

*developments in economic geology*

**13**

# **conceptual models in exploration geochemistry, 4**

**compilers and editors  
C.R.M. Butt and R.E. Smith**



*special publication no.8*

**elsevier scientific publishing company**

Developments in Economic Geology, 13

# **conceptual models in exploration geochemistry, 4**

**Australia**

Association of Exploration Geochemists  
Special Publication No. 8

Further titles in this series

1. *I.L. ELLIOTT and W.K. FLETCHER (Editors)*  
GEOCHEMICAL EXPLORATION 1974
2. *P.M.D. BRADSHAW (Editor)*  
CONCEPTUAL MODELS IN EXPLORATION GEOCHEMISTRY  
*The Canadian Cordillera and Canadian Shield*
3. *G.J.S. GOVETT and M.H. GOVETT (Editors)*  
WORLD MINERAL SUPPLIES  
*Assessment and Perspective*
4. *R.T. SHUEY*  
SEMICONDUCTING ORE MINERALS
5. *J.S. SUMNER*  
PRINCIPLES OF INDUCED POLARIZATION FOR GEOPHYSICAL  
EXPLORATION
6. *R.A. RICH, H.D. HOLLAND and U. PETERSEN*  
HYDROTHERMAL URANIUM DEPOSITS
7. *J.G. MORSE (Editor)*  
NUCLEAR METHODS IN MINERAL EXPLORATION AND  
PRODUCTION
8. *M. KUZVART and M. BÖHMER*  
PROSPECTING AND EXPLORATION FOR MINERAL DEPOSITS
9. *C.R.M. BUTT and I.G.P. WILDING (Editors)*  
GEOCHEMICAL EXPLORATION 1976
10. *G.B. FETTWEIS*  
WORLD COAL RESOURCES  
*Methods of Assessment and Results*
11. *R.G. TAYLOR*  
GEOLOGY OF TIN DEPOSITS
12. *H.K. GUPTA*  
GEOTHERMAL RESOURCES  
*An Energy Alternative*

DEVELOPMENTS IN ECONOMIC GEOLOGY, 13

# conceptual models in exploration geochemistry, 4

AUSTRALIA

Compiled and Edited by

**C.R.M. Butt**

*CSIRO, Division of Mineralogy, Wembley, W.A.*

and

**R.E. Smith**

*CSIRO, Division of Mineralogy, Wembley, W.A.*

Association of Exploration Geochemists Special Publication No. 8

reprinted from the *Journal of Geochemical Exploration*, Volume 12 No. 2/3



ELSEVIER SCIENTIFIC PUBLISHING COMPANY  
Amsterdam — Oxford — New York

1980

ELSEVIER SCIENTIFIC PUBLISHING COMPANY  
335 Jan van Galenstraat  
P.O. Box 211, 1000 AE Amsterdam, The Netherlands

*Distributors for the United States and Canada:*

ELSEVIER/NORTH-HOLLAND INC.  
52, Vanderbilt Avenue  
New York, N.Y. 10017

ISBN 0-444-41902-0 (Vol. 13)  
ISBN 0-444-41250-6 (Series)

© Elsevier Scientific Publishing Company, 1980.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written permission of the publisher, Elsevier Scientific Publishing Company, P.O. Box 330, 1000 AH Amsterdam, The Netherlands.

Printed in The Netherlands

## FOREWORD

This is the fourth in a series of special "Conceptual Models" volumes on exploration geochemistry. The first volume on the Canadian Cordillera and the Canadian Shield and the second volume on Norden concern themselves primarily with temperate glaciated environments. The third volume on the Basin and Range Province of the Western United States and Northern Mexico was the first one in this series to consider arid environments. The current volume on Australia provides an important expansion of the work started by the first three volumes. First of all, this volume is the first one on any aspect of the Southern Hemisphere and for that reason alone is to be welcomed. Secondly, it provides a better description and documentation of the effects of surface oxidation and weathering as it affects the use of geochemistry than is available anywhere else. Thirdly, the aspects of relief and of stripping of the weathered profile are treated in more detail than any of the previous volumes. As such this volume provides an important contribution to this series.

The purpose of these "Conceptual Models" volumes has been detailed in previous issues. Stated briefly, it is an attempt to give a complete overview of all aspects of exploration geochemistry for a given area or region and to describe the uses of geochemistry in a series of simplified models. In addition conclusions are given as to whether exploration geochemistry will not work using available technology, as well as where it will. It is customary practice to publish only successful case histories and it is generally only in a volume such as this negative examples, which are quite as important to the exploration geologists as positive examples, are readily published.

The editors and compilers of this volume have collected a very significant amount of original material and integrated it with available information from the literature. This has resulted in a very complete volume which has provided a very compact and successful summary of exploration geochemical conditions in Australia.

P.M.D. BRADSHAW  
Chairman, Case History Committee  
Association of Exploration Geochemists

## COMPILERS

The construction of the Idealized Models (Section D) and the compilation of the Case Histories (Section E) was the responsibility of the following:

C.R.M. Butt, CSIRO, Perth, W.A. (Co-editor).  
 R. Cox, Placer Exploration Ltd., Sydney, N.S.W.  
 R. Davy, Geological Survey of Western Australia, Perth, W.A.  
 B.L. Farrell, Australian Anglo American Ltd., Melbourne, Vic.  
 J.F. Gilfillan, J.F. Gilfillan and Associates Pty. Ltd., Sydney, N.S.W.  
 J.J. Hobbs, Geological Survey of N.S.W., Sydney, N.S.W.  
 A.S. Joyce, Queensland Institute of Technology, Brisbane, Qld.  
 N.J. Marshall, N.J. Marshall and Associates, Sydney, N.S.W.  
 R.H. Mazzucchelli, Western Mining Corp. Ltd., Perth, W.A.  
 P.G. Moeskops, AMDEL, Adelaide, S.A.  
 W.R. Ryall, CSIRO, Sydney, N.S.W. (Convener, Sydney Committee).  
 R.E. Smith, CSIRO, Perth, W.A. (Co-editor).  
 G.F. Taylor, CSIRO, Sydney, N.S.W.  
 K.R. Walker, Bureau of Mineral Resources, Geology and Geophysics, Canberra, A.C.T.  
 L.N. Wall, Carpentaria Exploration Company Limited, Brisbane, Qld.  
 B.K. Welch, Layton and Associates, Perth, W.A.  
 B.T. Williams, Geopeko Limited, Sydney, N.S.W.  
 J.R. Wilmshurst, CSIRO, Sydney, N.S.W.

## ACKNOWLEDGEMENTS

The preparation of this volume has involved the participation of numerous compilers and authors from the exploration industry, tertiary institutions and state and federal government organisations over a two and a half year period. Acknowledgement is due to the employers of the Compilers of the issue for their permission to participate in the project and the Compilers are indebted to many of their colleagues for their assistance. We particularly wish to thank the Australian Mineral Industries Research Association Ltd. for their support, which allowed the employment of Rhonda Puddey who drafted all illustrations, under the general supervision of Colin Steel. The authors of the various articles are thanked for generously acceding to the considerable editorial interference necessary to conform with the format and space limitations of the compilation. Drafts of the whole manuscript were rapidly and most accurately typed by Cheryl Harris. Parts of the text were reviewed by H.M. Churchward, G.M. Dimmock, J. Gentili and E.H. Nickel. Finally, the editors acknowledge the substantial commitment to the project of the facilities and resources of the Division of Mineralogy, CSIRO Institute of Earth Resources.

C.R.M. BUTT and R.E. SMITH  
 (Editors)

## CONTENTS

|                                                                                                                         |        |
|-------------------------------------------------------------------------------------------------------------------------|--------|
| Foreword. . . . .                                                                                                       | V      |
| Compilers . . . . .                                                                                                     | VI     |
| Acknowledgements . . . . .                                                                                              | VI     |
| <br>Section A. Introduction . . . . .                                                                                   | <br>1  |
| (W.R. Ryall, C.R.M. Butt and R.E. Smith)                                                                                |        |
| Objectives . . . . .                                                                                                    | 1      |
| Scope . . . . .                                                                                                         | 2      |
| Format . . . . .                                                                                                        | 2      |
| <br>Section B. Regional features . . . . .                                                                              | <br>5  |
| 1. Introduction: Tectonism, morphogenic provinces and relief. . . . .                                                   | 5      |
| 2. Weathering history and landform development . . . . .                                                                | 6      |
| (J.A. Mabbutt)                                                                                                          |        |
| Introduction. . . . .                                                                                                   | 6      |
| Kaolinitic profiles and ferruginous duricrusts . . . . .                                                                | 6      |
| Age and periodicity of deep kaolinization and associated ferruginization . . . . .                                      | 11     |
| Environmental associations and controls . . . . .                                                                       | 12     |
| Siliceous weathering crusts and silicified horizons . . . . .                                                           | 13     |
| Younger weathering crusts and indurated horizons without deep profiles . . . . .                                        | 16     |
| 3. Erosion and drainage development . . . . .                                                                           | 17     |
| Erosion . . . . .                                                                                                       | 17     |
| Drainage . . . . .                                                                                                      | 19     |
| 4. Soils . . . . .                                                                                                      | 20     |
| 5. Climate . . . . .                                                                                                    | 21     |
| 6. Vegetation . . . . .                                                                                                 | 24     |
| <br>Section C. Elements and sample media used in geochemical exploration: Definitions,<br>descriptions and use. . . . . | <br>27 |
| Elements and element mobilities . . . . .                                                                               | 27     |
| Ironstones . . . . .                                                                                                    | 28     |
| (G.F. Taylor, J.R. Wilmshurst, C.R.M. Butt and R.E. Smith)                                                              |        |
| Gossans . . . . .                                                                                                       | 30     |
| (G.F. Taylor, J.R. Wilmshurst, C.R.M. Butt and R.E. Smith)                                                              |        |
| Weathered bedrock . . . . .                                                                                             | 32     |
| (C.R.M. Butt)                                                                                                           |        |
| Soils . . . . .                                                                                                         | 36     |
| (N.J. Marshall)                                                                                                         |        |
| Transported overburden . . . . .                                                                                        | 39     |
| (N.J. Marshall)                                                                                                         |        |
| Stream sediments . . . . .                                                                                              | 41     |
| (R. Davy, A.R. Rossiter and L.N. Wall)                                                                                  |        |

# VIII

|                                                                                    |     |
|------------------------------------------------------------------------------------|-----|
| Waters . . . . .                                                                   | 43  |
| (A.W. Mann)                                                                        |     |
| Plants . . . . .                                                                   | 46  |
| (R. Davy and W.R. Ryall)                                                           |     |
| Atmospheres . . . . .                                                              | 47  |
| (R. Davy and W.R. Ryall)                                                           |     |
| <b>Section D. Idealized models.</b> . . . .                                        | 49  |
| Model classification . . . . .                                                     | 49  |
| Complete weathered bedrock profile. . . . .                                        | 51  |
| Landform situation A: Complete weathered profile, low relief . . . . .             | 51  |
| Landform situation B: Complete weathered profile, moderate relief . . . . .        | 54  |
| Landform situation C: Complete weathered profile, high relief. . . . .             | 56  |
| Partly stripped weathered bedrock profile . . . . .                                | 56  |
| Landform situation D: Partly stripped profile, low relief. . . . .                 | 56  |
| Landform situation E: Partly stripped profile, moderate relief . . . . .           | 59  |
| Landform situation F: Partly stripped profile, high relief . . . . .               | 62  |
| Fresh bedrock. . . . .                                                             | 64  |
| Landform situation G: Fresh bedrock, low relief . . . . .                          | 64  |
| Landform situation H: Fresh bedrock, moderate relief . . . . .                     | 65  |
| Landform situation I: Fresh bedrock, high relief . . . . .                         | 67  |
| Model for calcrete uranium mineralization . . . . .                                | 68  |
| (R.L. Deutscher, A.W. Mann and C.R.M. Butt)                                        |     |
| <b>Section E. Case histories.</b> . . . .                                          | 73  |
| Introduction. . . . .                                                              | 73  |
| Archaean regional geology and mineralization. . . . .                              | 75  |
| (R.H. Mazzucchelli and B.T. Williams)                                              |     |
| 1. Mons Cupri Cu-Pb-Zn-Ag deposit, Pilbara Block, W.A. . . . .                     | 78  |
| (M.E. Smith)                                                                       |     |
| 2. Carnilya Hill Ni-mineralization, Yilgarn Block, W.A.. . . .                     | 81  |
| (C.D. Arndt)                                                                       |     |
| 3. Duketon massive Zn (Pb) mineralization, Yilgarn Block, W.A. . . . .             | 84  |
| (A.J. Bell)                                                                        |     |
| 4. Forrestania Ni deposits, Yilgarn Block, W.A.. . . .                             | 88  |
| (M.D. Leggo and K.G. McKay)                                                        |     |
| 5. Jubilee Ag-Zn prospect, Yilgarn Block, W.A.. . . .                              | 94  |
| (S. El-Raghy)                                                                      |     |
| 6. Mt. Windarra Ni deposit, Yilgarn Block, W.A. . . . .                            | 96  |
| (B.H. Smith, C.T. Reddell and J.H. Cleghorn)                                       |     |
| 7. Yilgarn gold deposits, Eastern Goldfields Province, W.A.. . . .                 | 100 |
| (R.H. Mazzucchelli and C.H. James)                                                 |     |
| 8. Golden Grove Cu-Zn deposit, Yilgarn Block, W.A.. . . .                          | 105 |
| (R.E. Smith, K.M. Frater and P.G. Moeskops)                                        |     |
| Proterozoic regional geology and mineralization . . . . .                          | 110 |
| (B.T. Williams and K.R. Walker)                                                    |     |
| 9. Northern Yorke Peninsula Cu, Gawler Block, S.A. . . . .                         | 113 |
| (R.H. Mazzucchelli, B.E.E. Chapple and J.E. Lynch)                                 |     |
| 10. Trace metal content of ironstones, Tennant Creek Au-Cu mineral field, N.T. . . | 117 |
| (S.E. Smith)                                                                       |     |
| 11. Regional geochemical stream sediment survey, Halls Creek Province, W.A. . . .  | 121 |
| (R. Halligan and J.L. Harris)                                                      |     |
| 12. Bow River Cu-Ni deposit, Halls Creek Province, W.A.. . . .                     | 124 |
| (R. Halligan and J.L. Harris)                                                      |     |

|                                                                                                   |     |
|---------------------------------------------------------------------------------------------------|-----|
| 13. Ilmars Cu-Zn-Pb deposit, Halls Creek Province, W.A. . . . .                                   | 127 |
| (R. Halligan and J.L. Harris)                                                                     |     |
| 14. Corkwood Cu-Ni prospect, Halls Creek Province, W.A. . . . .                                   | 130 |
| (I.G.P. Wilding)                                                                                  |     |
| 15. Pentecost Sandstone Cu mineralization, Menuairs Dome area, Halls Creek Province, W.A. . . . . | 134 |
| (D.B. Orr and I.G.P. Wilding)                                                                     |     |
| 16. The Mary River Zn- Pb gossan, Pine Creek Block, N.T. . . . .                                  | 137 |
| (M.R. Daly, J.W. Shields and J.L. Willis)                                                         |     |
| 17. Ranger One U deposits, Pine Creek Block, N.T. . . . .                                         | 140 |
| (G.S. Eupene and B.T. Williams)                                                                   |     |
| 18. The Woodcutters L5 Pb-Zn prospect, Pine Creek Block, N.T. . . . .                             | 143 |
| (A. Taube)                                                                                        |     |
| 19. Warburton Range Cu prospects, Musgrave Block, W.A. . . . .                                    | 146 |
| (R.H. Mazzucchelli)                                                                               |     |
| 20. Galena Hill Pb-Zn prospect, Willyama Block, N.S.W. . . . .                                    | 149 |
| (G.D. Klingner, A.P. Fail and I.K. Simon)                                                         |     |
| 21. McArthur River Pb-Zn deposit, McArthur Basin, N.T. . . . .                                    | 153 |
| (A.D. Haldane)                                                                                    |     |
| 22. Una May U prospect, McArthur Basin, N.T. . . . .                                              | 157 |
| (A.G. Rossiter)                                                                                   |     |
| 23. The Cloncurry 8 Cu anomaly, Mt. Isa Belt, Qld. . . . .                                        | 159 |
| (A.G. Rossiter)                                                                                   |     |
| 24. Esperanza Z2 Cu deposit, Mt. Isa Belt, Qld. . . . .                                           | 163 |
| (M.J. Hunter)                                                                                     |     |
| 25. The Pegmont Pb-Zn deposit, Mt. Isa Belt, Qld. . . . .                                         | 166 |
| (G.R. Orridge)                                                                                    |     |
| 26. Squirrel Hills Zn-mineralization, Mt. Isa Belt, Qld. . . . .                                  | 169 |
| (B. Nisbet and P. Joyce)                                                                          |     |
| 27. Ti Tree Well Pb-Zn pseudogossan, Bangemall Basin, W.A. . . . .                                | 174 |
| (R.E. Smith and P.G. Moeskops)                                                                    |     |
| Phanerozoic regional geology and mineralization . . . . .                                         | 178 |
| (A.S. Joyce and W.R. Ryall)                                                                       |     |
| 28. Beltana and Aroona Zn deposits, Adelaide Geosyncline, S.A. . . . .                            | 182 |
| (P.G. Moeskops and A.H. White)                                                                    |     |
| 29. Ediacara Pb-(Zn)-(Cu) deposit, Adelaide Geosyncline, S.A. . . . .                             | 185 |
| (P.G. Moeskops and A.H. White)                                                                    |     |
| 30. Dewrang Pb prospect, Kanmantoo Group, Kangaroo Is., S.A. . . . .                              | 189 |
| (B.R. Boyd)                                                                                       |     |
| 31. Pinnacles Cu-Pb-Zn prospect, Dundas Trough, Tasmania . . . . .                                | 191 |
| (B.L. Farrell and D.B. Orr)                                                                       |     |
| 32. Que River Zn-Pb deposit, Dundas Trough, Tasmania . . . . .                                    | 194 |
| (E.H. Skey and C.H. Young)                                                                        |     |
| 33. Cleveland Sn-Cu deposit, Dundas Trough, Western Tasmania . . . . .                            | 201 |
| (D.M. Ransom and R.V. Sale)                                                                       |     |
| 34. Mt. Lindsay Sn prospect, Dundas Trough, Tasmania. . . . .                                     | 203 |
| (A.F. Ross and R.R. Schellekens)                                                                  |     |
| 35. Bold Head scheelite deposit, Tasman Fold Belt System, King Island, Tasmania .                 | 207 |
| (M.C. Rogers)                                                                                     |     |
| 36. Mount Moliagul Mo prospect, West Victorian Trough, Vic. . . . .                               | 210 |
| (D.A. McKenzie)                                                                                   |     |
| 37. Costerfield Au-Sb prospect, Melbourne Trough, Vic. . . . .                                    | 214 |
| (M. Hill)                                                                                         |     |
| 38. The Pipeline Ridge Cu-Pb-Zn-Ag prospect, Mineral Hill Synclinal Zone, N.S.W.                  | 217 |
| (B. Leeson)                                                                                       |     |
| 39. Sunday Creek Cu prospect, Molong-South Coast Anticlinorial Zone, Vic. . . . .                 | 219 |
| (P.J. O'Shea)                                                                                     |     |

|                                                                                       |     |
|---------------------------------------------------------------------------------------|-----|
| 40. Basin Creek Cu-Zn prospect, Bogan Gate Synclinal Zone, N.S.W. . . . .             | 222 |
| (J.E. Nethery)                                                                        |     |
| 41. Limekilns Zn-Pb-Cu deposit, Captains Flat-Goulburn Synclinal Zone, N.S.W. . . . . | 225 |
| (J.E. Nethery)                                                                        |     |
| 42. Lowe's Claim (Mo), Woolomin-Texas Block, N.S.W. . . . .                           | 228 |
| (Staff Australian Oil & Gas Corporation Limited)                                      |     |
| 43. Khan's Creek Cu-Pb-Zn prospect, Nambucca Block, N.S.W. . . . .                    | 230 |
| (C. Palethorpe)                                                                       |     |
| 44. Tartana Cu deposit, Hodgkinson Basin, Qld. . . . .                                | 232 |
| (R.J. Rawlins)                                                                        |     |
| 45. Jubilee Plunger Au deposit, Georgetown Inlier, Qld. . . . .                       | 234 |
| (A.G. Rossiter)                                                                       |     |
| 46. The Ajax Cu-Zn-Ag prospect, Yarrol Basin, Qld. . . . .                            | 237 |
| (R.R. Large)                                                                          |     |
| 47. Mount Cannindah porphyry-Cu deposit, Yarrol Basin, Qld. . . . .                   | 241 |
| (R.J. Fletcher)                                                                       |     |
| 48. Chinaman Creek Cu prospect, Yarrol Basin, Qld. . . . .                            | 245 |
| (F.W. Cook)                                                                           |     |
| 49. Langdon Au-Pb-Zn prospect, South Coastal Structural High, Qld. . . . .            | 248 |
| (B.L. Farrell)                                                                        |     |
| 50. Chedda Cliffs Pb-Zn-Cu mineralization, Lennard Shelf, W.A. . . . .                | 252 |
| (R.J. Fletcher)                                                                       |     |
| 51. Lake Austin U prospect, Murchison Region, W.A. . . . .                            | 257 |
| (A.G. Heath, R.L. Deutscher and C.R.M. Butt)                                          |     |
| 52. Yeelirrie calcrete uranium deposit Murchison Region, W.A. . . . .                 | 260 |
| (E. Cameron, R.H. Mazzucchelli and T.W. Robbins)                                      |     |
| Cross reference table . . . . .                                                       | 264 |
| Section F. References. . . . .                                                        | 265 |

## Section A

### INTRODUCTION

W.R. RYALL, C.R.M. BUTT and R.E. SMITH

#### OBJECTIVES

This is the fourth volume of the series "Conceptual Models in Exploration Geochemistry", following those for the Canadian Cordillera and Canadian Shield (Bradshaw, 1975), Norden (Kauranne, 1976) and the Basin and Range Province of the Western United States and Northern Mexico (Lovering and McCarthy, 1978). The objectives of this issue are similar to its predecessors, namely to develop a series of idealized models that illustrate the nature of the expression of mineralization in the secondary environment and outline the processes and mechanisms that have given rise to such an expression. The presentation of the models adheres strongly to the principles of landscape geochemistry as outlined by Fortescue (1975). Unlike the areas previously considered, however, much of the geochemical expression is the result of dispersion dating from previous weathering episodes. Consequently, much emphasis has been placed on the nature of those episodes and of the resultant zone of weathering, and on the constraints these apply to effective exploration in these terrains.

At present, mineral exploration in Australia is proceeding rapidly and the high potential for additional discoveries will ensure continued active exploration. Whereas, in the past, the discovery of nearly all significant precious metal, base metal and uranium deposits has resulted from recognition of prominent surface expressions, future discoveries will be far more difficult. Geochemical techniques can be confidently expected to play a larger role in exploration but the target deposits will have increasingly subtle surface signatures which may be difficult to distinguish from background.

In the planning stage of an exploration programme, consideration should be given not only to the geological aspects of the mineralization sought but also to those aspects of the secondary environment that place constraints on the type, magnitude and extent of the geochemical anomalies that can be expected. It is intended that the idealized models, which embody such considerations, will assist in the design of appropriate exploration procedures and will permit the selection of the most rewarding sampling and interpretational strategies.

## SCOPE

The present issue only provides an overview of the status of geochemical exploration in Australia. In general, insufficient is known about the geochemistry of the complex weathering history of most of the country and a more detailed treatment of particular models is not yet feasible. The issue concentrates on exploration for base and precious metals and uranium. Primary dispersion haloes are considered only in so far as they provide an enlarged target for dispersion in the weathering environment; they are unrelated to landform situation and can be discussed on a world-wide basis (Bradshaw, 1975). Except for supergene enrichments of ore, — e.g., over porphyry Cu bodies — and uranium mineralization in calcretes, space limitations have precluded consideration of those metalliferous deposits that are, essentially, entirely weathering products, such as bauxites, Ni-Co laterites, Mn laterites and certain Fe deposits. Nevertheless, the modes of development of these deposits are closely related to the mechanisms of geochemical dispersion and an understanding of their genesis is important to the interpretation of some geochemical data. Descriptions of most of the superficial deposits are given in Knight (1975).

## FORMAT

Section B of the issue gives a brief description of the regional features covering geomorphological provinces, weathering and landform development, soils, climate and vegetation, an appreciation of which is necessary to achieve an understanding of observed geochemical patterns. Emphasis is placed on the complex weathering history that is characteristic of much of Australia and has led to the development of the present landscape.

Terms are defined and sample media described in Section C. The idealized models follow in Section D. The models have been derived from a synthesis of previously published data, together with a representative set of geochemical exploration case histories (Section E) from a wide variety of geological, geomorphological and climatic environments throughout Australia.

The models are illustrated by a series of block diagrams which show the dispersion of elements in the weathering profile for specific landform and overburden situations. The models attempt to draw parallels between regions, based on the nature of weathering history and landform rather than on geological similarities. Thus, much detail of individual case histories is omitted from the models and it must be recognized that the type, magnitude and extent of a geochemical anomaly will be determined by local features which include the nature of the mineralization and wall rocks, soil types and climate.

In Section E, the contributed case histories have been grouped into three divisions — Archaean, Proterozoic and Phanerozoic — on the basis of age of the host rocks to mineralization and further subdivided according to recog-

nized structural elements and metallogenic provinces. Brief outlines of the regional geology and mineralization precede the case histories in each subsection. This layout is compatible with that of the Australasian Institute of Mining and Metallurgy's volume dealing with mineral deposits of Australia and Papua New Guinea (Knight, 1975), which contains fuller accounts of regional geology and metallogeny as well as detailed geological descriptions of most of the individual deposits. It is recognized that this basis of subdivision results in deposits located in different weathering and landform situations being placed together. However, it serves to illustrate that the style of geochemical expression of mineralization is largely independent of the geological setting. The data for each case history are summarized in tables, which not only serve as a basis for comparison but also highlight the incompleteness of our knowledge of the dispersion characteristics of most elements in the range of potential sample media. At the end of Section E is a table which cross-references the case histories and some of the published literature by model and style of mineralization.

Finally, Section F contains the accumulated references for the issue.

Throughout the text, the contributed case histories are references by name and a number corresponding to their numerical listing in Section E (see Fig. 18); previously published examples are references in the normal way.

This page intentionally left blank