

Contents

Tributes	xi
Eduardo GARZANTI, Vincent GODARD, Rodolphe CATTIN, György HETÉNYI, Jean-Luc EPARD and Martin ROBYR	
Foreword	xvii
Rodolphe CATTIN and Jean-Luc EPARD	
Preface. From Research to Education: The Example of the Seismology at School in Nepal Program	xix
György HETÉNYI and Shiba SUBEDI	
Part 1. Tethyan Himalayan Sequence	1
Chapter 1. Magmatism in the Kohistan–Ladakh Paleo-arc: Building Continental Crust During the India–Eurasia Convergence	3
Yann ROLLAND, Olivier REUBI and Sandeep SINGH	
1.1. Introduction	3
1.2. Geological setting of the Kohistan–Ladakh arc	5
1.3. Main geological contacts	9
1.3.1. The Shyok Suture Zone	9
1.3.2. The Indus Suture Zone	10
1.4. Reconstruction of the arc structure and evolution	10

1.4.1. Southern Plutonic Complex	11
1.4.2. Chilas Complex	12
1.4.3. Gilgit Complex and Kohistan Batholith	12
1.4.4. Ladakh Batholith	13
1.5. Geochemistry and magmatic evolution of Kohistan–Ladakh magmas	15
1.5.1. Inferences for juvenile continental crust construction	17
1.5.2. Isotopic composition, inferences on the mantle source and crustal assimilation, and implications for the timing of collisions	18
1.6. Tectonic reconstructions of Kohistan–Ladakh arc evolution	20
1.6.1. Scenario 1: south-dipping subduction zone	20
1.6.2. Scenario 2: north-dipping subduction zone	23
1.7. Conclusion	23
1.8. References	24
Chapter 2. Suture Zone	35
Julia DE SIGOYER and Jean-Luc EPARD	
2.1. Introduction	35
2.2. General geological description of the ITSZ	38
2.3. The Indus suture zone of the Eastern Ladakh, the Nidar zone	38
2.3.1. The Indus group sediments	41
2.3.2. The Nidar ophiolite	41
2.3.3. The accretionary wedge or oceanic mélange	44
2.4. Conclusion	48
2.5. References	50
Chapter 3. Geological Evolution of the Tethys Himalaya	55
Chiara MONTOMOLI, Jean-Luc EPARD, Eduardo GARZANTI, Rodolfo CAROSI and Martin ROBYR	
3.1. Introduction	55
3.2. The stratigraphy of the Tethys Himalaya	57
3.2.1. The pre-Tethyan history	57
3.2.2. The Neotethyan rift stage	59
3.2.3. The Neotethyan drift stage	59
3.2.4. The Paleocene–Eocene collision stage	63
3.3. Deformation of the Tethys Himalaya	63
3.3.1. Deformation and metamorphism of the Tethys Himalaya in Dolpo (Western Nepal)	64
3.3.2. Deformation and metamorphism of the Tethys Himalaya in Ladakh (NW India)	68

3.4. Conclusion	70
3.5. References	71
Part 2. Greater Himalayan Crystalline Complex	81
Chapter 4. High-Pressure and Ultra-High-Pressure Units in the Himalaya	83
Julia DE SIGOYER and Stéphane GUILLOT	
4.1. Introduction	83
4.2. High pressure rocks in the suture zone (witnesses of the oceanic subduction)	84
4.2.1. The Shapi–Shergol blueschists (Ladakh)	86
4.2.2. The Shangla Blueschists (Pakistan)	86
4.2.3. The Sangsang Blueschist	86
4.2.4. The Indo-Burmese Blueschists	87
4.3. Continental high-pressure (HP) to ultra-high-pressure (UHP) metamorphism of the Indian margin (continental subduction) located next to the Indus Tsangpo Suture Zone	87
4.3.1. The Kaghan unit	88
4.3.2. The Tso Morari UHP unit	90
4.3.3. Other HP metamorphosed unit south of suture zone in the Indian continental margin	92
4.4. Oligocene–Miocene high-pressure, high-temperature metamorphism eclogite with granulite overprint far from the suture zone	94
4.5. Conclusion	95
4.6. References	99
Chapter 5. The Greater Himalayan Sequence – Tectonic, Petrographic and Kinematic Evolution of the Metamorphic Core Zone of the Himalayan Orogeny	105
Martin ROBYR, Rodolfo CAROSI, Salvatore IACCARINO and Chiara MONTOMOLI	
5.1. Introduction	105
5.2. Tectono-metamorphic evolution of the GHS in the central part of the Himalaya in Nepal	110
5.3. Tectono-metamorphic evolution of the GHS in the north-western part of the Indian Himalaya in Himachal Pradesh and Ladakh	117

5.3.1. Metamorphism and deformation in the High Himalayan Crystalline Zone of Zaskar	122
5.3.2. Timing of crustal shortening and metamorphism along the Miyar Shear Zone	125
5.3.3. Kinematic and tectonothermal evolution of the High Himalayan Crystalline Zone of Zaskar	126
5.4. Conclusion	128
5.5. References	129
Chapter 6. Oligo-Miocene Exhumation of the Metamorphic Core Zone of the Himalaya Across the Range	135
Rodolfo CAROSI, Salvatore IACCARINO, Chiara MONTOMOLI and Martin ROBYR	
6.1. Introduction	135
6.2. Central Himalaya	136
6.3. North West India	145
6.4. Conclusion	151
6.5. References	151
Part 3. Lesser and Sub Himalayan Sequence	157
Chapter 7. Lithostratigraphy, Petrography and Metamorphism of the Lesser Himalayan Sequence	159
Chiara GROPPPO, Franco ROLFO, Shashi TAMANG and Pietro MOSCA	
7.1. Introduction	159
7.2. Lithostratigraphy and petrography	161
7.2.1. Lower-LHS	162
7.2.2. Upper-LHS	166
7.2.3. Meta-igneous rocks	174
7.2.4. Along-strike variation in the LHS lithostratigraphy	177
7.3. Metamorphism	177
7.3.1. Lower-LHS	179
7.3.2. Upper-LHS	180
7.3.3. Tectonic implications	180
7.4. Conclusion	181
7.5. References	183

Chapter 8. Sedimentary and Structural Evolution of the Himalayan Foreland Basin	189
Pascale HUYGHE, Jean-Louis MUGNIER, Suchana TARAL and Ananta Prasad GAJUREL	
8.1. Introduction	189
8.2. Overall geometry of the outer Himalayan domain	191
8.2.1. Foreland basin geometry	191
8.2.2. Incorporation of the foreland basin into the range: a typical thin-skinned thrust belt structure	194
8.3. The main foreland sediments features	198
8.3.1. Present-day foothill sediments and morphology	198
8.3.2. Sedimentary facies of the Neogene Siwalik foreland basin deposits	199
8.3.3. Evolution of sources	205
8.3.4. Evolution of environmental conditions	209
8.4. Evolution of the outer Himalayan domain: geodynamics and external processes control	212
8.4.1. Critical tectonic wedge, tectonic and surface processes velocity	212
8.4.2. Processes controlling the evolution of the foreland basin	215
8.5. Conclusion	218
8.6. References	219
Conclusion	227
Rodolphe CATTIN and Jean-Luc EPARD	
List of Authors	229
Index	233
Summaries of other volumes	235