

Contents

Foreword	ix
Bruno DAVID	
Acknowledgments	xiii
Chapter 1. General Points	1
1.1. Fossilization: a phenomenon that is always exceptional	1
1.2. The main processes of fossilization	3
1.2.1. Preservation of the endo- or exoskeletal elements	7
1.2.2. Formation of replicas or countermolds	8
1.2.3. Formation of internal molds	9
1.2.4. Case study: geode formation	10
1.3. The concept of a Lagerstätten	13
Chapter 2. Diversity of Types of Mineralization	17
2.1. Silicification	17
2.1.1. Primary silicification.	18

2.1.2. Secondary silicification	28
2.2. Carbonization of plants and compressions of cuticles	43
2.2.1. Carbonification due to anoxia	44
2.2.2. Carbonization in connection with forest fires	44
2.2.3. Biogeochemical carbonization (also known as “diagenetic carbonization”)	46
2.2.4. Plant compressions	49
2.2.5. Imprints and casts.	53
2.3. Carbonatizations and calcitic crystallizations.	55
2.3.1. Carbonatization by encrusting and impregnation	55
2.3.2. Carbonatization by percolation and recrystallization	58
2.3.3. Geodes and calcitic outgrowths	61
2.3.4. Crystalline fossils formed of carbonates	65
2.4. Pyritization, limonitization and siderite	67
2.4.1. Pyritization	67
2.4.2. Fossils made of iron oxides or hydroxides	80
2.4.3. Siderite nodules	82
2.5. Amberization	84
2.5.1. Copal	85
2.5.2. Amber	86
2.6. Sulfatization (gypsification and mineralization as barite).	92
2.6.1. Gypsification.	93
2.6.2. Mineralization to barite	94
2.7. Phosphatization	95
2.7.1. Phosphateous nodules	95
2.7.2. Phosphorites	96
2.7.3. Crystalline phosphate fossils.	97
2.8. Bituminous facies	99

Chapter 3. Remarkable Cases and Fossiliferous Contexts	105
3.1. Burial in fine, layered mud	106
3.1.1. The role of microbial mats in Precambrian and Cambrian shales	106
3.1.2. The role of microbial or algal mats in pelites and lithographic limestones	108
3.1.3. Anoxia of laminar clays bearing plants	112
3.1.4. Diatomites	115
3.2. Accumulations of teeth.	118
3.3. Bone beds	121
3.4. Fossilized tracks and trackways	123
3.5. Fossils with anatomical connections	128
3.6. Eggs and trophic traces (bite marks, galls, regurgitations and coprolites)	132
3.7. Land-based palynomorphs: spores and pollen grains	140
3.8. Aquatic palynomorphs	145
3.9. Aquatic microfossils: algae, foraminifera and ostracods.	148
 Chapter 4. Molecular Preservation	159
4.1. Color fossilization.	159
4.1.1. Fossils with preserved colors	160
4.1.2. Fossils where the colors are absent, but can be revealed	165
4.2. Fossilization of the original chemical compositions	166
4.3. Fossilized DNA	167
 Conclusion	173
 References	175

List of Figures	201
List of Plates	203
List of Authors	209
Index	211