

## CONTENTS

|  |     |
|--|-----|
| Dedication to S. Thomas Crough (1947–1982) . . . . .   | V   |
| Preface . . . . .  | VII |
| List of Authors . . . . .  | IX  |
| <br>   |     |
| Introduction—Processes of Continental Rifting . . . . .  | 1   |
| <br>   |     |
| <i>Models of Rifting</i>   |     |
| Mechanism of graben formation—the wedge subsidence hypothesis  |     |
| Bott, M.H.P. and Mithen, D.P. (Durham, England) . . . . .  | 11  |
| Rifts and swells: geophysical constraints on causality   |     |
| Crough, S.T. (West Lafayette, Ind., U.S.A.) . . . . .  | 23  |
| Mechanisms of active and passive rifting   |     |
| Turcotte, D.L. and Emerman, S.H. (Ithaca, N.Y., U.S.A.) . . . . .  | 39  |
| Mechanisms of uplift preceding rifting   |     |
| Mareschal, J.-C. (Atlanta, Ga., U.S.A.) . . . . .  | 51  |
| Convective thinning of the lithosphere: a mechanism for rifting and mid-plate volcanism on Earth, Venus, and Mars                                  |     |
| Spohn, T. (Frankfurt, F.R.G.) and Schubert, G. (Los Angeles, Calif., U.S.A.) . . . . .   | 67  |
| Mechanical aspects of continental rifting  |     |
| Neugebauer, H.J. (Clausthal-Zellerfeld, F.R.G.) . . . . .  | 91  |
| Submarine rifting at mid-ocean ridges  |     |
| Jarvis, G.T. (Toronto, Ont., Canada) . . . . .   | 109 |
| Hotspot tracks and the early rifting of the Atlantic   |     |
| Morgan, W.J. (Princeton, N.J., U.S.A.) . . . . .   | 123 |
| Mechanism of subsidence of ancient cratonic rift basins  |     |
| DeRito, R.F., Cozzarelli, F.A. and Hodge, D.S. (Amherst, N.Y., U.S.A.) . . . . .   | 141 |
| Phenomena of pulsation tectonics related to the breakup of the eastern North America continental margin  |     |
| Sheridan, R.E. (Newark, Del., U.S.A.) . . . . .  | 169 |
| <br>   |     |
| <i>Geophysical Constraints on Rifting</i>  |     |
| Gravity study of the Central African Rift System: a model of continental disruption. 1. The Ngaoundere and Abu Gabra Rifts                         |     |
| Browne, S.E. and Fairhead, J.D. (Leeds, Great Britain) . . . . .   | 187 |
| Gravity study of the Central African Rift System: a model of continental disruption. 2. The Darfur domal uplift and associated Cainozoic volcanism |     |
| Birmingham, P.M., Fairhead, J.D. and Stuart, G.W. (Leeds, United Kingdom) . . . . .  | 205 |
| Baikal rift: active or passive? — Comparison of the Baikal and Kenya rift zones  |     |
| Logatchev, N.A., Zorin, Y.A. and Rogozhina, V.A. (Irkutsk, U.S.S.R.) . . . . .   | 223 |
| Processes of planetary rifting as seen in the rifting and break up of Africa   |     |
| Girdler, R.W. (Newcastle upon Tyne, Great Britain) . . . . .   | 241 |
| The distribution and implications of heat flow from the Gregory Rift in Kenya  |     |
| Crane, K. and O'Connell, S. (Palisades, N.Y., U.S.A.) . . . . .  | 253 |
| Constraints on rift thermal processes from heat flow and uplift  |     |
| Morgan, P. (Houston, Texas, U.S.A.) . . . . .  | 277 |
| Magnetotelluric results opposing magma origin of crustal conductors in the Rio Grande rift   |     |
| Jiracek, G.R., Gustafson, E.P. and Mitchell, P.S. (San Diego, Calif., U.S.A.) . . . . .  | 299 |

|  |     |
|--|-----|
| <b>Crustal structure of the northern Mississippi Embayment and a comparison with other continental rift zones</b>  |     |
| Mooney, W.D., Andrews, M.C., Ginzburg, A., Peters, D.A. (Menlo Park, Calif., U.S.A.) and Hamilton, R.M. (Reston, Va., U.S.A.) . . . . .  | 327 |
| <b>The role of seismic refraction data for studies of the origin and evolution of continental rifts</b>  |     |
| Olsen, K.H. (Los Alamos, N.M., U.S.A.) . . . . .   | 349 |
| <br><i>Geological and Geochemical Constraints on Rifting</i>   |     |
| <b>Crustal structure of rifted continental margins: geological constraints from the Proterozoic rocks of the Canadian Shield</b>   |     |
| Easton, R.M. (St. John's, Nfld., Canada) . . . . .   | 371 |
| <b>The role of rifting in the tectonic development of the midcontinent, U.S.A.</b>   |     |
| Keller, G.R. (El Paso, Texas, U.S.A.), Lidiak, E.G. (Pittsburgh, Pa., U.S.A.), Hinze, W.J. and Braile, L.W. (West Lafayette, Ind., U.S.A.) . . . . .                                   | 391 |
| <b>Geologic and geochemical evidence for the nature and development of the Middle Proterozoic (Keweenawan) Midcontinent Rift of North America</b>                                      |     |
| Green, J.C. (Duluth, Minn., U.S.A.) . . . . .  | 413 |
| <b>Timing and chemistry of igneous events associated with the Southern Oklahoma Aulacogen</b>  |     |
| Gilbert, M.C. (Blacksburg, Va., U.S.A.) . . . . .  | 439 |
| <b>Origin of the Oslo Graben in relation to the Hercynian-Alleghenian orogeny and lithospheric rifting in the North Atlantic</b>   |     |
| Russell, M.J. (Glasgow, Great Britain) and Smythe, D.K. (Edinburgh, Great Britain) . . . . .   | 457 |
| <b>Active versus passive continental rifting: evidence from the West African rift system</b>   |     |
| Fitton, J.G. (Edinburgh, Great Britain) . . . . .  | 473 |
| <b>Tectonic and geologic evolution of the Españaña basin, Rio Grande rift: structure, rate of extension, and relation to the state of stress in the western United States</b>          |     |
| Golombek, M.P. (Houston, Texas, U.S.A.), McGill, G.E. and Brown, L. (Amherst, Mass., U.S.A.) . . . . .   | 483 |
| <b>The Morton-Black hypothesis for the thinning of continental crust—revisited in western Afar</b>   |     |
| Mohr, P. (Galway, Ireland) . . . . .   | 509 |
| <b>Continental rift jumps</b>  |     |
| Wood, C. (Houston, Texas, U.S.A.) . . . . .  | 529 |
| <b>Surface deformation in volcanic rift zones</b>  |     |
| Pollard, D.D. (Menlo Park, Calif., U.S.A.), Delaney, P.T., Duffield, W.A. (Flagstaff, Ariz., U.S.A.), Endo, E.T. (Seattle, Wash., U.S.A.) and Okamura, A.T. (Hawaii, U.S.A.) . . . . . | 541 |
| <b>The chemical and thermal evolution of rifts</b>   |     |
| Bailey, D.K. (Reading, Great Britain) . . . . .  | 585 |
| <b>Major stages of rifting evolution in the Earth's history</b>  |     |
| Milanovsky, E.E. (Moscow, U.S.S.R.) . . . . .  | 599 |
| <br><i>Resources associated with Rifting</i>   |     |
| <b>Continental rifting and porphyry-molybdenum occurrences in the Oslo region, Norway</b>  |     |
| Schönwandt, H.K. (Aarhus, Denmark) and Petersen, J.S. (Oslo, Norway) . . . . .   | 609 |
| <b>Accumulation of fossil fuels and metallic minerals in active and ancient rift lakes</b>   |     |
| Robbins, E.I. (Reston, Va., U.S.A.) . . . . .  | 633 |
| <b>Geothermal resources of rifts: a comparison of the Rio Grande Rift and the Salton Trough</b>  |     |
| Swanberg, C.A. (Garland, Texas, U.S.A.) . . . . .  | 659 |
| <b>Subject Index</b>   | 679 |