-1 82ppm.
Zn	Soda Felspar	15	X.R.F.	2	W-1 82ppm.
Zn	Syenite	244	X.R.F.	2	W-1 82ppm.
Zn	T - 1	160	X.R.F.	2	W-1 82ppm.
Zn	Sulphide Ore	263	X.R.F.	2	W-1 82ppm.
Zn	G.R.	57	X.R.F.	2	W-1 82ppm.
Zn	Arg. Lime	138	X.R.F.	2	W-1 82ppm.
Zn	G - 1	44	X.R.F.	9	W-1 82ppm.
Zn	W - 1	84	A.A.	2	Synthetic
Li	W - 1	11	A.A.	2	Synthetic

F I G U R E 1

CATION EXCHANGE ON DOWEX 50

FIGURE 1

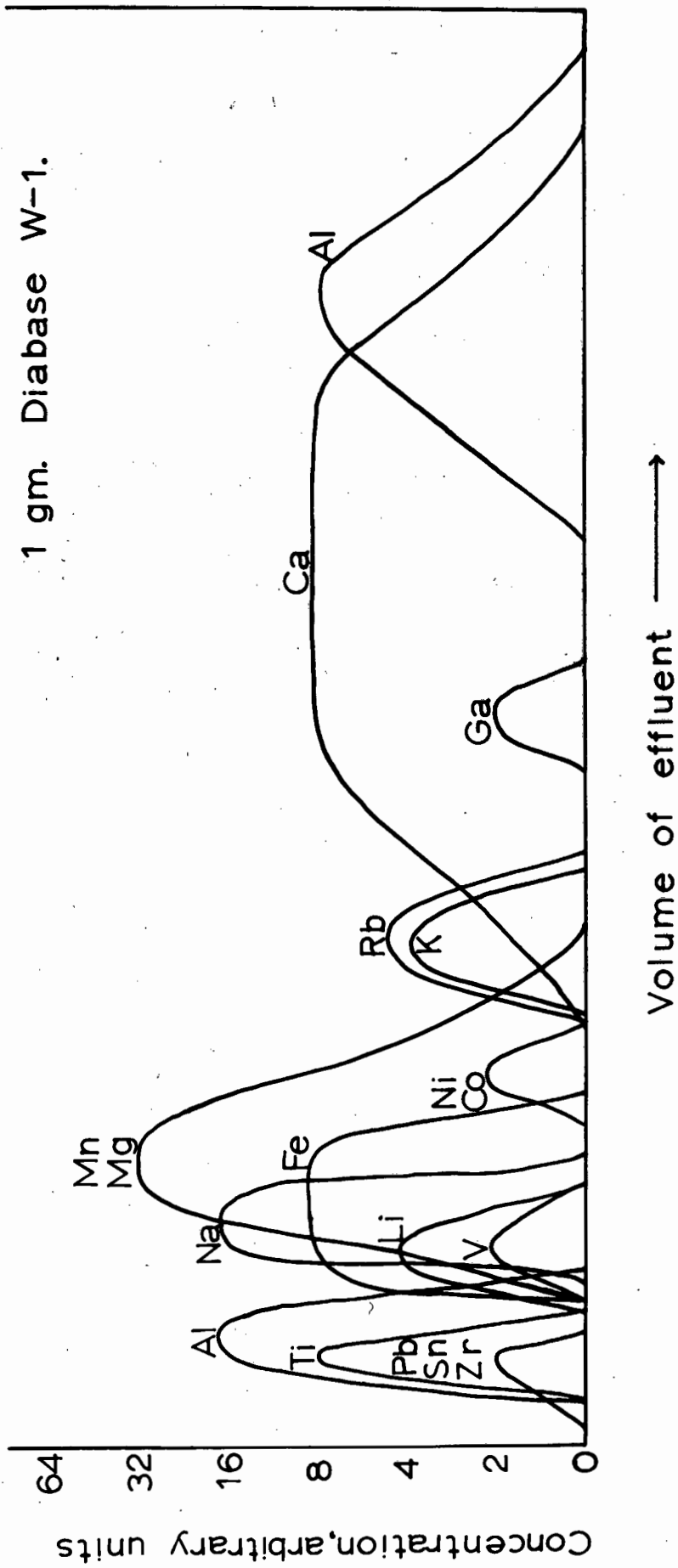


FIGURE 2

ANION EXCHANGE ON AMBERLITE IRA 400

FIG. 2 Anion Exchange

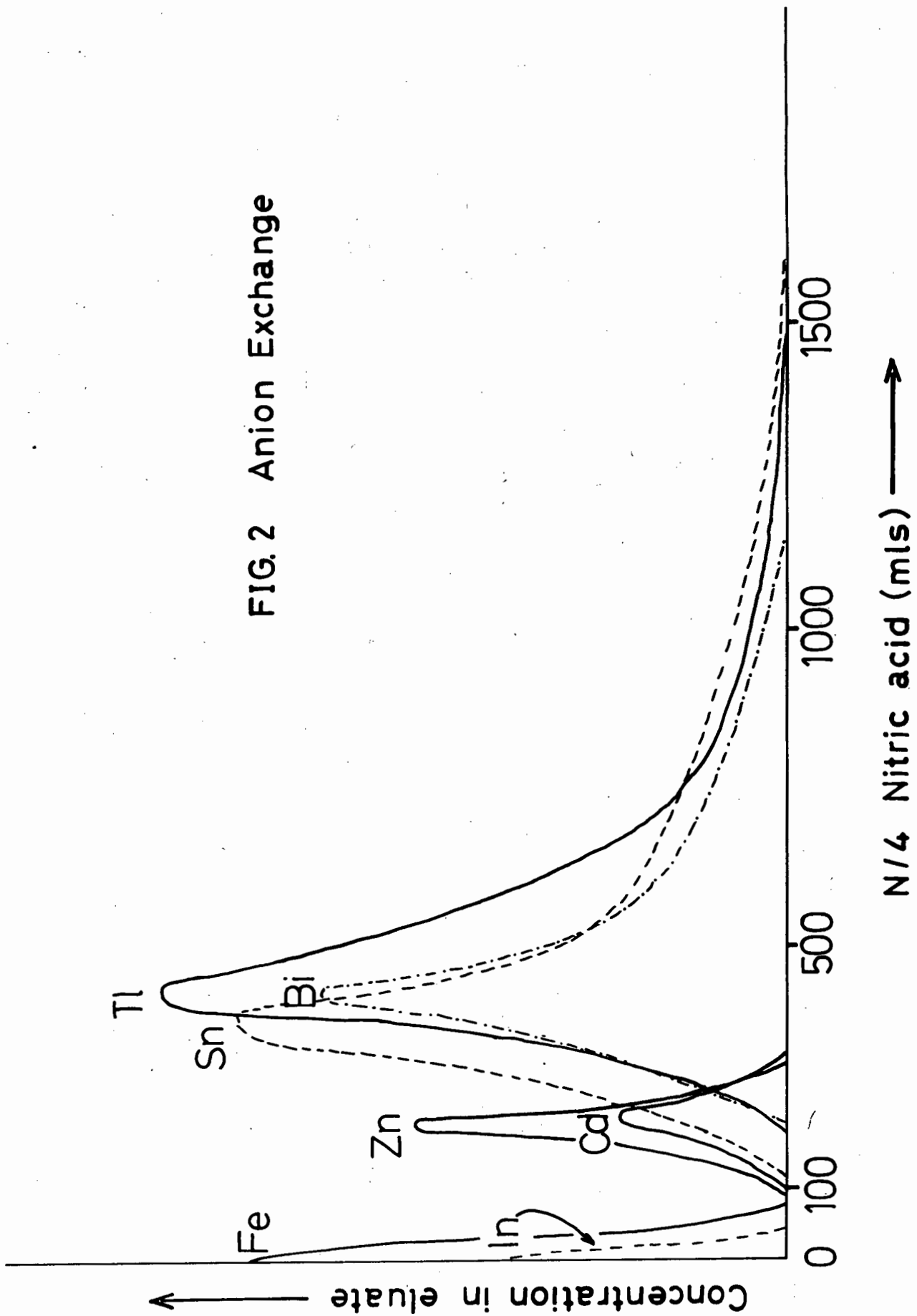


FIGURE 3

RECOMMENDED LENS SYSTEMS

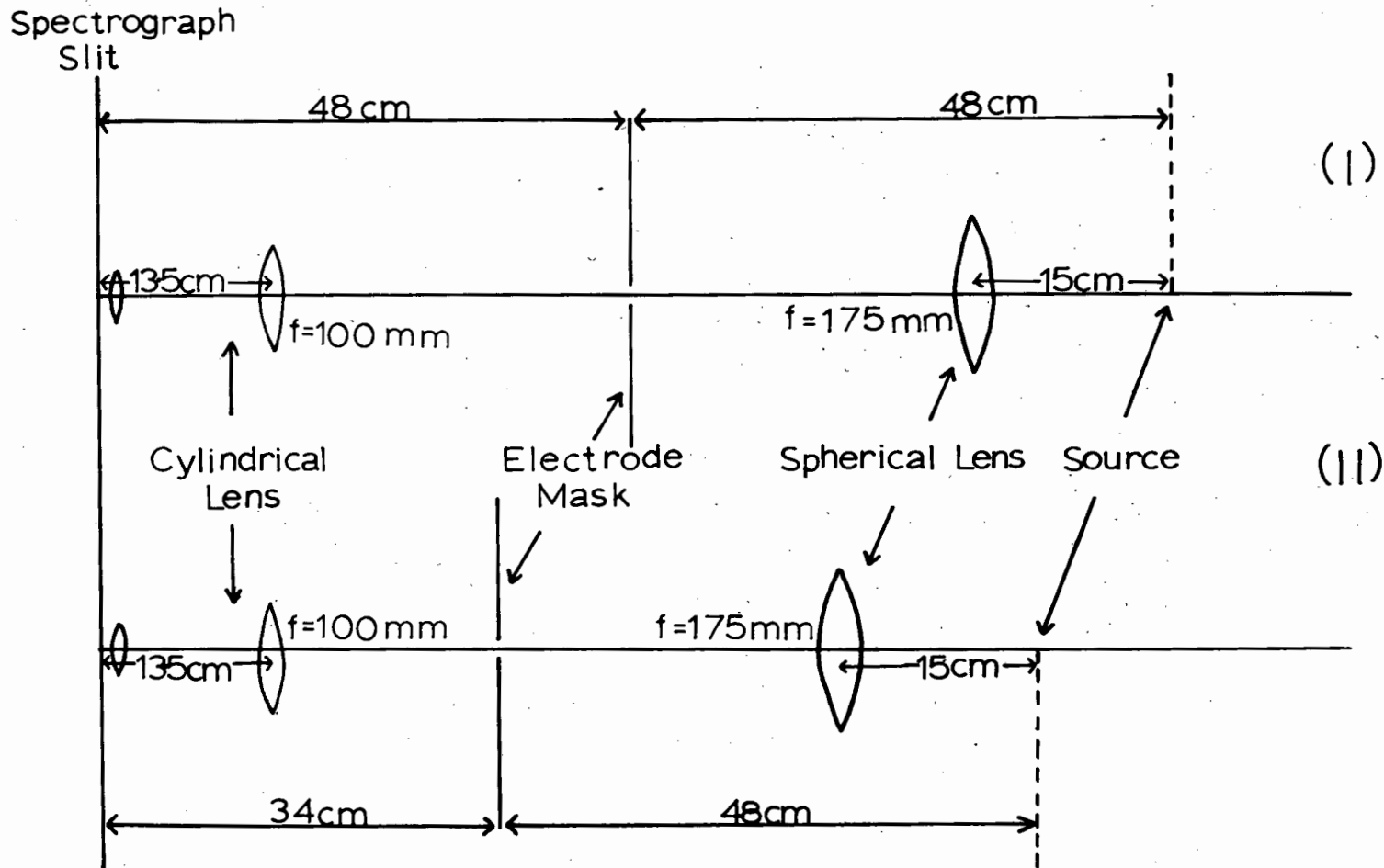


FIGURE 3  
Recommended  
Lens Systems

FIGURE 4

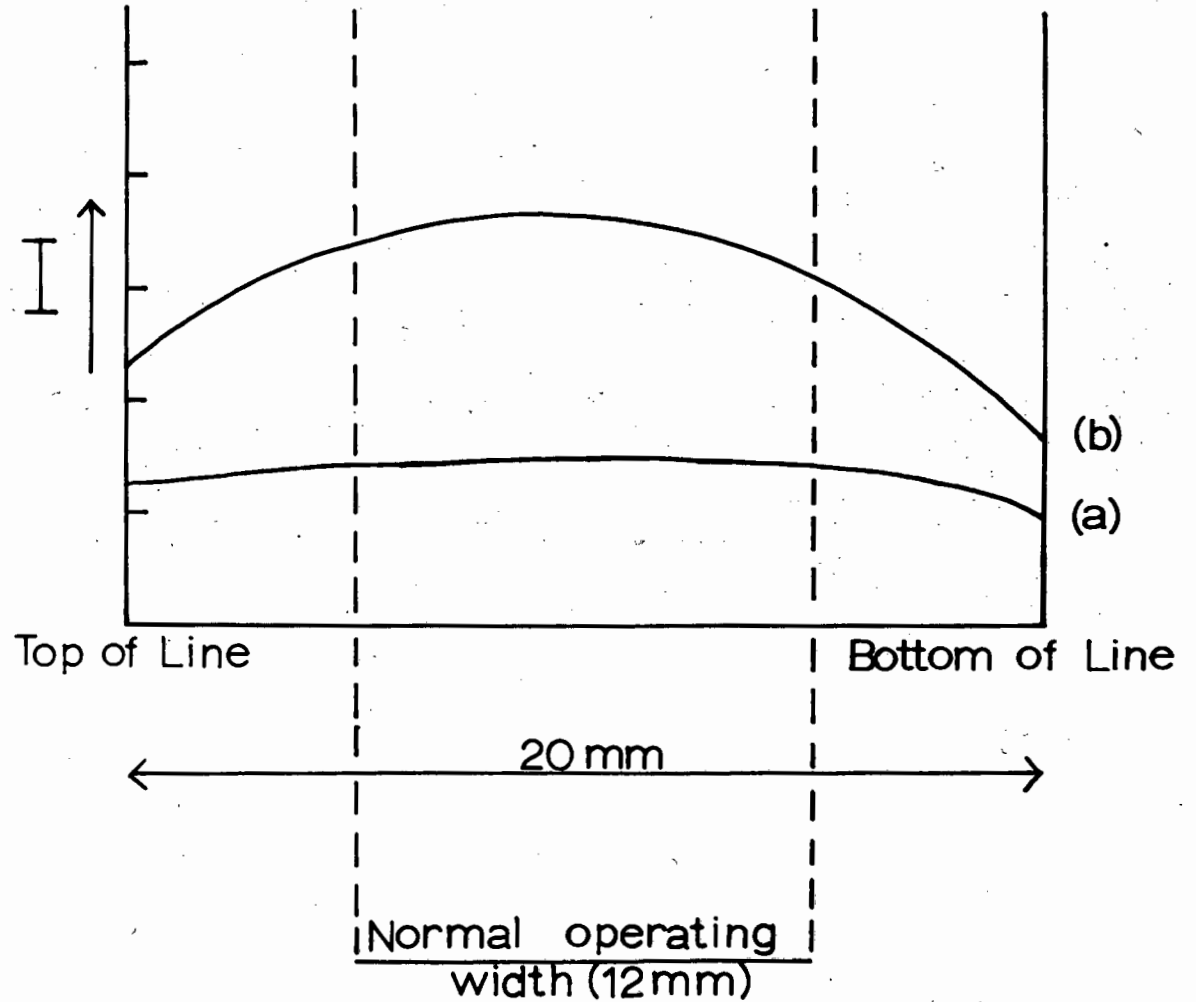
LATERAL VARIATION OF LINE INTENSITY

FIGURE 4

Lateral Variation of  
Line Intensity

(a) Lens System (i)

(b) Lens System (ii)



F I G U R E 5

MOVING PLATE STUDY FOR PURE SAMPLE

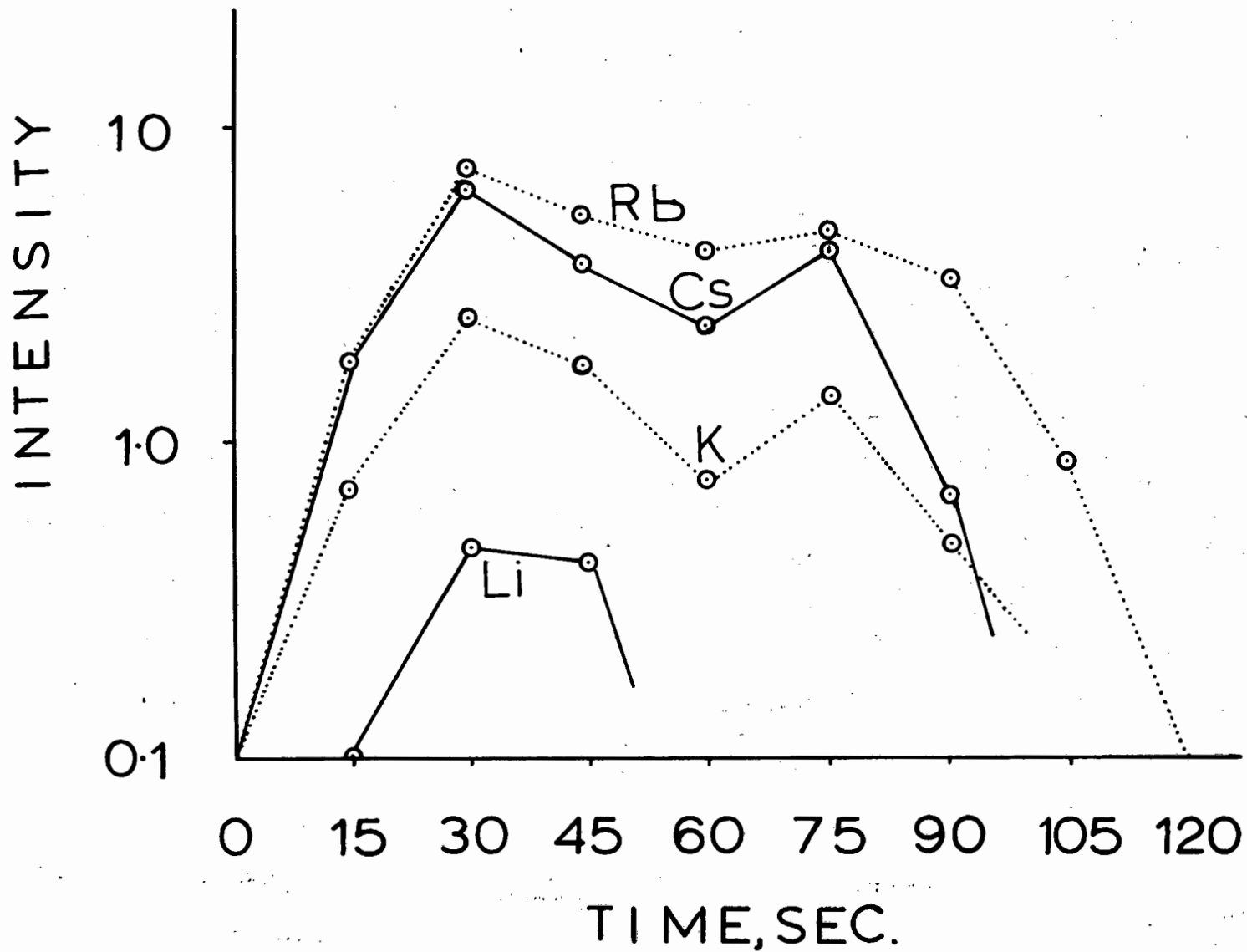


FIGURE 5. MOVING PLATE STUDY FOR PURE SAMPLE

FIGURE 6

MOVING PLATE STUDY FOR SAMPLE MIXED

WITH 20% CaF<sub>2</sub>

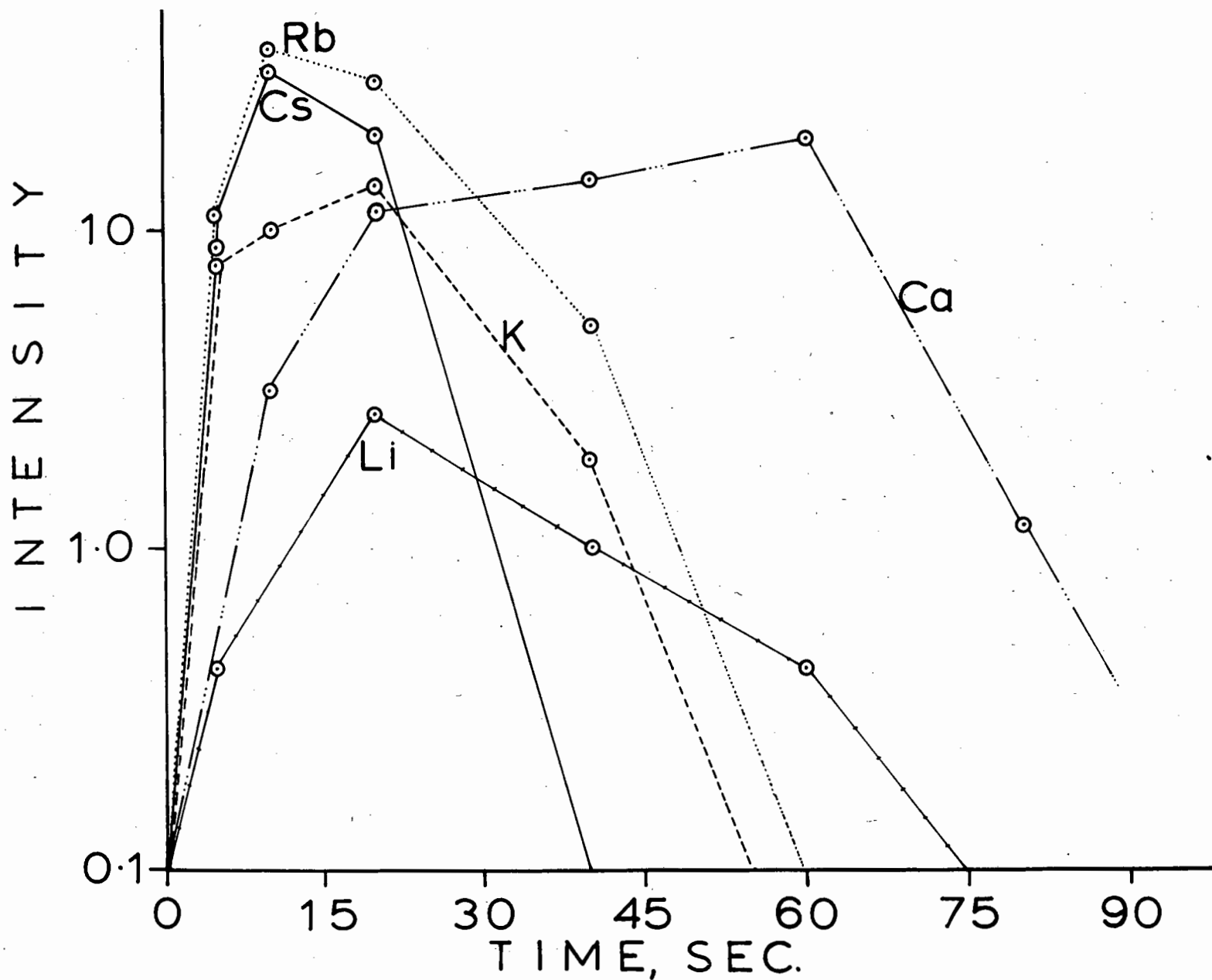


Figure 6. Moving plate study for sample mixed with 20%  $\text{CaF}_2$

FIGURE 7

ALKALI METAL LINE INTENSITY ENHANCEMENT

WITH ADDITION OF  $\text{CaF}_2$

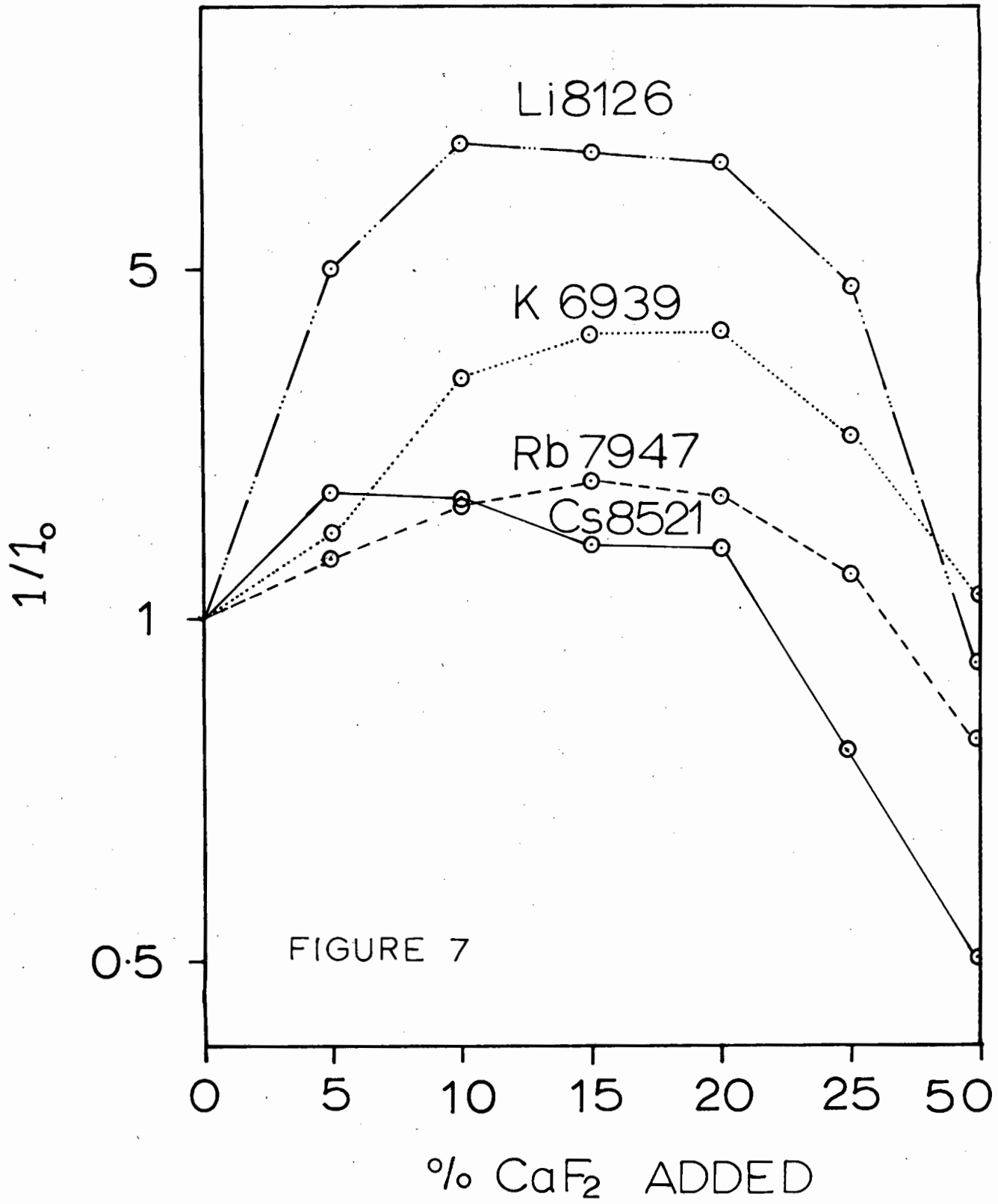


FIG. 8

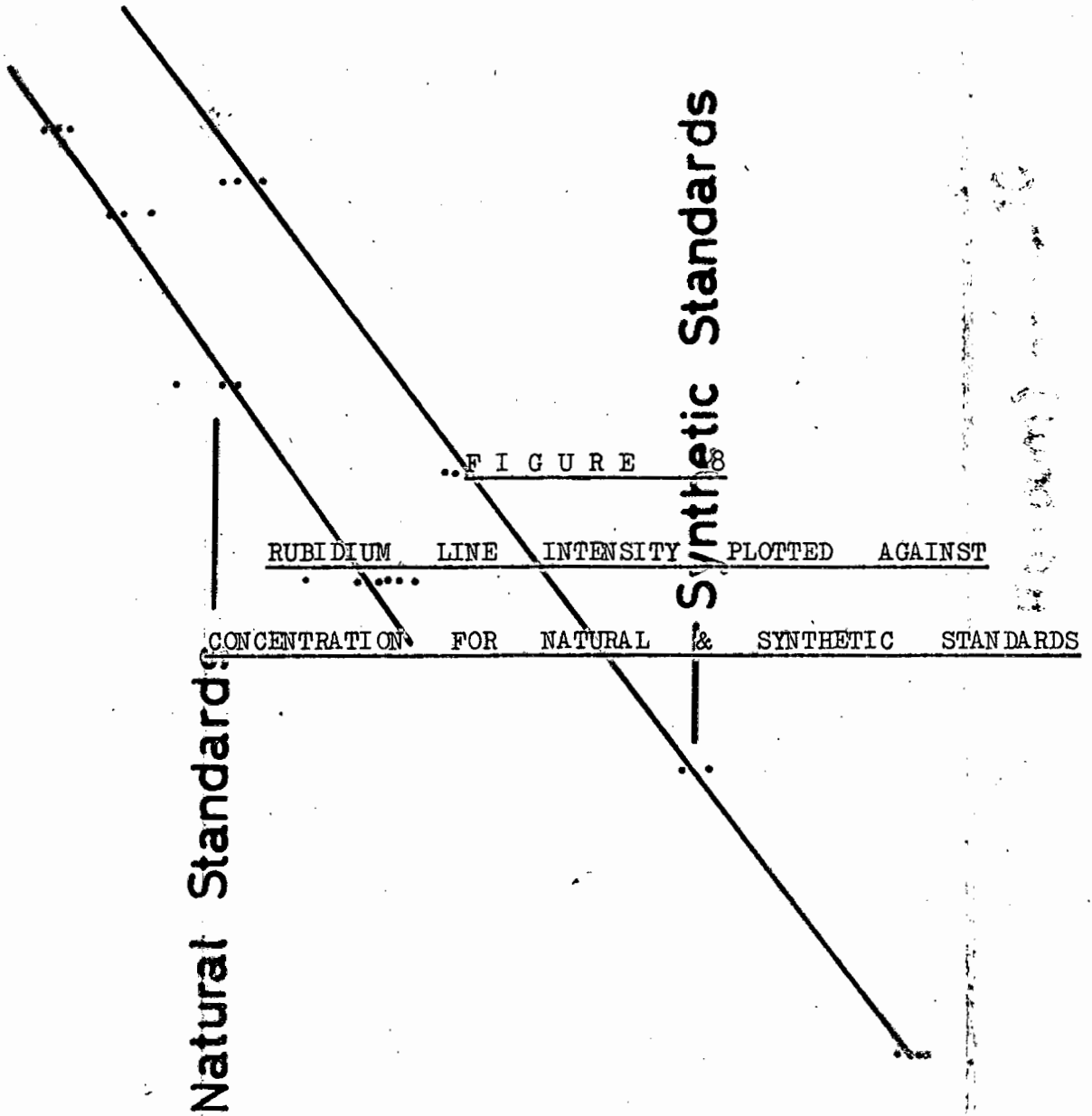


FIGURE 8

RUBIDIUM LINE INTENSITY PLOTTED AGAINST

CONCENTRATION FOR NATURAL & SYNTHETIC STANDARDS

← 7947 Intensity

F I G U R E 9

AVERAGE POTASSIUM CONTENT

AND

AVERAGE K/Rb RATIO FOR KIMBERLITES

FIGURE 9  
KIMBERLITE AVERAGES

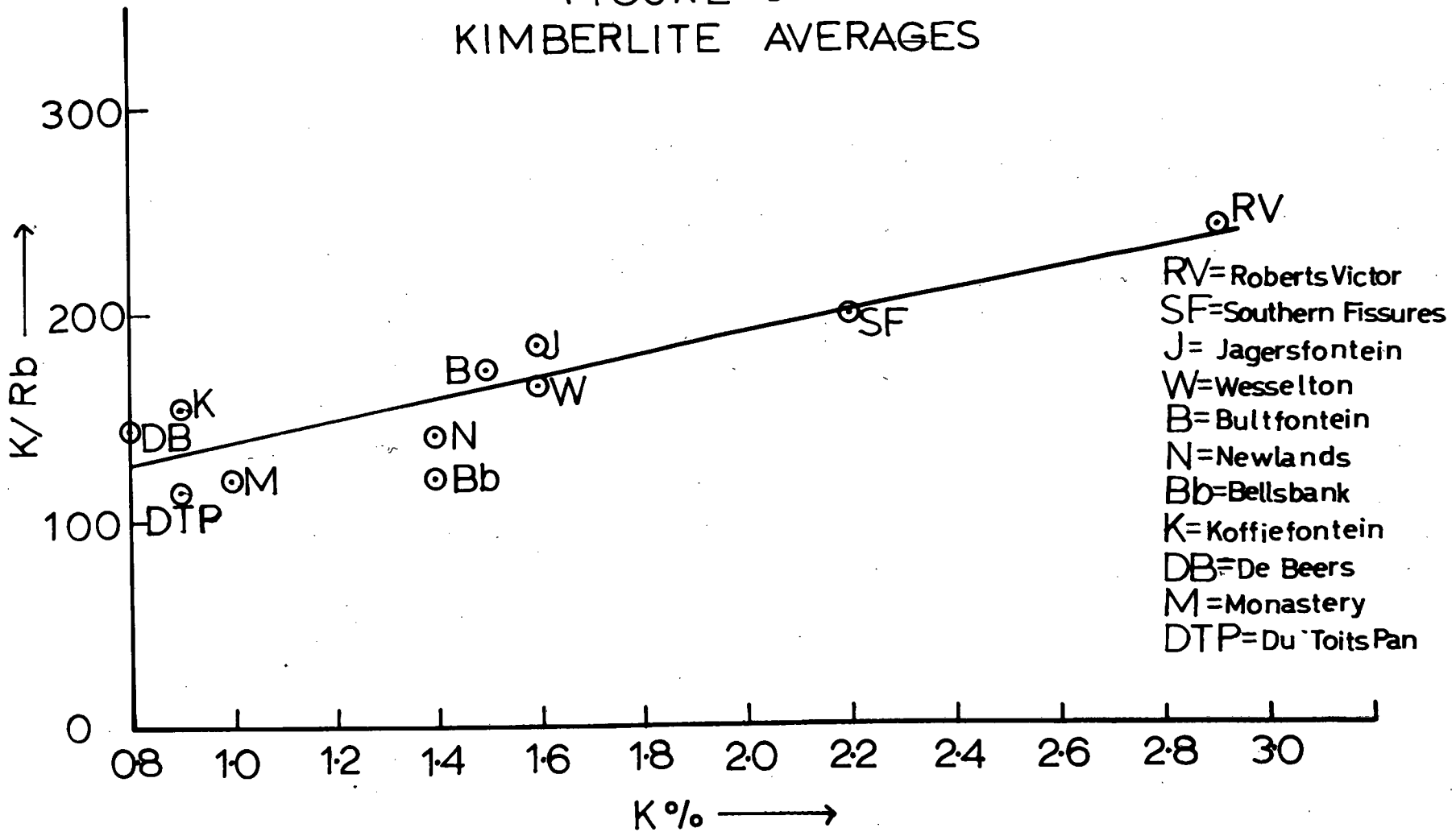


FIGURE 10

POTASSIUM IN PERIDOTITES

# POTASSIUM IN PERIDOTITES

## FIGURE 10

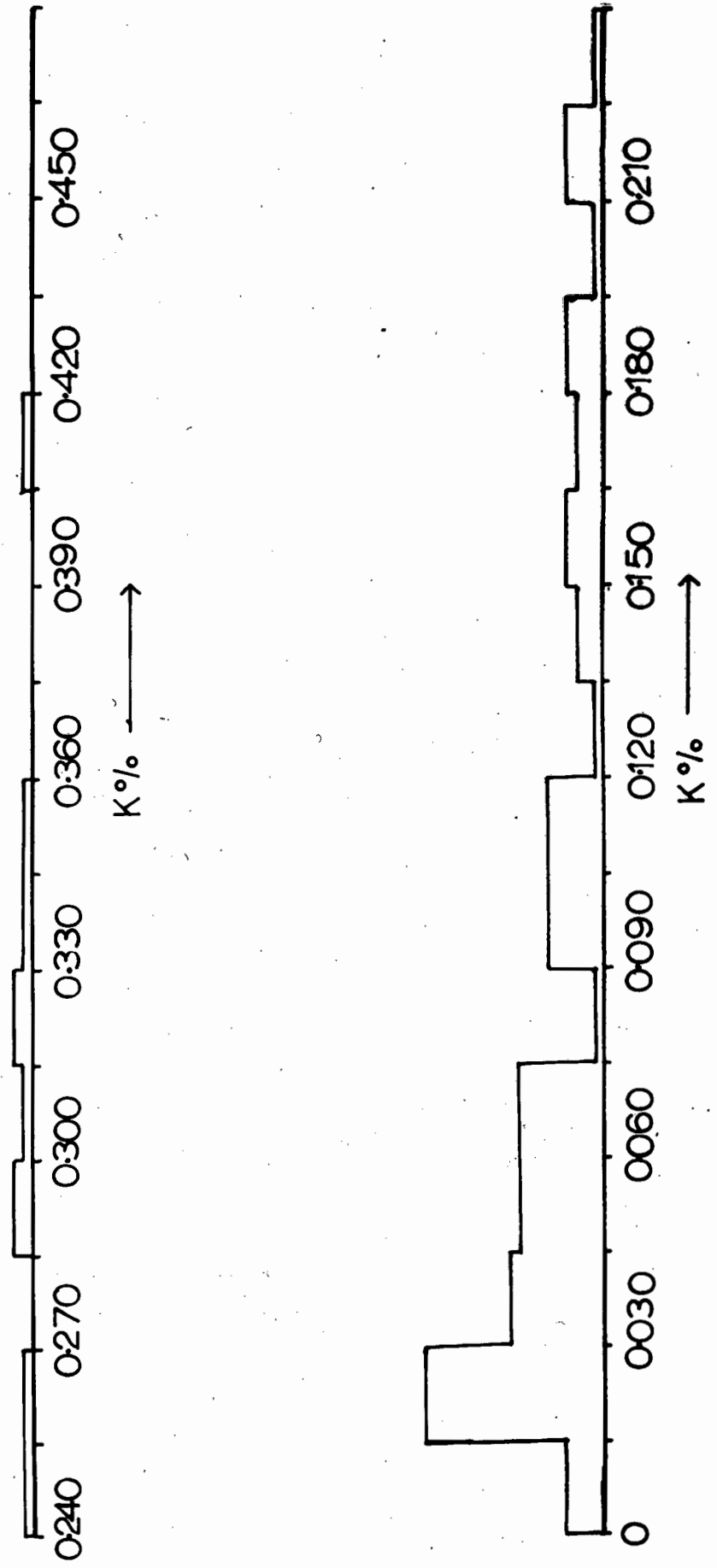


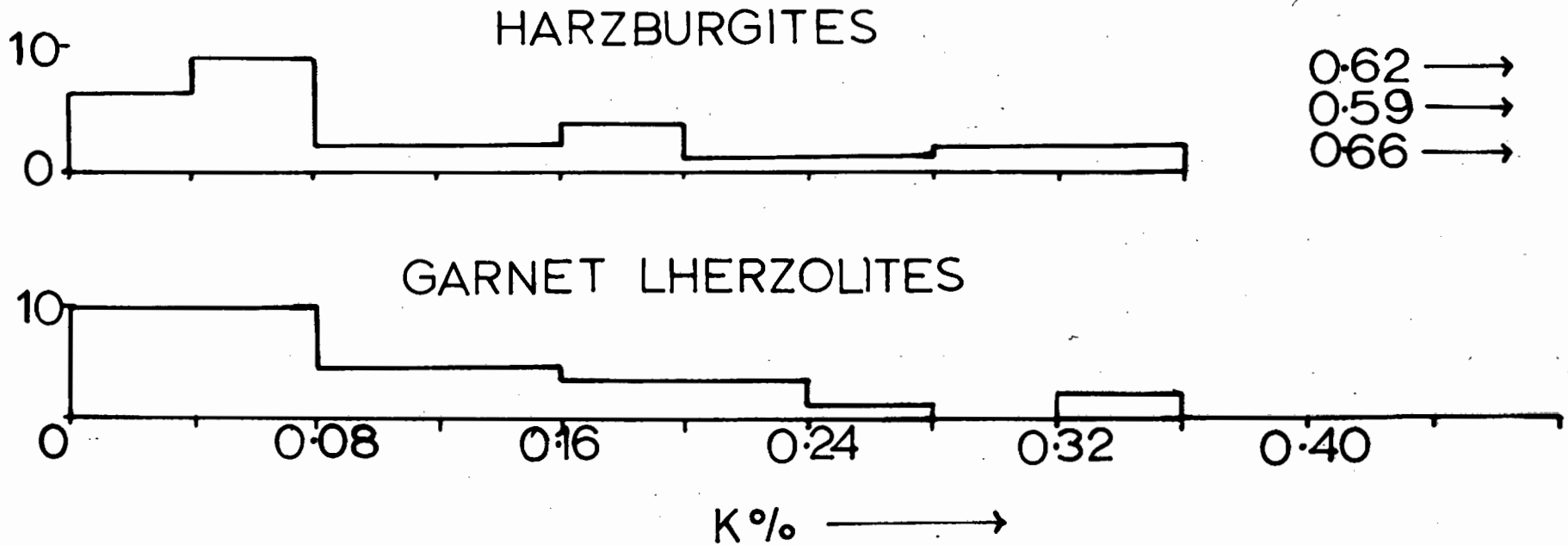
FIGURE 11

POTASSIUM IN GARNET LHERZOLITES

AND HARZBURGITES

FIGURE 11

POTASSIUM IN GARNET LHERZOLITES AND HARZBURGITES



F I G U R E 12

POTASSIUM AND PHLOGOPITE CONTENT OF

PERIDOTITES

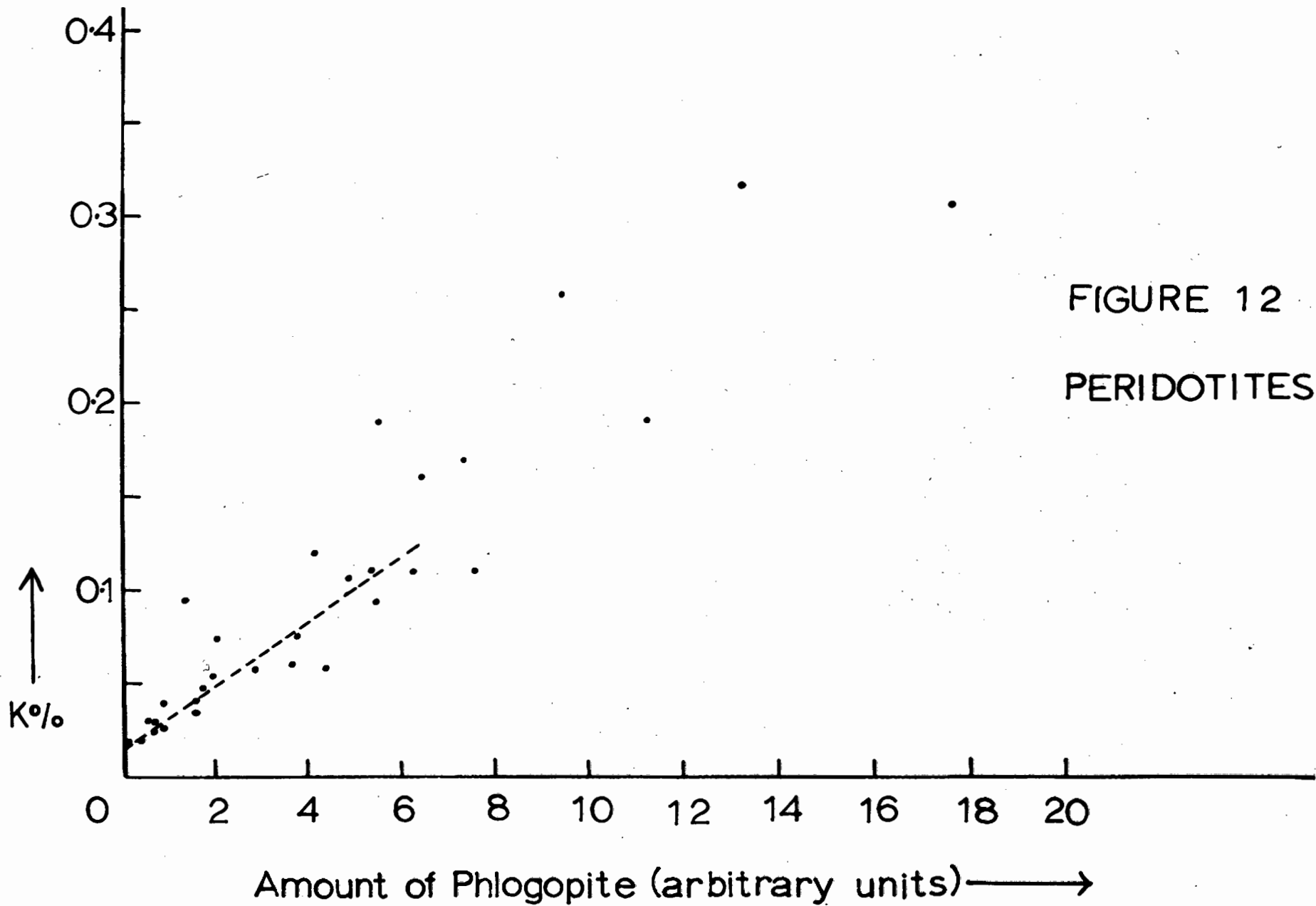


FIGURE 13

RELATIONSHIP BETWEEN THE AVERAGE

K/Rb RATIOS FOR KIMBERLITE AND PERIDOTITE

FROM THE SAME OCCURRENCE

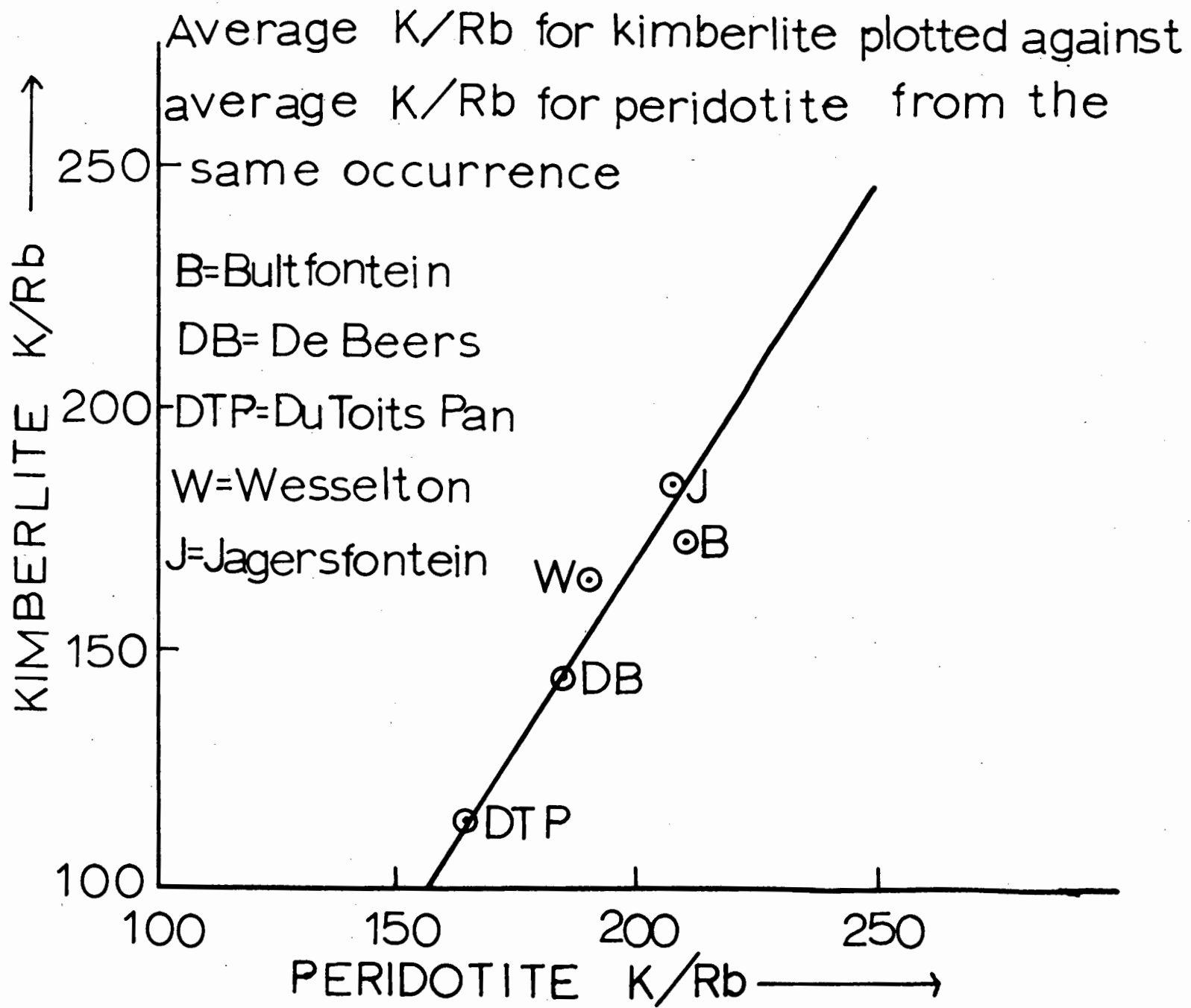


FIGURE 14

POTASSIUM AND RUBIDIUM IN ECLOGITES

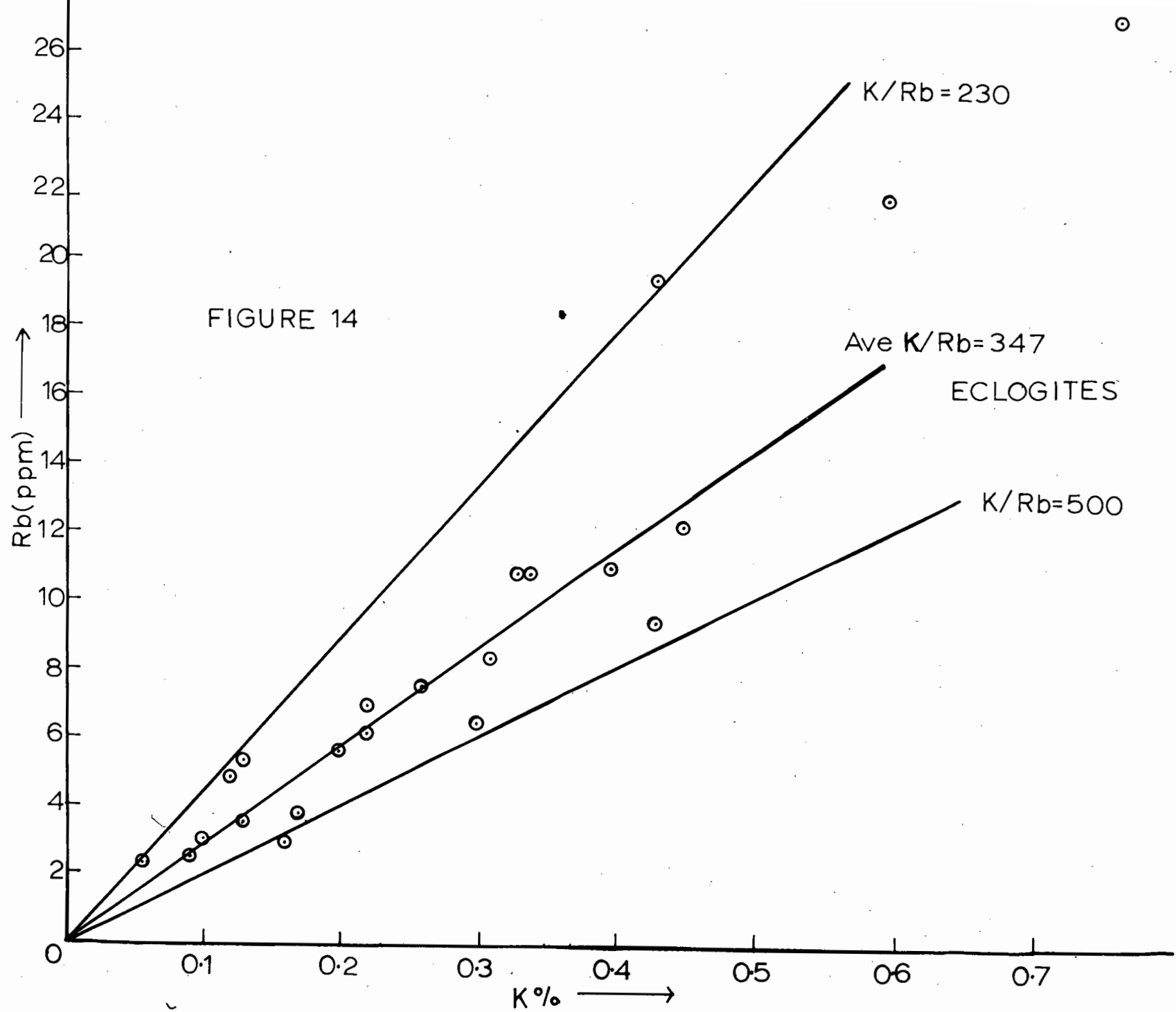
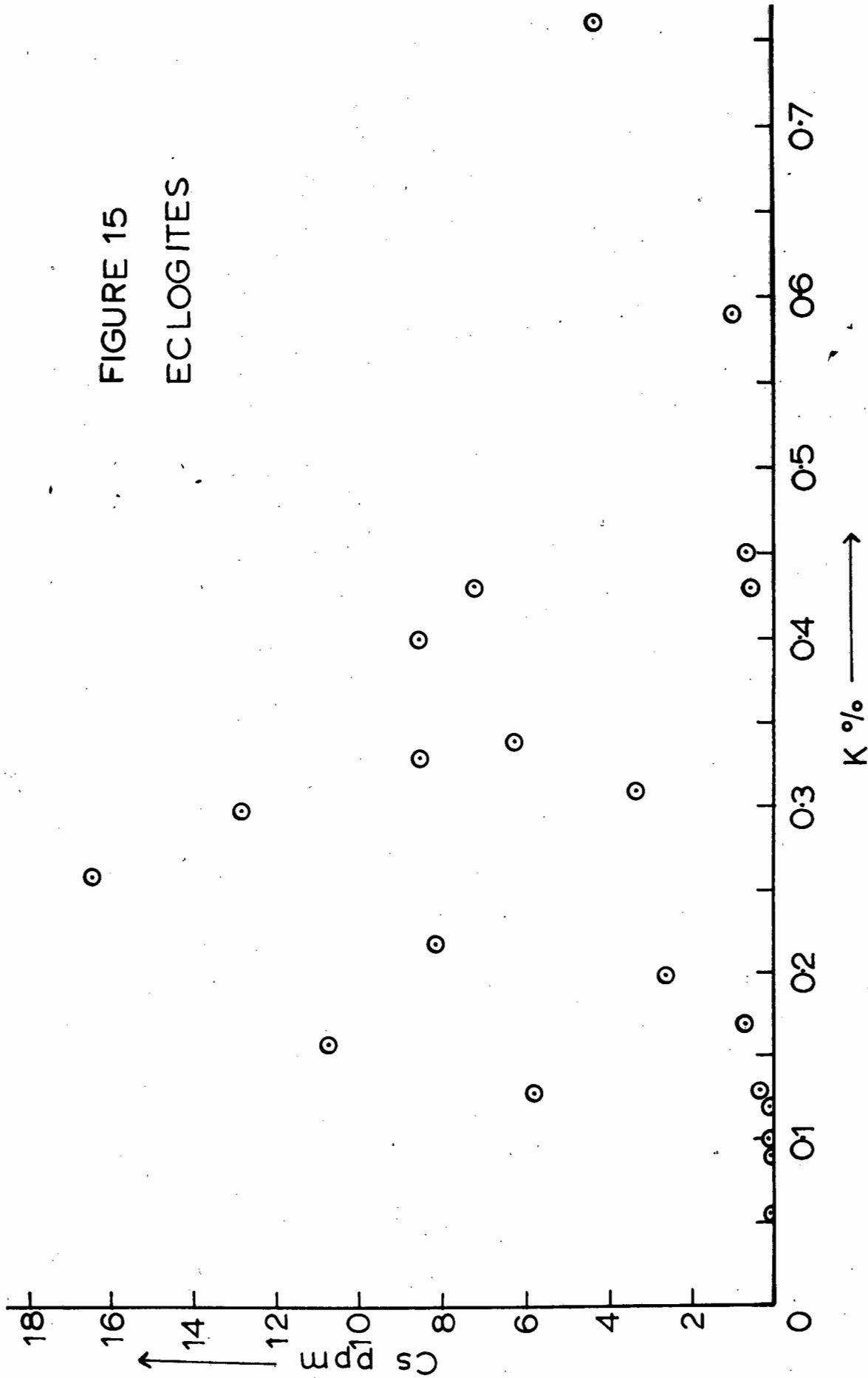


FIGURE 15

POTASSIUM AND CESIUM IN ECLOGITES

FIGURE 15  
ECLOGITES



F I G U R E 16

K/Rb AND K/Cs RATIOS FOR OLIVINE

MELILITITE FROM SUTHERLAND

FIGURE 16

MELILITITE BASALTS - SUTHERLAND OCCURRENCE  
PLOT OF K/Rb AGAINST K/Cs RATIOS

$$(K/Cs + 8000) = (K/Rb) \cdot 120$$

(Over the range  $K/Rb = 100-300$ )

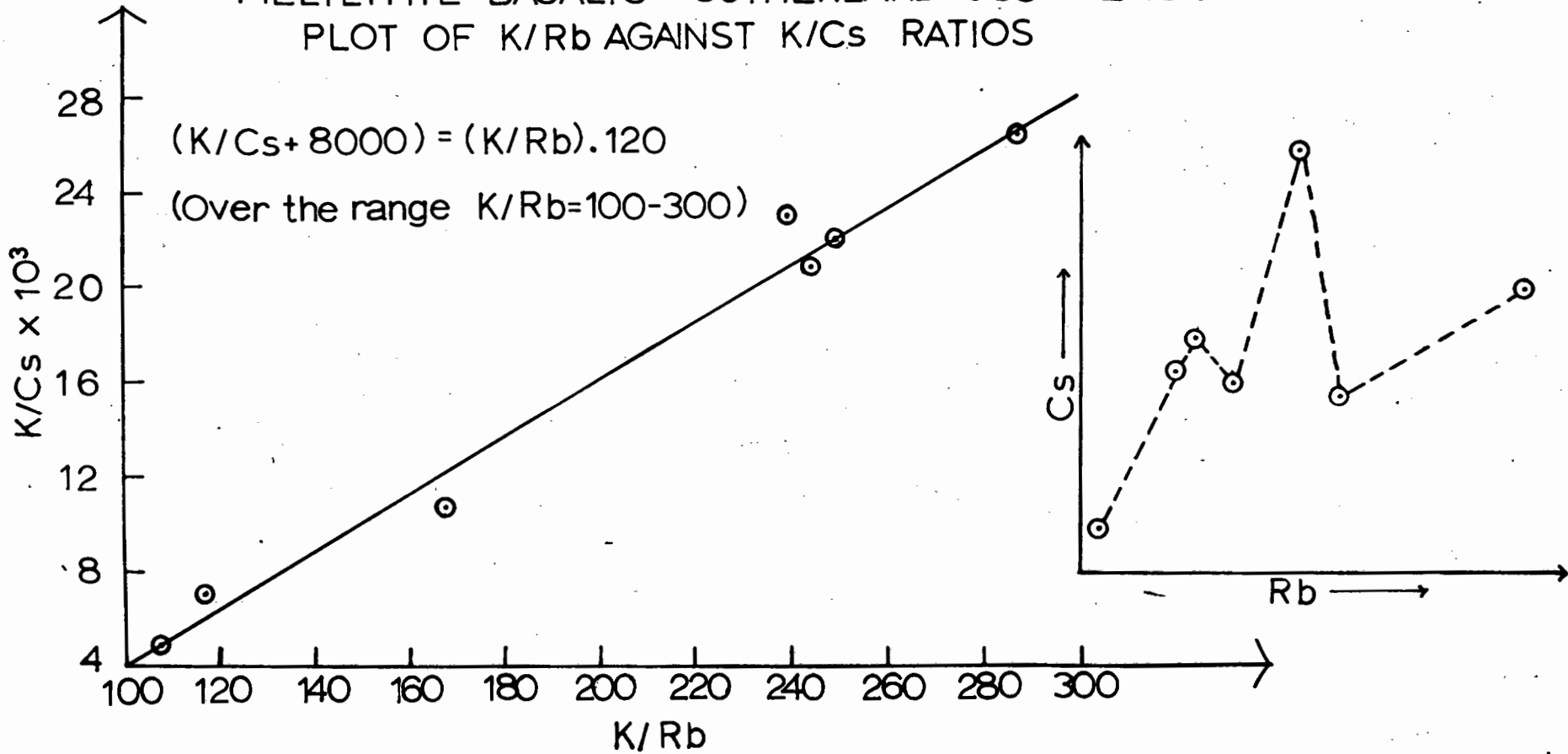


FIGURE 17

ELECTRON MICROPROBE SCAN ACROSS PORTION

OF RV 377

Electron microprobe manual scan.

Roberts Victor eclogite RV 377.

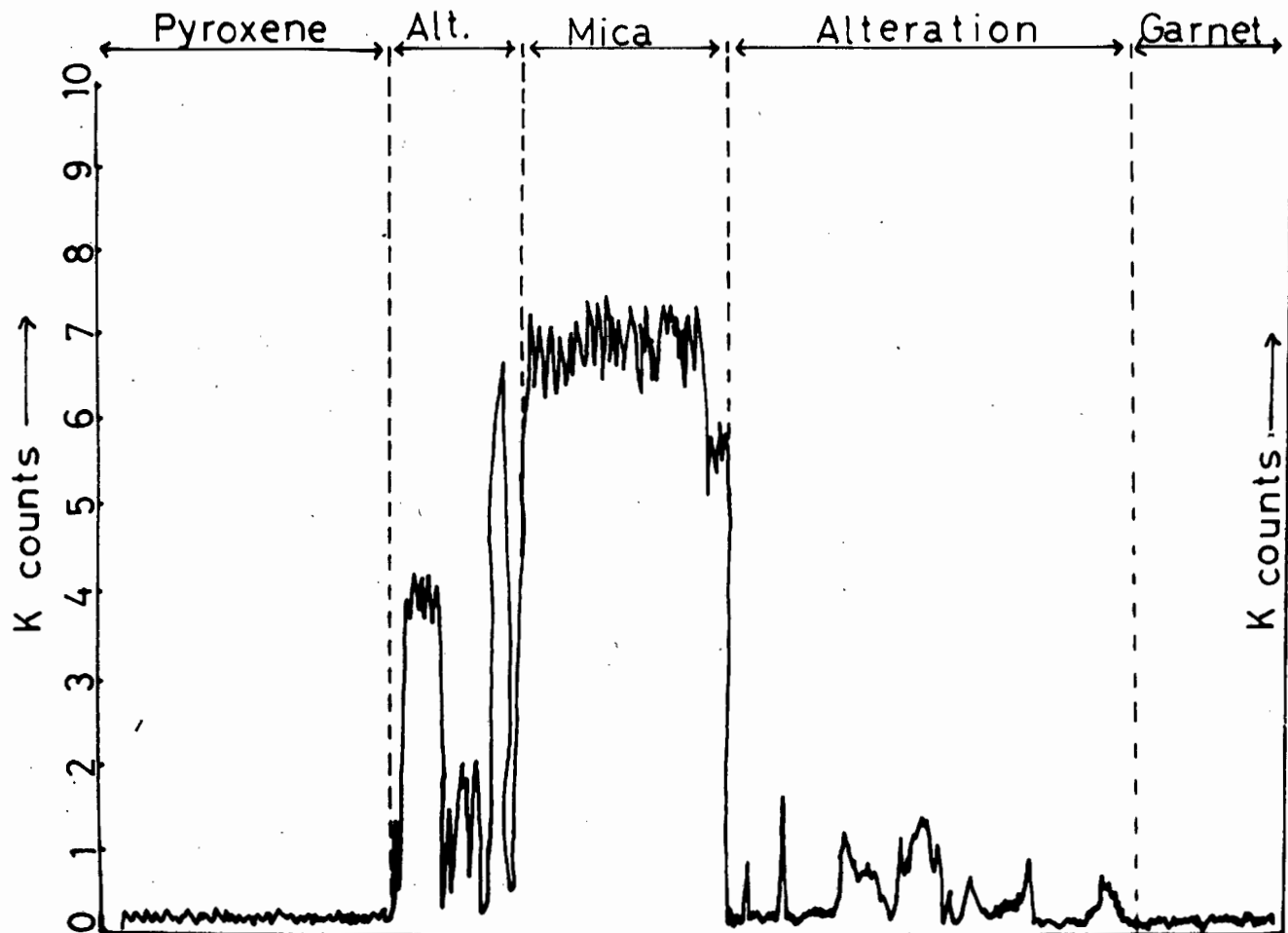


FIGURE 17

FIGURE 18

K/Cs RATIO AND POTASSIUM CONTENT OF

ECLOGITES

FIGURE 18

ECLOGITES

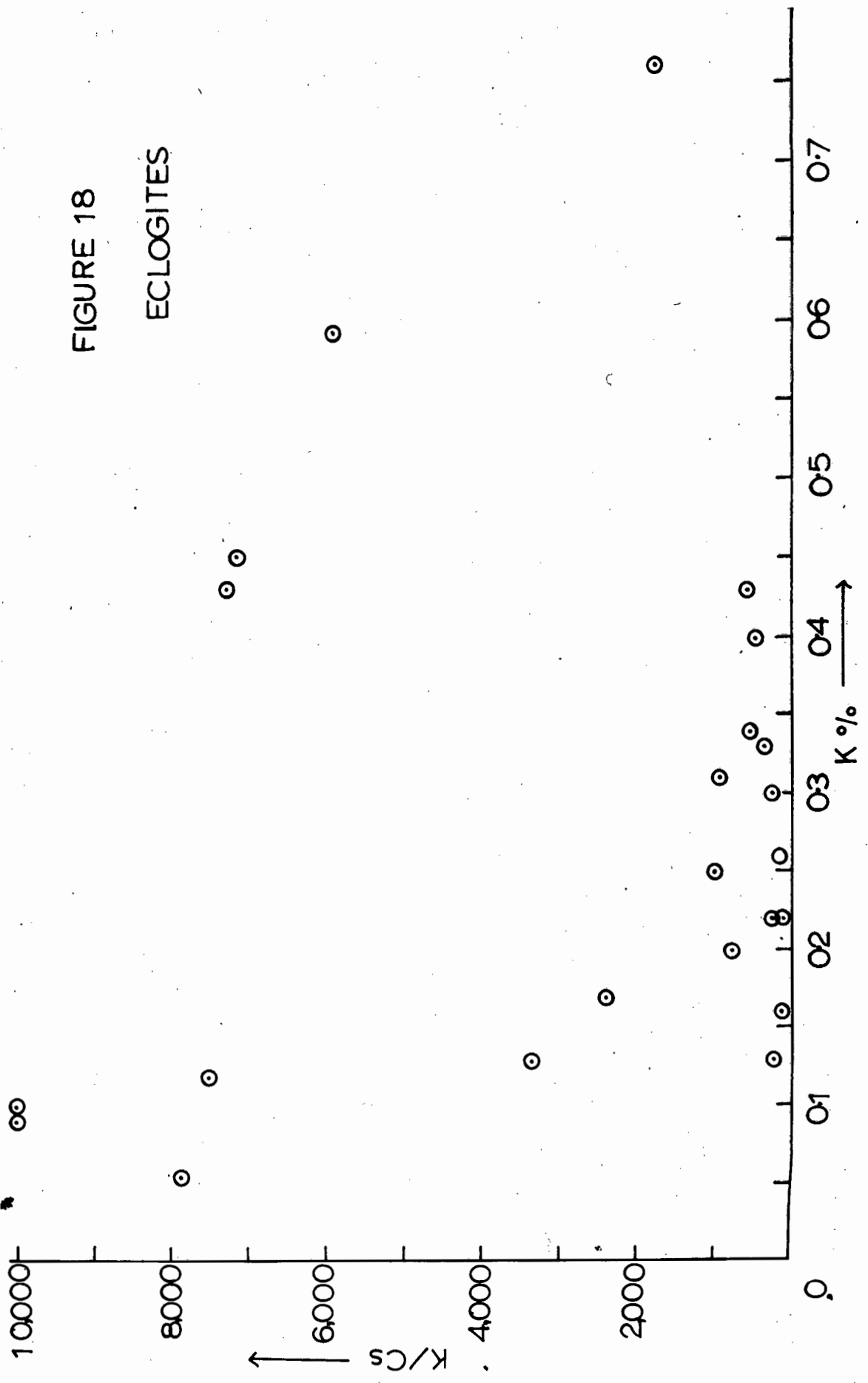


FIGURE 19

K/Rb RATIO AND POTASSIUM CONTENT

OF ECLOGITES

FIGURE 19

ECLOGITES

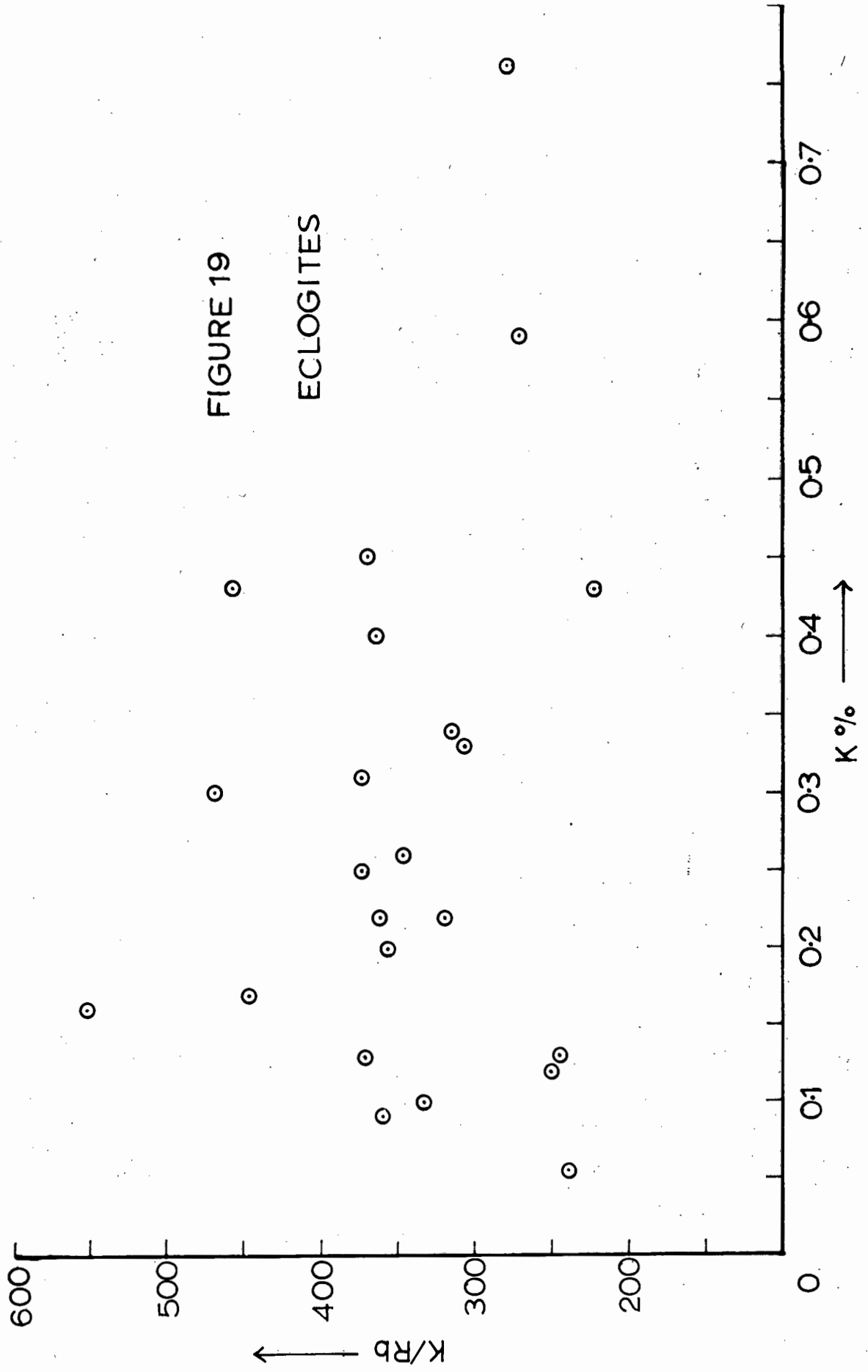


FIGURE 20

K/Rb RATIO AND THE POTASSIUM CONTENT

OF PERIDOTITES



FIGURE 21

ZINC CONTENT OF KIMBERLITES

# ZINC IN KIMBERLITES

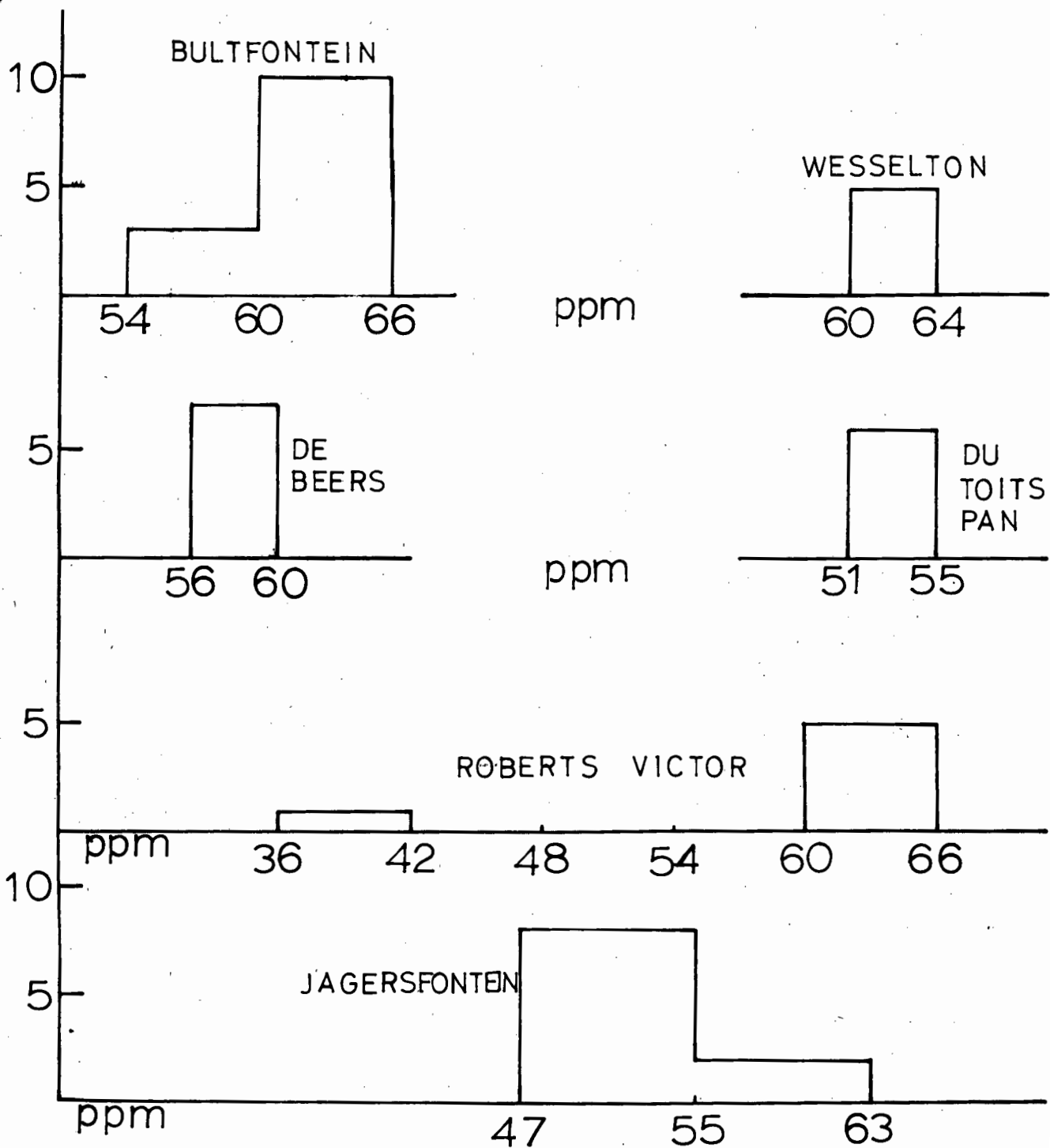


FIGURE 21

FIGURE 22

ZINC CONTENT OF KIMBERLITES, ECLOGITES

AND PERIDOTITES

# ZINC

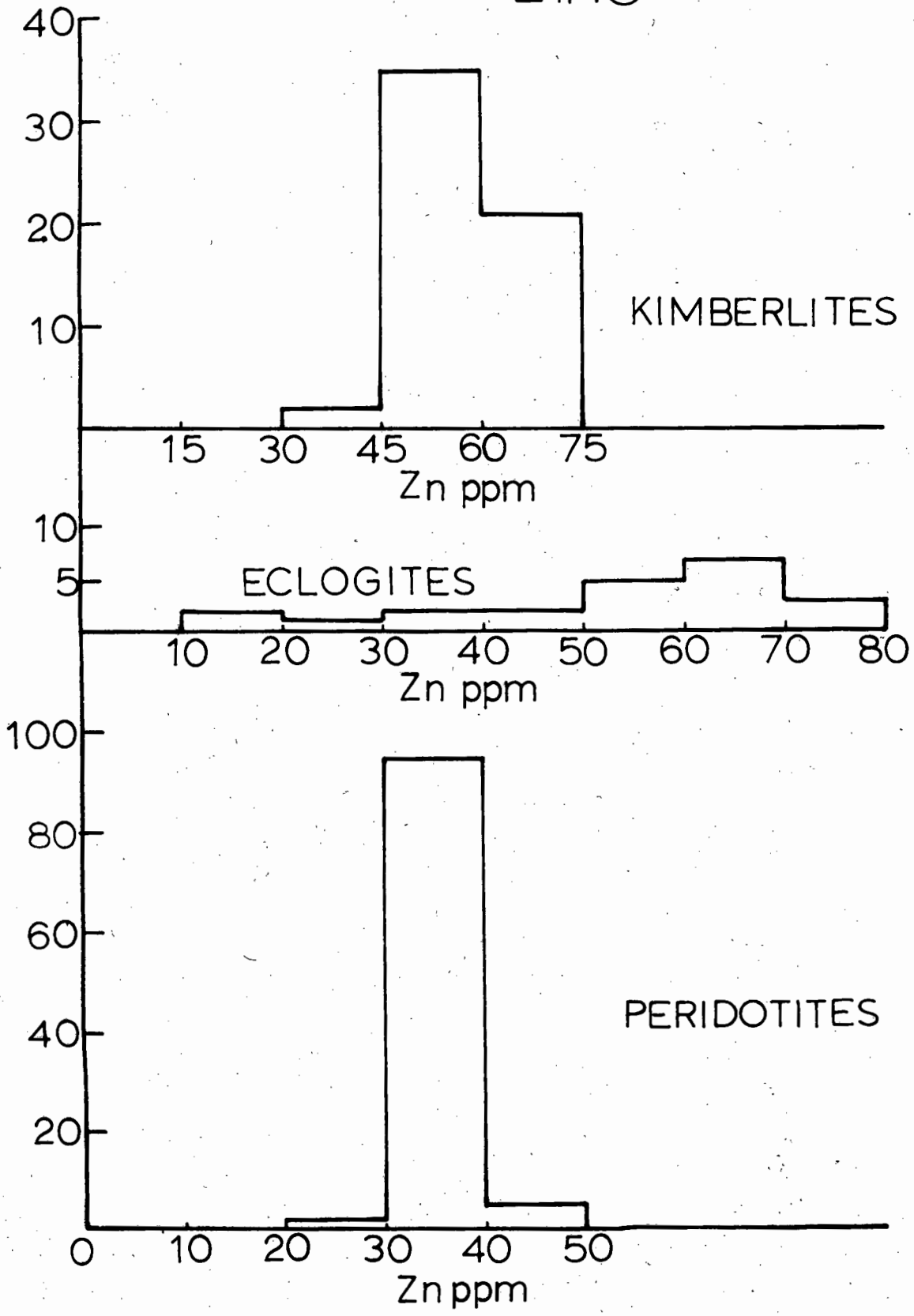


FIGURE 22