

Contents

List of Contributors	xi
Preface	xv
Acknowledgements	xvii
INTRODUCTION	
<i>P. H. Nixon</i>	1
Historical review	
<i>S. C. Bergman</i>	5
REGIONAL STUDIES	11
THE AMERICAN PLATES – Introduction	
<i>P. H. Nixon</i>	13
1. Greenland <i>B. H. Scott Smith</i>	23
2. Mantle-derived xenoliths in Canada <i>R. H. Mitchell</i>	33
3. Lithosphere of the continental United States: xenoliths in kimberlites and other alkaline magmas <i>D. H. Eggler, F. O. Dudas, B. C. Hearn, M. E. McCallum, E. S. McGee, H. O. A. Meyer, and D. J. Schulze</i>	41
4. A record of subduction processes and within-plate volcanism in lithospheric xenoliths of the southwestern USA <i>M. A. Menzies, R. J. Arculus, M. G. Best, S. C. Bergman, S. N. Ehrenberg, A. J. Irving, M. F. Roden, and D. J. Schulze.</i>	59
5. Mantle xenoliths in Mexico <i>J. J. Aranda-Gómez and F. Ortega-Gutiérrez</i>	75
6. Mantle xenoliths in South America <i>H. O. A. Meyer and D. P. Svisero</i>	85
EURASIAN PLATE (west) – Introduction	
<i>P. H. Nixon</i>	93
7. Scandinavia – the carbonatite connection <i>W. L. Griffin and P. Kresten</i>	101
8. The British Isles – a Palaeozoic mantle sample <i>R. H. Hunter and B. G. J. Upton</i>	107
9. Xenoliths in the Iberian Peninsula <i>E. Ancochea and P. H. Nixon</i>	119
10. Relationship between geochemistry and textural type in spinel lherzolites, Massif Central and Languedoc, France <i>H. Downes</i>	125
11. Italy: a review of xenolithic occurrences and their comparison with Alpine peridotites <i>L. Morten</i>	135
12. Central Europe <i>P. Jakeš and K. Vokurka</i>	149

EURASIAN PLATE (east) – Introduction	155
<i>P. H. Nixon</i>	
13. Xenoliths from the USSR and Mongolia: a selective and brief review	159
<i>N. V. Sobolev and P. H. Nixon</i>	
14. Mantle xenoliths and alkali-rich host rocks in eastern China	167
<i>Rong-Long Cao and Shou-Hua Zhu</i>	
15. Mantle xenoliths from kimberlites in China	181
<i>He Guan-Zhi</i>	
AFRICAN-ARABIAN PLATE – Introduction	187
<i>P. H. Nixon</i>	
16. Cenozoic volcanism associated with swells and rifts	195
<i>J. M. Dautria and M. Girod</i>	
17. Kimberlitic xenoliths and their cratonic setting	215
<i>P. H. Nixon</i>	
INDIAN-AUSTRALIAN AND ANTARCTIC PLATES – Introduction	241
<i>P. H. Nixon</i>	
18. Xenoliths in Proterozoic kimberlites from southern India: petrology and geophysical implications	249
<i>J. Ganguly and P. K. Bhattacharya</i>	
19. Eastern Australia – 4000 kilometres of mantle samples	267
<i>S. Y. O'Reilly and W. L. Griffin</i>	
20. Western Australia – xenoliths from kimberlites and lamproites	281
<i>P. H. Nixon, F. R. Boyd, and D. C. Lee</i>	
21. Ultramafic xenoliths in the late Cenozoic McMurdo Volcanic Group, western Ross Sea embayment, Antarctica	287
<i>P. R. Kyle, A. Wright, and I. Kirsch</i>	
THE PACIFIC PLATE AND ADJOINING REGIONS – Introduction	295
<i>P. H. Nixon</i>	
22. Arc and back-arc xenoliths in Kurile-Kamchatka and western Alaska	303
<i>S. E. Swanson, S. M. Kay, M. Brearley, and C. M. Scarfe</i>	
23. Japanese Island arc: xenoliths in alkali basalts, high-alumina basalts, and calc-alkaline andesites and dacites	319
<i>K. Aoki</i>	
24. Ontong Java Plateau: deep-seated xenoliths from thick oceanic lithosphere	335
<i>P. H. Nixon and C. R. Neal</i>	
25. Mantle xenoliths from the New Zealand region	347
<i>A. Reay and P. P. Sipiera</i>	
26. Xenoliths associated with the Hawaiian Hot Spot	359
<i>G. Sen</i>	
PRINCIPLES, PROCESSES, and SPECIAL STUDIES	377
Introduction	
<i>P. H. Nixon</i>	379
27. Thermobarometry for garnet peridotites: basis for the determination of thermal and compositional structure of the upper mantle	381
<i>A. A. Finnerty and F. R. Boyd</i>	

28. High- and low-temperature garnet peridotite xenoliths and their possible relation to the lithosphere–asthenosphere boundary beneath southern Africa <i>F. R. Boyd</i>	403
29. The composition of the lower crust and the nature of the continental Moho – xenolith evidence <i>W. L. Griffin and S. Y. O'Reilly</i>	413
MANTLE MAGMAS AND OTHER PRODUCTS	431
30. Megacrysts from alkalic volcanic rocks <i>D. J. Schulze</i>	433
31. Roberts Victor eclogites and their relation to the mantle <i>C. J. Hatton and J. J. Gurney</i>	453
32. The MARID suite of xenoliths in kimberlite: relationship to veined and metasomatised peridotite xenoliths <i>J. B. Dawson</i>	465
THE DIAMOND ASSOCIATION	475
33. Recent physical, chemical, and isotopic research of diamond <i>J. W. Harris</i>	477
34. Inclusions in diamond <i>H. O. A. Meyer</i>	501
35. Harzburgites with garnets of diamond facies from southern African kimberlites <i>P. H. Nixon, P. W. C. van Calsteren, F. R. Boyd, and C. J. Hawkesworth</i>	523
MICROSTRUCTURES AND MINERAL COMPOSITIONS IN PERIDOTITE XENOLITHS	535
36. Textural studies of garnet lherzolites: evidence of exsolution origin from high-temperature harzburgites <i>K. G. Cox, M. R. Smith, and S. Beswetherick</i>	537
37. Compositional heterogeneities in a high-temperature lherzolite nodule and implications for mantle processes <i>D. Smith and F. R. Boyd</i>	551
38. Peridotite xenoliths in Massif Central basalts, France: textural and geophysical evidence for asthenospheric diapirism <i>A. Nicolas, F. Lucazeau, and R. Bayer</i>	563
MANTLE PROPERTIES AND EXPERIMENTAL STUDIES	575
39. Magnetic properties of mantle xenoliths and the magnetic character of the crust–mantle boundary <i>P. J. Wasilewski</i>	577
40. Oxidation state of the upper mantle: present conditions, evolution, and controls <i>R. J. Arculus and J. W. Delano</i>	589
41. Mantle xenoliths: melting and dissolution studies under volatile-free conditions <i>C. M. Scarfe and M. Brearley</i>	599
42. Metasomatism and fluid generation in mantle xenoliths <i>P. J. Wyllie</i>	609
THE EFFECTS OF ENRICHMENT, INCLUDING METASOMATISM	623
43. Metasomatic events recorded in mantle xenoliths: an overview <i>B. Harte</i>	625
44. Regional K-metasomatism in the mantle beneath the west branch of the East African Rift: alkali clinopyroxenite xenoliths in highly potassic magmas <i>F. E. Lloyd, P. H. Nixon, G. Hornung, and E. Condiliffe</i>	641
45. Volatile-rich mantle beneath eastern Australia <i>S. Y. O'Reilly</i>	661

46. Metasomatic mineral titanates in upper mantle xenoliths <i>S. E. Haggerty</i>	671
47. Fluid inclusions in mantle xenoliths <i>J. D. Pasteris</i>	691
MANTLE EVOLUTION: CHEMICAL AND ISOTOPIC EVIDENCE	709
48. Strontium and neodymium isotopic and rare earth element evidence for the genesis of megacrysts in kimberlites of southern Africa <i>R. A. Jones</i>	711
49. Upper mantle processes and composition <i>M. A. Menzies and C. J. Hawkesworth</i>	725
MANTLE STRUCTURE AND PROCESSES	739
50. Mantle xenolith perspectives <i>P. H. Nixon and G. R. Davies</i>	741
Abbreviations and symbols	757
Glossary of terms used in this book	761
References	765
Index	837