

Index

Page numbers in *italic* denote figures. Page numbers in **bold** denote tables.

- abiotic dolostone 111
- abiotic model, lacustrine carbonates 8, 209–217
 - composition 211–214
 - cyclothems 214–215
 - origin 210, 215–216
- abiotic precipitates 4, 5, 6, 8, 239
- abstract (extended) volume 1, 2, 3
- Abu Dhabi, sabkha 9–10
- accommodation space 179, 187, 235, 236, 237, 240
- acid digestion fractionation factor 247
- activity measurements 289–294, 295
- age, non-marine carbonates **20, 22, 24**
- aggradational structure 183–185, 187, 188
- algae 34, 54
 - bioherms 27, 31, 39
 - mounds (palaeoberesellid) 7
- alkalinities 39
- alkalinity 111, 217, 297
- alluvial fan 185
- alveolar fabric 123, 130, 137, 141, 147, 149, 152
- aminopeptidase 295
- ammonite biozone 158, 161
 - duration of 171
 - thickness 164
- anoxia 53, 292
- aragonite 43, 45, 54, 55, 56
 - Cretaceous 213, 216
 - Neoproterozoic 128, 130, 138, **145**, 147, 149, 151
- Atlantic opening 103, 156, 177, 179, 181
- ATP activity measurements 289–293, 295
- Australia, Nullarbor Plain 9

- bacteria *see also* cyanobacteria
 - Cenozoic 251, 253, 255
 - Eocene 263
 - Mesozoic 159, 161, 212
 - Precambrian communities 87
 - Quaternary 293, 297
- bacterial shrubs 48, 55
- bacteriomorphs 123, 128, 132, 137, 143, 148, 151, 152
- bafflestones 2
- Barra Velha Formation 210, 211–214
 - cyclothems 214–217
- basin and range **21**
- basin evolution
 - Santos Basin 176–181
- beach carbonates 263–264, 271
- Betic cordillera 9
- bindstone 4, 5
- bioarchitecture, carbonates 70–73, 82–83
- biochemical processes 73–74
 - reef microbialites 295–296
 - study methods 288–291
- biofilm 125, 146, 147s
 - model 296

- bioherm 28, 31, 56, 69, 188, 263, 273
 - competency 100–102
 - Ediacaran 91, 92, 93
 - fractures 104–105
 - lake margin 32, 34
 - sedimentology 95–98
- biology, microbial reef 287–297
- biomarkers 292
- biomineralization 147
- biostrome 69, 91, 92, 93, 188
 - compaction 104
 - competency 100–102
 - sedimentology 98–99
- biota, summary
 - non-marine carbonates **20, 22, 24**
- bioturbation 233
- borehole image log facies
 - cyclicality and stacking 233–237
 - facies classification 237–239
 - interpretation 224–232
 - Macabu Formation 232–233
 - methodology 223–224
 - and wireline logs 221–222, 239–240
- boundstone 2, 137
 - carbonate platform 160, 161–164, 166, 169
 - fabric 45, 47, 50, 51, 53
 - lacustrine 210, 213
 - porosity 280, 281
- Brazil
 - Barra Velha Formation 210–217
 - Brejo do Espinho 243–257
 - Campos Basin 221–240
 - offshore 194
 - oil production 69
 - pre-salt carbonates 7–8
 - Santos Basin 175–189
 - stromatolite study 69–84
 - sub-salt carbonates 193–205
- breccia 225, 227
- Brejo do Espinho lagoon 244–246
- brittle deformation 93, 100, 102, 103, 104
- burial 150, 151
- bushy thrombolites 126–129, 136, 140–144, **145**, 150
 - deposition and preservation 149

- caddisfly cases 34, 41, 51, 54, 273
- calcification, sponge tissue 159
- caliche 227
- caliche crust 126, 137, 139, 141, 146, 151, 152
- Campos Basin 2, 7, 8, 194, 209
 - image log facies microbialites 221–240
 - stratigraphy 223
- carbon isotope 139, 146, 150, 151, 237, 238, 256
 - analysis 152–153
 - dolomite crust 251–252
 - non-marine carbonates 37, 39, 48
 - value 4, 9, 254

- carbonate *see also* microbial carbonate
 clumped isotope thermometry 247–248, 251–252, 256–257
 data 198–199
 platform evolution 170
 redeposited 189
 review 17–57
- carbonate factory 7, 262, 280
- carbonate grains
 Great Salt Lake 263–265, 266, 269, 271
- carbonate precipitation 294
 mechanism 53–56
 present day 28, 253
- carbonate-water thermometer 247–248
- carbonate, non-marine build-ups
 case studies 19, **20**, **22**, **24**
 classification 18
 material and methods 19, 24
 summary **20–25**
- case studies 2, 3
 early deformation microbialites 88
 non-marine carbonates 19–57
- Caspian Basin, microbialites 7
- cathodoluminescence 19
 deformed microbialites 113
 Qarn Alam, Oman 137–139, 141, 144, 150–152
 Rasthof Formation 117, 119, 120
- cementstone 4, 5, 7, 8, 33, 51
 fabric 45
 texture 50
- chemical conditions 147
- chemical weathering 297
- chemical zonation 144
- chlorides 215
- clastic accumulation
 Sugar Loaf High 185–187
- clay 212, 214
- clay minerals 128–133, 137, 140–142, 147
 analysis 152
 diagenesis 149, 150, 151
- climate **20**, **22**, **24**, 236, 237, 240, 244
 dolomite formation 257
- clotted texture 40, 44, 287
 Cretaceous 211, 232, 233, 235
 Eocene 276–277, 280, 282
- CO₂ non-marine carbonates 51–57
 source 18
- coal 279
- compaction 99, 101, 105
 rate of 104
 topographic high 101
- competency, microbialites 100–102
- computed tomography analysis *see* CT
- conductivity 248, 250
 hypersaline lagoon 245, **246**
- cone and dome structures 113, 117
- coral facies 155, 156
- coral reef, Tahiti 10, 287–288
- coralgal assemblage 292
- core handling and sampling 288–289
- crandallite 80
- crinkly laminite 233
 deposition and preservation 148
 Qarn Alam, Oman 125–127, 129–136, 139, 142, 147, 150
 stable isotopes **145**, 146
- crust formation, seasonal 256
- Cryogenian glaciations 87, 111
- Cryogenian microbial facies 111–121
- CT (micro-computed tomography) analysis 78, 80
 microbialites 83
 stromatolite 81–83
- cultivation of micro-organisms 290, 292
- cyanobacteria 37, 44, 46, 47, 53–57, 211
 microbiology 288, 293, 297
- cyclicality 216
 lacustrine carbonate 221–240
 origin 235–237
- cyclothem 239–240
 lacustrine carbonates 214–217
- DAPI cell counting 291
- deep lake environment 233
- deformation, microbialites 93, 95
- deformed facies 113, 114, 115–117, 121
- degassing 213
- deglacial reefs sequence 287–288, 297
- dendrolite 74
- deposition and preservation
 microbialites, Oman 141–147, 146
- depositional environment 5, 10, 51, 57, 177, 209
 Campos Basin 222, 223, 224, 229–231
 lacustrine cyclothem 227, 231–233, 236–238
 dolomite crust and mud 253
 evaporite facies 125
 Great Salt Lake 262
 microbialites, Oman **145**
 Moscardón 155–156, 159
 Neoproterozoic 89, 111–112, 147, 150–152
 non-marine carbonates **21**, **23**, **25**, 39, 49
 porosity 83
 Sugar Loaf High 182–183
 Unita Basin 269, 271
- depositional slope 155, 164, 166, 169
- depositional texture, classified 196–198
- depth range 172
 microbial/sponge mounds 169, 171
- desiccation cracks 214, 215, 233
- desiccation mechanism 255, 257
- diagenesis 5, 7, 10
 early dolomite formation 243–257
 early minerals 137–147
 deposition and preservation 150–151
- diagenetic features 201, 202, 205, 221, 224, 231, 238
- dissolution cavity 97, 105
- dissolution features 196, 200, 201, 205
- dissolved inorganic carbon 52, 53, 54, 55
- dolomite 10, 43, 45, 51, 214
 classification 250
 present-day precipitation 253
 primary/early diagenetic 123, 150–152
 in thrombolites 136–139, 140–144, 147, 149
- dolomite crust 245, 250–251, 254
 seasonal formation 256
 SEM 255
 XRD 252

- dolomite precipitation/diagenesis 243–257
 sampling and methodology 244–248
 dolomite rhombs 212, 213
 dolomitization 105
 dolostone 111, 113
 ductile deformation 93, 100, 102, 104
- E₂ carbonate bed 278, 279, 283, 284
 East African Rift
 lacustrine carbonates 9
 Ediacaran microbial carbonates 87–106
 EDS *see* energy dispersive X-ray spectroscopy
 eggshell fragments 51
 emergent features 233, 234, 237, 239
 energy dispersive X-ray spectroscopy (EDS)
 elemental composition 128, 131–137,
 142, 148
 EPS *see* extracellular polymer substances
 erosion, Sugar Loaf High 188
 eukaryotic organisms 119, 254, 293
 Europe, distribution non-marine carbonates 26
 eutrophication 155
 evaporation 263
 hypersaline lagoon 244, 248
 evaporite 181, 184, 188, 189, 210, 277, 279
 thermal conductivity 177
 evaporite facies 125, 126, 137, 146, 147, 151, 152
 evaporite seal 179, 181
 exoenzymes 295, 297
 activity measurements 290–291, 292
 extracellular polymer substances (EPS) 17, 37,
 53–56, 73
 Cenozoic 250, 251, 255
 Tahiti reef 291, 294, 297
 Great Salt Lake 46
 Mesozoic 210–211, 215
 Neoproterozoic 123, 128–132, 147–152
 in thrombolites 134–136, 140, 141,
 143, 145
 extreme lake deposystems 217
- fabric 57, 128, 130, 131, 137, 148
 non-marine carbonates 28–37
 and pore types 45, 47–51
 facies
 Bajocian microbial/sponge mounds 159–171
 classification, borehole image logs
 237–240
 lacustrine carbonates 214–217
 model, Qarn Alam 125
 facies modelling
 borehole image logs 221–240
 faecal pellets 119
 faults 93, 179
 remote sensing 99–100
 fenestral porosity 72–73, 216, 251, 254
 filament moulds 210–211, 235
 filaments 46, 211, 228, 231, 233, 239
 Cenozoic 251, 264, 274, 277, 279, 283
 floatstone 164, 165, 166, 169
 flood basalt 179, 181
 flooding, carbonate platform 188
 fluid-flow system 105, 106
 fluorite 138, 139, 143, 145, 147, 148, 149
 fluvial tufa 19, 42, 43, 45, 46, 47–51
 geological summary 24–25
 Italy 28, 35, 37
 precipitation mechanism 55–56
 stable isotope 52
 foraminifera 167, 210
 fossils, microbial 134, 152
 fracture data 94, 100, 102
 fracture systems in microbialites 87–106
 sedimentological overview 95–99
 structures 99–105
 study methods 93, 95, 96–97
 fracture, open-mode 102, 105, 106
 framestones 2, 5
- gamma-ray logs 221, 223, 227, 229, 231, 232–234, 236
 gas field 176
 gas production, West Willow Creek 279
 geochemical data 292, 296
 geochemistry
 non-marine carbonates 37, 51–53
 Qarn Alam 147–149
 geometry, non-marine carbonates 28–37
 geomicrobiological biofilm model 296
 geomicrobiology, Tahiti reef 287–297
 study methods 288–291
 geostatistics 79
 Ghaba Salt Dome 123
 glaciation, Neoproterozoic 87, 111
 glauconite 129, 132, 145, 147, 150, 151
 gliding horizon 96, 102, 103, 104, 105
 glucosidase 295
 Gondwana break-up 177, 181, 222
 grain-supported facies 166, 167, 168, 169, 171, 172
 grains in microbialites 73, 74
 grainstone 276, 277–278, 280, 281
 Ediacaran 91, 92, 93, 98
 gravitationally controlled fractures 103, 104, 105
 Great Salt Lake, Utah 9, 25–27, 39, 47, 56, 261
 bioherm 46
 fabric and geometry 28, 30, 31, 32, 51
 lake characteristics 262–263
 petrographic characterization 263–265, 266,
 269–271
 precipitation mechanism 53–54
 Green River Formation, USA 240, 271–284
 deposition/review 8, 27, 31, 37, 39
 precipitation mechanism 54
 Skyline research core 273–279
 groundwater 54, 57
 source 18–19, 27
 stable isotope 52
 growth rate, microbial 288
- H₂S 296
 horseshoe-shaped fragments 128, 130
 hot springs 9, 53, 55
 hydrocarbon reservoirs 1
 hydrolytic exoenzymes 290, 291
 hydrothermal deposits 2, 6, 18, 19
 travertine, Italy 26, 28, 33, 35
 hydrothermal springs, Italy 29
 hydrothermal water, stable isotope 52
 hypersaline lake/lagoon 244–257, 261

- Iberian Basin, microbialites 7, 9, 156–158
 ikaite 27–28, 33, 38, 40, 45
 image log facies *see* borehole image log facies
 image processing 76–80
 inclusions 211, 212, 213
 insect cases 47
 see also caddisfly
 Integrated Ocean Drilling program 288
 Irece Basin, Brazil 71, 75
 iron respiration 295–297
 isolation of micro-organisms 290, 292
 isopach map, Unita Basin 278
 Italy
 hydrothermal springs 29
 hydrothermal travertine 26, 28, 33, 35
 Jurassic carbonate platforms 155
Jurussia [digiform stromalite] 70, 77, 78, 80, 81
 Korolev Field 7
 Kuibis Subgroup 88, 89–90
Kussiella [colonial stromatolite] 75–78, 79
 lacustrine carbonate 8, 18–19, 188
 characteristics summary **20–23**
 cyclicality 221–240
 lacustrine carbonate platform 175–189
 Lagoa Salgada, Brazil 71, 74
 modern stromatolites 80–83
 Lagoa Vermelha, hydrological system 252
 lagoon, hypersaline 244
 Lake Bonneville 262–263
 lake level change 224, 236–237, 239–240
 lake margin 36
 bioherms 32, 39, 41
 carbonates 263
 depositional environment 49–50
 precipitation mechanism 53–54
 Lake Unita, palaeo-lake 267
 lake–lagoon complex 209
 laminated facies 112–117, 118, 119, 120, 121
 lamination 78, 80, 84
 development of 73–75, 76
 laminite 198, 200, 201, 202, 203, 211, 228, 233
 log interpretation 231
 laminites, planar 128–129, 130–133, 142, **145**, 150
 deposition and preservation 147
 leiolite 2, 74
 leiolitic facies 40, 250, 251, 257
 LiDAR survey, fractures 93, 95
 data 100
 light microscopy cell counting by DAPI
 staining 289
 lineaments 93, 99–100, 102
 lithification 103, 161
 Little Cedar Creek Field, Alabama 7
 Lula field 176
 Macabu Formation 229, 230
 borehole image interpretation 232–235
 Mahogany oil shale 270, 271
 Mammoth Hot Springs 53, 55
 marine carbonates 5–10
 distribution 2
 marker molecule for living cells 290
 mass failure scars 184
 mats 125, 146, 147, 148, 149
 mats, modern 211, 213, 215
 mechanical layer 105
 Mesozoic microbialites
 overview 7–8
 meteogene travertines 18
 meteorite-impact basin 27
 Mg-silicate gel 213–217
 micro-scale carbonate products 56
 microbial activity, location of 291–292
 microbial biofilms 37, 288–297
 microbial carbonates
 case studies 3, 24–28
 classification and growth forms 1–4
 modern 2, 9, 261–271
 overview 5–10
 petrography and characterization 261–284
 processes 4–5
 sampling and measurement 69–84
 soft-sediment deformation 111–121
 see also modern microbial carbonates
 microbial communities, modern 216, 263
 microbial communities, Neoproterozoic
 deposition and preservation 123–125,
 141–151, 147
 early diagenetic minerals 137–141,
 150–152
 methodology 126, 152–153
 sedimentary facies 125–137
 microbial crusts 161–172
 microbial framework study
 facies description 113–115
 methods 113
 peloid-like components 117, 119
 sediment rigidity 115–117
 microbial macrostructures 210–211
 microbial mat 117, 119, 245
 present day 253–254, 263
 rigidity 115–117
 microbial sediments
 biosedimentary processes 73–74
 microbial/siliceous sponge mounds
 elevation 169
 facies 159–171
 geological setting 155–157
 methods and data 159
 microbialite
 deformation 87–106
 study methods 93, 95
 depositional texture 193–205
 development 287
 mat 113
 misnomer 217
 overview 1–11
 microbiology, Tahiti reef 287–297
 living microbial biofilms 291–297
 study methods 288–291
 mineralization 150
 mineralogy 19, 137, 142
 dolomite 248, 250–251, 252
 non-marine carbonates **21, 23, 25**, 43, 45
 XRD study, hypersaline lagoon 246–247, 252

- modern microbial carbonates 2, 9, 27–28, 152, 261–271
 review 53–56
 sampling and modelling 80–83
- Mono Lake, California 27–28, 30, 39
 microbial fabric 46, 47, 48
 precipitation mechanism 54
 spring pinnacles 33, 36, 40, 51
 stable isotopes 37
- Moscardón (Spain)
 geology, palaeogeography 155–159
 microbial-siliceous sponge facies 159–172
- mounded facies 184, 185, 188, 189
- mounds, lacustrine 36–39, 46–51, 54
- mud mound 162
- Nama Basin, Namibia 87–106
 geology 88–95
 sedimentological overview 95–99
- Namibe Basin, Angola 8
- Namibian carbonates 87–121
- Namibian microbialites 6, 8
- nanoscale structures 56
- Neoproterozoic *see also* Naminian and Qarn Alam
 marine microbialites 6
 stromalites 70
- Neoproterozoic deformation
 Cryogenian 111–121
 early diagenetic 123–152
 Ediacaran 87–106
- non-marine carbonates
 reservoir heterogeneity 175
 review 17–57
 setting 5–11
- non-marine microbial carbonates
 present-day 53–56
- Nullarbor Plain, Australia 9
- nutrient concentration 155, 172
- ocean floor spreading 177, 179, 222
- oil production 175–176
 Brazil 69
 West Willow Creek 279
- oil shale 270, 271
- Oman, microbial communities 123–152
- Omkyk Member, Ediacaran 90–93
- oncoids 277, 283
- ooids, modern 263–265, 269, 271, 274–276,
 280, 283
- open-mode fracture 102, 105, 106
- orbital cycle 172
- organomineralization 53, 54, 132, 147–152
- ostracods
 Cenozoic 254, 278, 280, 281, 283
 Cretaceous 210, 214, 215, 232, 239
- Owando Basin 111
- oxic conditions 142–143, 145, 148, 150
- oxygen fluctuation 172
- oxygen isotope 139, 146, 250, 256
 analysis 152–153
 Aptian 237, 238
 hypersaline lagoon 246
 Neoproterozoic 150–151
 non-marine carbonates 37, 39, 48
- oxygenation, atmospheric 6
- packing index 198, 199, 200, 202, 204
- packstone 45, 161–163, 166, 171, 172
 field view 165, 167–168
- palaeo-lake 262–263, 267
- palaeoenvironment 273
 carbon precipitation 256
- palaeogeography
 Iberian Basin 157
 Moscardón 155–159
- palaeotemperature
 carbon precipitation 256
- palaeotopography 166, 168, 177
- Palaeozoic microbialites, overview 6–7
- palygorskite 129, 132, 134, 140
 lagoonal 147, 150, 151
 stable isotopes 145
 XRD analysis 137, 141, 142
- Pan-African deformation events 102–103
- passive margin 179, 222
- peloid-like components 117, 119
- permeability 71–72, 73, 119, 199–205
 study methods 196–198
 West Willow Creek oil field 279–280,
 281–283
- petrography 19, 33, 41, 118, 120, 135, 149
 deformed microbialites 113–115, 117
 evaluation 238, 263
 grains and cement 265
 oolites 263
- petrophysical analysis
 microbial carbonates 69–84
- petrophysical data 279, 281
- petrophysical properties 70, 203, 204
 sub-salt microbialites 193
- pH measurements 248
 hypersaline lagoon 245, 246
- phosphatase 295
- phosphate 131, 135, 145, 290, 292
- phosphatic minerals 148
- photomicrographs 293
 dolomite crust 254–255
 microbialite, Cretaceous 196, 212
 microbialite, Eocene 265, 266, 274–277
 microbialite, Neoproterozoic 128, 129, 137,
 138, 152
 Rasthof Formation 115–118, 120
 non-marine carbonates 34, 38, 40, 44, 46
 sponge boundstone 160
 use in borehole image logs 221, 224,
 226, 228
- photosynthesis 52, 53, 54, 55, 294
- physico-chemical mechanisms 55–56, 57
- physico-chemical parameters 246
- pore cement 271
- pore characterization 266
 data 198–199
 methods 196–198
 porosity and permeability 199–205
- pore network 71, 80, 81, 119
- pore structure 271
- pore types 4–5
- pore-throat 196, 198, 200–202, 203–205
- pore-water temperature 247, 248,
 249, 250

- porosity 33, 137, **145**, 148
 - 3D from CT scan 71, 78
 - Cretaceous carbonates 194, 199–205, 212, 213
 - Aptian 223–224, 225–226, 228, 232
 - development 71–73
 - Eocene carbonates 273, 274–277, 278, 284
 - fenestral 72–73, 216, 251, 254
 - modern stromatolites 80–83
 - primary 28, 31, 33, 70, 71, 82
 - secondary 43, 70
 - study method 196–198
 - type 83
 - West Willow Creek 279–280, 281–283
- porosity modelling, microbialites 70–84
 - methods 76–80
- pre-salt microbialites, Brazil 209
 - Campos Basin 221–240
 - hydrocarbon play 7, 8, 175–176
 - Santos Basin 175–189
- precipitation
 - abiotic 4–8, 213, 239
 - rate of 197
- pressure solution 212
- primary and early diagenetic minerals 123–152
- primary biomass 150
- primary deposit 151–152
- primary fabric 146, 148
- primary fracture 102, 103–104, 105
- primary porosity *see under* porosity
- prograding clinoform 185–187
- promontory, carbonate 183–185
- Proterozoic stromatolites 75–80
- pustular grains 263, 264
- Pyramid Lake, Nevada 27, 30, 31, 33
 - mounds 36, 37–39, 46, 47–51
 - formation mechanism 54
- Qarn Alam, Oman
 - microbial communities 123–152
- rainfall
 - hypersaline lagoon 248, 250
- ramp facies 90–91
- Rasthof Formation, Namibia 111–121
 - facies 113–115
 - geology 111–112
 - microbial mat rigidity 115–117
- redox reaction 147
- reef community 293–297, 296
- reef framework 287, 288
- reef microbialites 287–297
- regressive cycle 234, 236, 237
 - lacustrine environment 231
- remote sensing
 - fractures 99–100, 102
- representative elementary volume (REV) 69, 80, 82
- reservoir
 - carbonate 105, 106
 - fracture systems 87
 - lacustrine microbialite 209, 261
 - microbial 261
 - non-marine carbonates 56
 - properties 5
 - quality 175, 284
 - target 111
 - carbonate platform 188–189
 - reservoir characterization 10, 69
 - resistivity images 221, 227, 229, 232, 238
 - restricted conditions 217
 - Ries Crater, Germany 27, 31, 37, 39
 - precipitation mechanism 54
 - stable isotopes 52
 - rift to drift tectonics 175, 177, 179, 181
 - rifting 187, 222
 - rigidity of sediment 112, 115–117, 119
 - rock fabric 4–5
 - roll-up structures 113, 116, 117, 118, 119
 - root mat 210
 - rudstone 164, 165, 166
- sabkha 9–10, 125, 126, 146, 149, 150
- sag basin 27
- sag sequence 176, 177–181, 186–188, 209
 - Sugar Loaf High 182–183
- saline lake, stable isotopes 51–53
- salinities 39
- salinity 19, 177, 237, 248, 253, 254, 263
 - stable isotope 51–53
- salt basin
 - Oman 1, 6
 - Santos 179
- salt dome, Oman 123, 124, 126
- sampling and measurement 246
 - microbial carbonates 69–84
- Santos Basin, offshore Brazil 1, 2, 7, 8, 194
 - lacustrine carbonate platform 175–189, 209, 211
 - microbialites 69
- Sapinhoá field 176
- scanning electron microscope analysis (SEM)
 - dolomite 251, 253, 255
 - hypersaline lagoon 247
 - methodology 19, 152, 289
 - micrite 56
 - microbial mat 250, 251, 253, 255
 - microbialites, Oman 128–138, 140, 141, 142
 - reef cavity 294
 - travertine and tufa 46
- sea-level change 169–172, 288
 - Bajocian 156–157
- seafloor spreading 177, 179, 222
- secondary fracture sets 105
- sediment sampling
 - hypersaline lagoon 246
- sedimentary cycles 239–240
 - lacustrine carbonates 233–237
- sedimentation rate 171
- sediments, microbial 73–74
- seismic 3D data 7, 177
- seismic profile
 - Sugar Loaf High 178, 180–181, 186
- seismic stratigraphy 175, 182–183
- SEM *see* scanning electron microscope
- sequence stratigraphy
 - Campos Basin 230, 234, 235, 236–238
 - Ediacaran microbialites 92, 93

- sequences of deposition, Bajocian 158, 172
 regressive 163–169
 transgressive 161–163, 164
- shoreline carbonates 271, 280
- shrub
 defined 211
 facies 53, 213–215
- shrub size
 analytical methods 196–198, 199
 sorting 197, 200–203, 204, 205
- side-wall core 231, 232, 237–238, 240
 and image logs 221
 samples 223, 224
- silicate gel 213–217
- Skyline research core 270
 Eocene microbialites 273–279
- slope angle 185, 188
- slope failure 184
- soft sediment deformation 113, 117, 119
- sonic wireline log 221, 224, 229, 232
- sorting index 200, 203, 204
- South Atlantic
 lacustrine carbonates 209–217
- Spain, Moscardón platform 155–172
- sponge, siliceous mounds 155–171
- spring mounds 38, 47, 48, 51, 52, 56
 sublacustrine 41–43
- spring pinnacles 33, 36, 41–43, 51, 57
 fabric 47
 Mono Lake, California 40
- spring-fed carbonates 18–19, 25, 27
- stable isotope 57, 139, 146, 237, 238
 carbonates 247–248
 microbialites, Oman **145**
 mud 251–252
 non-marine carbonates **21, 23, 25, 37, 39,**
 51–53
 study method 19, 24
 thrombolites 150, 151
- statistical analysis
 microbialite images 76–80
- stevensite 182, 213–216, 226, 231, 235,
 237, 239
- storm wave base 169, 227, 230, 231
- stratigraphic analysis
 borehole image log facies 239–240
- stratigraphy
 Barra Velha Formation 210
 Campos Basin 223
 Moscardón, Sapin 161–169, 170
 Nama Basin, Namibia 88, 89
 Sugar Loaf High 181–182
 Unita Basin 268, 270, 278
- stromatactis cavity 160, 161
- stromatolite 2, 51, 53, 54, 91, 125
 abiogenic 216
 borehole image interpretation 232, 233
 classification 74–75
 columnar 116
 Cretaceous 210–211, 228, 235, 239
 development 287
 digitate 202, 274–275, 280, 281
 dome 118, 120
 Eocene 271, 272, 273, 277, 281, 282
 modern 80–83, 263, 266
 porosity study 70–84
 Proterozoic 75–80
- structure, microbialites 99–102
- struvite 148
- Sturtian glaciation 111
- stylolite 102
- sub-lacustrine
 precipitation mechanism 54
 spring mounds 41–43, 49, 50
- sub-oxic environment 147
- sub-salt microbialites
 offshore Brazil 193–205
- subsidence
 Iberian Basin 156
 thermal 177, 179, 187
- Sugar Loaf High 175–189
 bathymetry 183
 data 177
 geology 176–177
 sedimentary facies 181–188
 stratigraphy 181–182
 structure 177–181, 187
- sulphate 209–210, 215
 sulphate reducing 54, 150
 bacteria 10, 159, 292–294, 296, 297
- sulphide oxidation 253
- syndepositional deformation
 Ediacaran microbial carbonates 87–106
- Tahiti microbial reef 287–297
- talc 213, 214, 215
- taphonomic window 4
- tectonic setting 10
- tectonically controlled fractures 103
- teepee structure 225
- temperature 19, 213
 Bajocian 156–157
 dolomite formation 252
 hypersaline lagoon 247–248
 pore water **247, 248, 249, 250**
 seasonal variation 244
- Tengiz Field 7
- Terminal Horst Platform 183–185, 186–187, 188
- Tethys 155, 156
- texture 51, 128, 198
 boundstone/cementstone 50
 lacustrine carbonate 209–217
 microbialites, Oman 127–132
 pore characterization 193–205
- thermal subsidence 177, 179, 187
- thermal travertine 45
- thermal water 53, 54, 55, 57
 stable isotope 52
- thermogene travertines 18
- thermometer, carbonate-water 247
- thin-section *see* photomicrographs
- thrombolite 2, 7, 74
 borehole image interpretation 232
 Cretaceous 215, 233, 235, 240
 development 287
 Ediacaran 91, 98, 99, 100, 102–104
 Ediacaran-Cambrian 125, 126, 127
 Eocene 271–273, 275, 276–277, 280, 282

- thrombolite (*Continued*)
 stromatolitic, layered and massive 134–137, 146
 deposition and preservation 148–149
see also bushy thrombolite
- tidal fluctuation 149
- topographic high
 compaction of 101
 Sugar Loaf 181, 182, 186
- topography-controlled fractures 103, 104, 105
- tortuosity 200, 201, 203, 204, 205
- trace mineral assemblages 147
 microbialites, Oman 125–137
- training images 78
- transgressive–regressive cycle 231, 234, 235, 237, 239
- travertine 2, 6, 9, 57, 213
 modern 217
 precipitation mechanism 54
 shrubs 211
 texture 216
- travertine, hydrothermal 28, 29
 depositional setting 33–35, 39, 42, 43–45, 46
 fabric and pore type 47–53
 geological summary 24–25
 precipitation mechanism 54
- travitufa 19
- tufa 2, 4, 6, 9
see also fluvial tufa
- tufted mat 128, 138, 148, 150
- U-Pb zircon age 89
- Unita Basin
 depositional environment 269
 geology 271–279
 West Willow oil field 279–284
- USA
 distribution non-marine carbonates 26
- variographic analysis 79
- vent, hydrothermal 27, 36, 43, 55, 57
- volcanic feature 183
- volcanism 9, 56, 181, 237
 borehole image interpretation 235
 and continental break-up 179
 and lake chemistry 215
- volume, representative elementary (REV) 60, 69, 82
- vug 97, 105
- water
 chemistry 21, 23, 25
 cycle, hypersaline lagoon 252
 evaporation 244
 properties, Great Salt Lake 262–263
 sampling and study methods 244–246
- water temperature 47
- water temperature, monitoring 246, 247
- water/sediment temperature 247, 249
- wave base 169–172
- wedging geometry 179, 180–181, 182
- West Willow Creek oil field 271, 279–284
- Williston Basin, Canada 9
- wind-blown quartz 149
- wireline logs 284
 facies analysis 221–240
 Unita Basin 270, 278
- Witputs sub-basin 88, 89
- worm tubes 161
- X-ray diffraction analysis (XRD) 128–130, 137, 141, 142
 dolomite crust 252
 microbial mat 250
- Zaris sub-basin 88, 89
- Zebra River Canyon system 93
 carbonate platform 89, 90–91
 sedimentological overview 95–99
- zonation, cement 139, 144