# Contents

1 Background: Correlating Microscale and Macroscale ................................. 1
   1.1 A Common Challenge ........................................... 1
   1.2 Questions and Opportunities for Engineers ........................ 2
   1.3 An Interest in Mesoscales .................................... 3
   1.4 Footprint ....................................................... 5
   1.5 Objectives ..................................................... 6

2 The EMMS Principle: Compromise Between Competing Dominant Mechanisms .......... 7
   2.1 The Importance of Structural Heterogeneity ..................... 7
   2.2 Analysis of Heterogeneous Structures .......................... 9
   2.3 Multiscale Approaches to Analyze Heterogeneity ............... 13
   2.4 A Variational Multiscale Method: The EMMS Model .............. 15

3 Verification and Application of the EMMS Principle ................................. 19
   3.1 Proof of the EMMS Principle .................................... 19
      3.1.1 The Importance of Compromise in Competition .............. 19
      3.1.2 Exploring the Universality of the EMMS Principle .......... 23
   3.2 Verification of the EMMS Principle ................................ 26
   3.3 Application of the EMMS Principle ................................ 28

4 Extension and Generalization of the EMMS Principle ............................... 33
   4.1 Extension of the EMMS Principle to Gas–Liquid Systems .......... 33
   4.2 Extension of the EMMS Principle to Turbulence ................... 33
   4.3 Universality of the EMMS Principle ................................ 36
Towards Mesoscience
The Principle of Compromise in Competition
Li, J.; Huang, W.
2014, XII, 78 p. 23 illus., 20 illus. in color., Softcover
ISBN: 978-3-642-41789-4