Contents

1 Constant-Scale Natural Boundary Mapping in Context ....................... 1
  1.1 The Value of a Geometry-Based Mapping Paradigm ...................... 1
  1.2 Relationship to Conventional Cartographic Techniques ................. 2
  1.3 Deriving Boundaries: Maxwellian Hills and Dales ....................... 11
  1.4 The Use of Boundaries ............................................................. 12
  1.5 Relationship to 3D Modeling Techniques and Topology ................. 17
  1.6 Relationship to Perspective-Based and Anamorphic Drawing .......... 22

2 Constant-Scale Natural Boundary Mapping Technique ....................... 27
  2.1 Identifying Critical Boundaries, Unzipping and Zipping ................. 27
  2.2 Making Closed Shapes and Adjusting Proportions ......................... 29
  2.3 Adjusting Internal Scale ........................................................... 29
  2.4 Drawing the Grid and Creating a Map ......................................... 32
  2.5 Folding ...................................................................................... 36
  2.6 Waterlining ................................................................................ 36
  2.7 Demonstration .......................................................................... 39
  2.8 Summary of Implications for Global Mapping ............................... 42

3 Interpretation of CSNB Maps .......................................................... 43
  3.1 Nature of Processes and Resulting Boundaries ............................... 43
  3.2 Externally Driven Processes ....................................................... 44
  3.3 Internally Driven Processes ....................................................... 45
  3.4 Making Comparisons ................................................................. 46

4 Mapping the Earth ........................................................................ 47
  4.1 Earth’s Dynamic Context ............................................................ 47
  4.2 Tectonic Activity ....................................................................... 48
  4.3 Watersheds, Watercourses, and Weather ..................................... 51
  4.4 Ocean Currents ......................................................................... 56
5 CSNB Mapping Applied to Regular Bodies ........................................... 59
  5.1 Overview of Application................................................................. 59
  5.2 The Moon ...................................................................................... 60
  5.3 Venus ............................................................................................ 60
  5.4 Mars ............................................................................................... 63
  5.5 Future Applications ...................................................................... 68

6 CSNB Mapping Applied to Irregular Bodies ........................................ 71
  6.1 Overview of Application ................................................................. 71
  6.2 Distribution of Features on Asteroid 433 Eros ............................... 72
  6.3 Comparison of Eros, Phobos, Deimos, and Ida ............................... 76
  6.4 Exploring Asteroid 25143 Itokawa ................................................. 81
  6.5 Other Irregular Objects .................................................................. 85

7 Mapping the Sky ................................................................................ 89
  7.1 Beyond Human Sight ..................................................................... 89
  7.2 Cosmic Microwave Background ................................................... 89
  7.3 CSNB Maps of CMB Anisotropy ................................................... 92

8 The Future of CSNB Mapping ............................................................. 95
  8.1 Status, Goals, and Motivation ....................................................... 95
  8.2 Methodology and Plan for 2D Mapping .......................................... 96
  8.3 Methodology and Plan for 3D Modeling ........................................ 96

References .......................................................................................... 101

Provenances ...................................................................................... 107

Acronyms .......................................................................................... 113

About the Authors ............................................................................... 115
Constant-Scale Natural Boundary Mapping to Reveal Global and Cosmic Processes
Clark, P.E.; Clark, C.
2013, X, 116 p. 53 illus., 30 illus. in color., Softcover
ISBN: 978-1-4614-7761-7