
Contents

1	Introduction	1
2	Principles	35
2.1	Terranes	35
2.2	Sediments and Sedimentary Processes	40
2.3	Igneous Rocks and Processes	43
2.4	Ophiolite	46
2.5	Metamorphic Rocks	46
2.6	Cordilleran Margins	48
3	The Cordillera's Foundations: Paleoproterozoic and Mesoproterozoic Periods: Ca. 1800–1000 Ma	55
3.1	Beginnings	55
3.2	Basement Rocks	55
3.3	Proterozoic Orogens	61
4	The Cordillera's Long-Lived Passive Margin: Neoproterozoic to Middle Devonian Periods: Ca. 1000 Ma–400 Ma	63
4.1	Break-Up of Rodinia	63
4.2	Passive Margin	64
4.3	Transgression	66
5	The Antler Orogeny and the First Suspect Terrane: Middle Devonian to Late Pennsylvanian: Ca. 400–300 Ma	73
5.1	Arrival of Exotic Terranes	73
5.2	Great Carbonate Shelves and Meteor Strike	74
5.3	Trench Rollback and Back-Arc Spreading	76
5.4	Assembling Pangaea	79
6	The Amalgamation of Pangaea and the Sonoma Orogeny: Early Permian to Early Triassic – Ca. 300–240 Ma	83
6.1	Pangaea	83
6.2	The Back-Arc Closes: Sonoman Orogeny	84
6.3	Sedimentation Across an Arid Landscape	85
7	The Arrival of Wrangellia and the Nevadan Orogeny: Late Triassic to Late Jurassic: Ca. 240–145 Ma	89
7.1	Introducing the Cordilleran Arc and Subduction Zone	89
7.2	The Continental Arc	92
7.3	A Myriad of Oceanic Arcs	95
7.4	New Exotic Terranes	95
7.5	Transcontinental Rivers, Explosive Volcanism, and Enormous Ergs	98

8	The Continental Arc, Sevier Orogeny, Western Interior Seaway and Flat-Slab Subduction: Cretaceous Period: Ca. 145–65 Ma	103
8.1	Break-Up of Pangaea	103
8.2	Wrangellia	105
8.3	An Accretionary Prism in the Cordilleran Trench: The Franciscan	107
8.4	Forearc Sedimentation: The Great Valley Sequence	114
8.5	Expanding Arc and the Sevier Orogen	117
8.6	Foreland Basin and the Western Interior Seaway	121
8.7	Flat-Slab Subduction	126
9	Flat-Slab Subduction, the Laramide Orogeny, Uplift of the Colorado Plateau and Rocky Mountains: Paleocene and Eocene: Ca. 65–35 Ma	131
9.1	Dawn of the Cenozoic	131
9.2	Nevadaplano	136
9.3	Laramide Orogen	137
9.4	Continental Sedimentation and Interior Lakes	139
9.5	Laramide Magmatism	141
9.6	Terranes Move Northward	144
9.7	Paleogene Coastal Sedimentation	146
10	Changing Tectonics, Cooling Climates and the Dawn of Crustal Extension: Late Eocene to Early Miocene (ca. 35–20 Ma)	149
10.1	Birth of a Transform Margin	149
10.2	Salinia	152
10.3	Metamorphic Core Complexes	154
10.4	Continental Sedimentation and Climate Change	156
10.5	Widespread Oligocene-Early Miocene Volcanism	157
11	The End of Cordilleran Subduction and the Formation of the Basin and Range: Early and Middle Miocene: Ca. 20–10 Ma	163
11.1	Basin and Range Beginnings	163
11.2	Transform Faults and the San Andreas Fault System	166
11.3	Late Cenozoic Basins: The Monterey Formation	167
11.4	The Strange Odyssey of the Transverse Ranges	171
11.5	Volcanism Reigns in the Pacific Northwest	173
11.6	Colorado Plateau and Basin and Range Provinces Differentiate	174
12	Interior Basins, Drainage Integration and Deep Incision: Late Miocene to Pliocene: Ca. 10–2.6 Ma	179
12.1	The Beginning of the End	179
12.2	Relentless Volcanism Continues	179
12.3	Uplift of the Sierra Nevada	182
12.4	Growing Transform Margin and Coastal Sedimentary Basins	183
12.5	Sedimentation, Drainage Development, and the Birth of the Modern Landscape	183
13	The North American Cordillera Today: Pleistocene, Holocene and the Anthropocene: Ca. 2.6 Ma to Present	193
13.1	Continuing Tectonic and Volcanic Processes	193
13.2	Winter Is Coming	197
13.3	Lakes and Ice Dams	204
13.4	The Pleistocene Along the Coast	204
	Erratum	E1
	Epilogue	209
	Glossary	211
	Index	223