

Index

- acclimation
 induction of, 193, 198–205
 to light, 177, 185, 189–91, 263, 264
 in *Peltigera scabrosa*, 177
 in *Peltigera praetextata*, 175, 177, 200, 263, 266
 in *Stereocaulon paschale*, 177
 to temperature, 150, 175–7, 191, 192, 205, 262, 266
- aerodynamic resistance of branches, 51
- albedo, 3, 4, 11, 18–22, 260
- Alectoria*, 32, 225, 259, 260
- ochroleuca*, 20, 46, 48, 51, 174–5, 223–4
- sarmentosa*, 210
- allelopathy, 97, 98, 100, 101
- alpine lichens, 19, 207, 257, 266
- aluminium, 60, 97
- anion uptake, 63, 66, 67, 71, 73, 74, 91
- area to weight ratio (*A/W*), 18, 31, 33, 46–7, 259, 260
- arctic lichens, 8, 31, 117–18, 174, 206–8, 238, 257, 266
 photosynthetic temperature optima, 206, 207, 210, 260
- arsenate (As^{5+}), 73, 74
- Aspicilia*
calcareae, 6
esculenta, 31
fruticulosa, 31
lacustris, 163, 165, 166
- Actacama Desert, 35, 37
- Bacidia chlorococca*, 87
- Biatora granulosa*, 9, 14, 15
- bisulphite, 78, 80, 81
- borderline ions, 69, 71, 80
- boundary-layer resistance, 24, 44, 45, 48, 50, 51, 142, 144, 153, 154, 216
- Bryoria*, 20, 22, 32, 160, 162, 259, 260
- nitiidula*, 17, 22, 23, 48, 49, 51, 207, 208
- americana*, 160, 161
- calcium (Ca^{2+}), 60, 61, 65, 68, 69, 80, 88, 93, 96, 108
- canopy
 closed, 5, 11, 53, 211, 248
 microclimate, 11, 24–6, 36, 53–9, 95, 162, 215, 263
- resistance, 44, 46, 48, 250
 temperature, 24–7, 51, 55–7, 211
 temperature profile, 24, 51, 55
- capacity
 photosynthetic, change in, *see* photosynthetic capacity change
 water-holding, 33, 148, 248–50
- carboxylation resistance, r_c , 153, 155
- cation exchange, 63–7, 95
- cation uptake, 63–7, 91, 95, 96
- cephalodia, in *Peltigera aphthosa*, 24, 124, 136–8
- Cetraria nivalis*, 46, 144, 174–5, 207
- chelation, 64, 93, 95
- Cladonia*
gonecha, 16
impexa, 36, 82
rangiferina, 36, 147, 186–8, 204, 221, 251
rangiformis, 19, 66, 68
stellaris, 17, 36, 49–51, 54–9, 76, 79, 94, 95, 98, 99, 147, 188, 207, 250–2
uncialis, 35, 36
- class A ions, 63, 69, 71, 80, 88, 139
- class B ions, 69, 71
- CO_2 burst, 228, 233
- CO_2 diffusive resistance, 142, 144, 152, 153, 155, 156, 158, 160, 162, 207, 234, 247, 248, 250, 259
- limitation, 142, 144, 145, 153–8, 238, 257, 259
- Collema* 107, 113, 125, 160, 162, 169
crispum, 106
flaccidum, 35
furfuraceum, 107, 113, 115, 131, 169, 170, 265
- Conizaeoidion association, 88
- copper, 66, 69
- cortex,
 light screening, 162, 248–50, 259
 thick, 41, 48, 158, 248, 250, 259
 thin, 162, 250
- cryptoendolithic, 9
 ^{137}Cs , 95, 198
- cyphellae, 159
- dark respiration, 22, 123, 124, 141, 176, 189, 191, 216, 223–5, 227, 228, 237, 239, 248
 (see also respiration)
- denitrifying bacteria, 139

288 *Index*

- Dermatocarpon miniatum*, 35
 desert,
 Atacama, 35, 37
 lichens, 4, 35, 40, 74, 80, 163, 211, 222, 223,
 257, 260
 Namib, 35–7
 Sonoran, 35, 37
 dew point, 30
 temperature, 36, 39
 diffusive resistance, 248
 boundary layer, 142, 144, 153
 internal, 152, 153, 156, 158, 160, 162, 207,
 234, 247, 250, 259
 in *Ramalina maciformis*, 155, 158, 234
Dryas integrifolia, 51, 52
- ecotypes,
 of *Cladonia rangiferina*, 148, 202, 248, 251
 of *Cladonia stellaris*, 148, 250, 251
 of *Peltigera aphthosa*, 148, 248, 250
 efflux,
 of carbohydrate, 78, 151, 170
 of potassium, 68, 78, 165
 electrolyte sorption, 63–5
 energy,
 balance, 1, 4, 9, 18, 227, 257
 coupling, 183, 189, 193, 239
 transfer, 2, 6, 18, 25, 27, 45, 48, 50
 turbulent transfer, 2, 27, 50
 transduction, 183, 188, 189, 193, 198, 201,
 202, 205, 266
 uncoupling, 183, 188, 193, 202, 239, 266
 epiphytes, 27, 87
 evaporation,
 gradient, 43, 45, 51, 55
 rate, 22, 29–31, 33, 40–3, 45, 46, 48, 50, 51,
 160, 162, 222
 thallus, 19, 22, 24, 29–31, 33, 40, 41, 45, 48,
 50, 52, 160, 162, 222
 topographic control, 50
 evaporative,
 cooling, 12, 27
 losses, 30, 46, 58, 260
 resistance, 44–6, 48, 51
Evernia prunastri, 86, 87
 photosynthetic capacity of, 174, 191
 exchange,
 ion, 63–8, 78, 95, 141, 145
 mechanism, 63–6, 72, 78, 153, 250, 260
 strong field, 63–5
 weak field, 63–5
 experimental design, 113, 116–18, 141, 143,
 211
 experimental replicates,
 pretreatment, 104, 142, 151
 rehydration of, 116, 151, 228
 storage of, 108, 116, 127, 142, 151, 177, 193,
 196, 200, 216, 225, 239, 248
 extracellular uptake, 63, 96
 Fe/Ti ratio, 61
 fire succession, 9, 11, 12, 53, 58, 215
 flow systems, 142, 143
 fog, 35–8, 113, 118, 127, 132
 freezing,
 and *Alectoria ochroleuca*, 223
 and net photosynthetic rate, 176, 223–5
 and respiration, 176, 223–5
 stress, 223–6
 functional group, 63, 64, 66–8, 71
 gas exchange,
 measurement, 141–3, 145, 153, 237
 rates of, 141–5, 149, 151, 152, 155, 158, 162,
 163, 177, 237, 248, 250, 251
 and thallus moisture, 151, 152, 158, 237,
 248, 250
 and thallus temperature, 141, 151, 152, 162,
 177, 210, 237, 250, 251
 genotypic plasticity, 246, 251
 glucose transport,
 in *Collema furfuraceum*, 170
 in *Peltigera polydactyla*, 168
 in *Peltigera praetextata*, 167
 in *Peltigera rufescens*, 169
 and temperature, 167, 168
 and thallus hydration, 167, 168
 glutamine synthetase, 138, 139
 ground heat flux, 3, 4, 12, 27
 growth,
 centrifugal, 240
 centripetal, 240
 intercalary, 240
 models of, 227, 238, 245
 non-linear phase, 240
 in *Parmelia conspersa*, 241, 243, 244
 in *Parmelia glabratula*, 241, 243, 244
 in *Parmelia saxatilis*, 241, 244
 in *Physcia orbicularis*, 241, 243
 rates, 47, 220, 227, 230, 231, 238–41, 243,
 247, 260
 relative, 240, 247
 strategies, 45, 172, 246, 247, 260
 and thallus moisture, 12, 246, 260
 heat stress, 162, 210, 211, 218, 220, 222, 256,
 257
 (see high temperature stress)
 heat tolerance, 218, 222
 seasonal changes in, 220
 heterocyst frequency, 104, 124
 high temperature stress,
 in *Alectoria sarmentosa*, 210
 in *Cladonia pyxidata*, 210
 in *Cladonia rangiferina*, 218

- in Fulgensietum continentale association, 211
 and net photosynthesis, 29, 162, 206, 210, 211, 214, 216, 218, 223, 227, 257
 and nitrogenase activity, 126, 211, 216, 218, 222
 in *Parmelia praetextata*, 211, 212, 219
 in *Peltigera rufescens*, 213, 216, 219, 222
 in *Peltigera scabrosa*, 214, 215
 and respiration, 210, 211, 216, 218, 222, 223, 227
 in *Stereocaulon paschale*, 214
 in Usneetum barbatae association, 211
 hydration,
 and CO₂ burst, 228–33
 and net photosynthesis, 141, 151–6, 160–2, 248
 and nitrogenase activity, 102, 104–7, 109, 116, 131, 135, 139
 and respiration, 141, 155, 207, 208, 227, 228, 231–7
Hypogymnia physodes, 26, 27, 71, 72, 78, 87, 230, 250
- I_k , 179–83
 in *Cladonia rangiferina*, 187, 188
 in *Peltigera praetextata*, 189
 indicator species, 88
 induction of capacity change,
 in *Caloplaca trachyphylla*, 205
 in *Peltigera praetextata*, 193–7
 in *Peltigera scabrosa*, 193
- ion,
 exchange, 63–8, 78, 95, 141, 145
 exchange capacity, 64, 78, 141, 145
 toxicity, 71, 78, 80, 81, 88
 uptake, 60, 63–7, 71, 73, 74, 91, 95, 96, 245
- ions,
 borderline, 69, 71, 80
 cellular location, 61
 class A, 63, 69, 71, 78, 80, 88, 139
 class B, 69, 71
 iron, 61, 64, 66, 84, 93, 96
- $K \downarrow$, 3, 4
 $K \uparrow$, 3, 4
- $L \uparrow$, 3, 4
 $L \downarrow$, 3, 4
 laminar boundary layer, 2, 3, 18
 laminar flow, 2
 latent heat flux, 3, 18, 27, 48, 51, 222
LE, 3, 27, 257
 lead, 66, 68
Lecanora conizaeoides, 75, 76, 83, 86, 87
Leptogium cyanescens,
 nitrogenase activity, 113
- Letharia vulpina*, 26, 27
 lichen,
 arboreal, 25, 211, 259
 competition, 12, 78, 87, 101, 247, 257, 259, 260
 corticolous, 27, 52, 60, 88, 95, 97, 259
 crustaceous, 1, 6, 27, 37, 86, 246
 desert, 4, 35, 37, 39, 40, 74, 80, 86, 163, 209, 211, 222, 223, 257, 260, 261
 epiphyllous, 4
 foliose, 1, 7, 18, 27, 35, 159, 240
 fruticose, 1, 18, 25, 27, 35, 159, 240
 growth rates, 47, 220, 227, 230, 231, 238–41, 243, 247, 260
 pendulous, 1, 25, 27, 206
 rock, 1, 6–9, 25, 27, 37, 60, 61, 87, 91–3, 96, 148, 206, 241, 243, 244
 soil, 1, 4, 6, 11, 12, 18, 25, 37, 53, 55, 58, 86, 91, 92, 98, 100, 101, 139, 208, 211, 257
 terricolous, 4, 93, 160
 woodland, 5, 6, 9, 11, 12, 14., 53, 58, 196, 211, 212, 215, 218, 233, 248, 264, 266
- Lichina confinis*, 106, 113, 119
 light,
 acclimation, 177, 181, 189, 263
 saturation, 172, 179, 180, 187, 189, 191, 192, 209
 light stress, 19, 248, 249
 in *Peltigera aphthosa*, 248, 249
- Lobaria*,
pulmonaria, 151
 low temperature stress, 223–6
 in *Ramalina maciformis*, 223
 and respiration, 222–5
 in *Rocella fucoides*, 223
 in *Umbilicaria vellea*, 223–5
- magnesium, 61, 65, 93
 membrane, 78, 97, 153, 178, 220
 integrity, 68, 78, 165, 225
 and ion leakage, 68, 69
 mercury, 69
 mesic, 33, 41, 51, 160, 162, 169, 170, 228, 234
 microclimate,
 of a canopy, 24–7, 51, 53, 55, 95, 215, 248, 263
 of a surface, 9, 11, 50, 53, 55, 58, 98, 215, 248
 molecular diffusivity, 2
 mosses, 11, 31, 101, 210
 mulching, 12, 98
 mycorrhizal association, 98
- ¹⁵N₂, 102, 137–9
 and cephalodia, 136–8
 Namib Desert, 35–7
Nephroma arcticum,
 nitrogenase activity in, 113, 117, 119, 132

290 *Index*

- net photosynthesis,
 in *Caloplaca trachyphylla*, 192, 194, 195
 capacity changes, 172, 173, 175–7, 179–205,
 210, 253, 260–3
 in *Cladonia rangiferina*, 176, 218, 221, 251
 in *Collema furfuraceum*, 160, 161, 177, 263,
 265
 and hydration, 141, 145, 148–50, 152–6,
 158, 160–2, 166, 207, 208, 234, 247, 248,
 250, 260, 263
 and light, 40, 162, 172, 177–92, 248–50,
 261–3
 measurement of, 141–3, 145, 153, 154
 and moisture, 143–5, 152, 158, 160, 198,
 207, 234, 248, 250, 253, 257, 260, 261, 263
 in *Peltigera polydactyla*, 162, 168, 177, 197,
 199, 200
 in *Peltigera praetextata*, 145, 177, 189–91,
 200, 263
 in *Rhizocarpon superficiale*, 261, 264
 seasonal pattern of, 175, 177, 253, 260
 and temperature, 172, 175–7, 187, 191, 192,
 194, 198, 200, 206–8, 210–18, 223, 227,
 250, 251, 253–5, 258, 260, 261, 263, 266,
 267
 net photosynthetic,
 acclimation, 175–7, 187, 191–5, 223, 260–3
 maximum, 147, 148, 152, 155, 162, 179–93,
 195, 196, 198, 204, 207, 208, 237, 247,
 248, 251
 measurement, 141–3, 145, 153, 154
 response matrix, 149, 173–5, 191, 192, 194,
 208, 224, 251, 252, 254, 255, 264, 265
 seasonal pattern, 172, 175–7, 179–205, 253,
 260
 temperature optima, 175, 177, 200, 206,
 207, 210, 260, 261, 263
 net radiation, 2, 3, 11, 12, 22, 48, 249, 250,
 257
 nickel, 61, 66, 68, 69
 nitrogen fixation, 102–40
 nitrogenase activity,
 and acetylene stimulation, 105, 123
 in the dark, 115, 118–21, 123–4, 126–9, 133,
 136
 and dehydration, 107–11, 136
 and drought, 108, 109, 111, 135, 136
 and glucose, 117, 122, 123
 hydration response, 104–7, 109, 116, 121,
 125, 131
 and high temperature, 111–16, 123, 216,
 218–22
 and light, 108, 109, 113, 118–27, 129, 131,
 132, 135, 136
 and moisture, 102, 104, 106, 109, 113, 116,
 117, 124, 125, 131, 132
 and low temperature, 116–18, 123–31, 135
 and photophosphorylation, 118, 121, 122
 response matrix, 112–15, 126, 130–2, 136
 and snow cover, 125–32
 temperature adaptation, 118, 125, 126
Notoc, 102, 124, 136, 137
*P*_{max}, 179–93
 and acclimation, 187, 191
 in *Cladonia rangiferina*, 187, 188
 in *Peltigera praetextata*, 189
 and PSU density, 179, 180, 182, 185
 and temperature, 180, 184, 187, 191–3, 208,
 209, 253, 254
 and uncoupling, 183, 184, 186, 188, 193, 223
 paraplectenchymatous cortex, 158
Parmelia, 76, 247, 250
caperata, 84, 144, 158, 234, 236, 247
consersa, 93, 241–4
disjuncta, 7–9, 191, 216, 217
furfuracea, 93
perlata, 83, 84
saxatilis, 72, 163, 166
 particulate, 61, 63, 91, 95
 fall-out, 62
Paxillus involutus, 98
 Pb, 69
Peltigera, 5, 98, 104, 105, 107, 113, 116, 117,
 167, 176, 200, 201, 203, 204, 230, 234
aphthosa, 24, 125, 126, 132, 148, 149, 160–
 2, 248, 249
canina, 32, 97, 106, 107, 132
polydactyla, 105, 108–11, 119–23, 146, 147,
 168, 196, 197–200, 228–32
praetextata, 5, 105–7, 112, 113, 116, 118,
 119, 125, 145, 167–9, 189–91, 196, 211,
 212, 219, 237
rufescens, 5, 106, 107, 113, 114, 118, 119,
 125, 127–9, 169, 192, 193, 208, 213, 219,
 220, 253, 255
scabrosa, 132, 178, 193, 214, 215, 238
 pendulous lichens, 1, 25–7, 206, 258
 in *Cladonia rangiferina*, 251
 in *C. stellaris*, 251, 252
 and photosynthetic capacity, 251, 252
 phosphate uptake, 71–3
 photosynthate, 78, 233
 transport of, 167–70
 photosynthetic,
 adaptation, 29, 38, 153, 155, 163, 175, 177,
 209, 256, 257, 259, 261
 capacity, 172–9, 184, 186, 187, 191–3, 200–
 2, 205, 210, 220, 223, 225, 253, 255
 compensation, 163, 175, 208, 248
 maximum, 147, 148, 152, 155, 162, 179–93,
 195, 196, 198, 204, 207, 208, 237, 247,
 248, 251
 measurement, 141–43, 145, 153, 154
 pigments, 178–81, 225

- response matrix, 149, 173–5, 191, 192, 194, 208, 224, 251, 252, 254, 255, 264, 265
 strategy, 158, 162, 169, 182, 191, 246, 257, 259–61, 263, 264, 266
 stress, 162, 163, 166, 167, 202, 206, 210, 212, 214–16, 218, 220, 223–5, 247–9, 256, 257
 temperature optima, 175, 177, 200, 205–7, 210, 260, 261, 263
 photosynthetic acclimation, 175–7, 187, 191–5, 223, 260–3
 in *Caloplaca trachyphylla*, 192, 194, 195
 induction of, 193–205
 photosynthetic capacity change, 172, 173, 175–205, 210, 253, 260–3
 in *Alectoria ochroleuca*, 174, 175, 191, 223
 in *Bryoria nitidula*, 174, 175, 191
 in *Cetraria nivalis*, 174, 175
 Cladonia rangiferina, 176, 186–8, 202, 205, 220, 221
 Evernia prunastri, 173, 174, 191
 and freezing, 176, 223, 225
 induction of, 193–205
 in *Peltigera polydactyla*, 177, 200, 202
 in *Ramalina farinacea*, 173, 174, 191
 in *Stereocaulon paschale*, 177
 in *Umbilicaria papulosa*, 177
 photosynthetic temperature optimum, in *Bryoria nitidula*, 174, 175, 208
 in *Peltigera rufescens*, 208, 209, 254
 seasonal changes in, 175, 210, 260, 261, 266
 photosynthetic uncoupling, 183, 186, 192, 210, 223, 239
 in *Cladonia rangiferina*, 176, 186–8, 202, 205
 induction of, 193–205
 n *Peltigera praetextata*, 193
 photosynthetic units, 179–87
 change in density of, 181, 185, 189, 190, 238
 change in size of, 181, 184
 uncoupling of, 183, 186, 192, 210, 223
 photosystem 1, 179
 photosystem 2, 179, 183
 PI curve, 179–90
 α , 179, 181, 187, 189, 191, 192
 and acclimation, 184, 185, 187, 191, 192
 in *Caloplaca trachyphylla*, 192, 194
 in *Cladonia rangiferina*, 186, 187, 188
 P_{\max} , 179–95
 in *Peltigera praetextata*, 189, 190
 in *Peltigera rufescens*, 191–3
 and uncoupling, 186, 188, 192
 pK_a , 64
 pigmentation, 18, 19, 182, 183, 185, 250, 259
 podetia,
 black, 19, 20
 white, 19, 20, 95
Polytrichum piliferum, 9, 11, 16
 pored epicortex, 158
 potassium, 60, 65, 66, 68, 69, 72, 78, 165, 245
 potassium efflux, 68, 78, 165
 profile,
 canopy, 24, 51, 53, 55–8
 humidity, 51, 55, 57, 58
 temperature, 1, 3, 4, 8, 24, 51, 55
 wind, 8, 50, 51
 PSI, 179, 183, 186
 PS2, 179, 183, 186, 198
 pseudocyphellae, 155, 158, 159
Pseudocyphellaria, 152, 234
 amphisticta, 153, 155
 PSU, 184, 189, 191, 202, 266
 density, 181–3, 185, 210, 238, 239
 size, 180, 181, 183, 185, 192
 synthesis of additional, 187, 264
 radiation, 1, 4–8, 18, 19, 23–5, 27, 30, 36, 37, 42, 43, 52, 55, 58, 131–4, 136, 241, 243
 net, 2, 3, 11, 12, 22, 48, 249, 250, 257
 raised beach, 17, 50, 208
Ramalina,
 farinacea, 75, 173, 174
 maciformis, 38–44, 155–8, 163, 208, 209
 menziesii, 38, 240
 reticulata, 65
 usnea, 259
 relative humidity, 34–6, 38, 51, 55, 162, 163
 relative net photosynthetic rates, 38, 145, 148, 149, 152
 relative thallus hydration, 33–35, 38, 148–50, 152, 247, 248
 resaturation respiration, 228–33
 in *Cetraria cucullata*, 230
 in *Chondropsis*, 230
 in *Peltigera polydactyla*, 228–30, 232, 233
 in *Tortula ruralis*, 232
 resistance,
 aerodynamic, 51
 boundary layer, 24, 44, 45, 48, 50, 51, 142, 144, 153, 216
 canopy, 44, 46, 48, 250
 evaporative, 44–6, 48, 51
 grids, 50, 51
 respiration, 227–40
 basal, 228–30
 burst, 228, 233
 and growth, 211, 220, 227, 230, 231, 238, 239, 244
 moisture interaction, 234–7
 and nitrogenase activity, 119–24, 151
 in *Peltigera aphthosa*, 124, 234, 235, 248
 in *Peltigera dolichorhiza*, 234, 235
 in *Peltigera polydactyla*, 177, 195, 200, 228–30, 232–4, 237
Pseudocyphellaria billardieri, 234
 in *Ramalina maciformis*, 155, 223, 234

292 *Index*

- respiration (*Contd*)
 resaturation, 228–33
 seasonal changes in, 124, 141, 173, 177, 187,
 191, 192, 210, 220, 225, 238
 in *Sticta caperata*, 234
 and thallus age, 145, 146, 237
 and thallus hydration, 231–4, 236, 237, 248
 response matrix, 149, 173–5, 191, 192, 194,
 224
 in *Caloplaca trachyphylla*, 192, 194
 in *Cladonia stellaris*, 251, 252
 in *Collema furfuraceum*, 113, 131, 265
 in *Peltigera praetextata*, 113, 200
 in *Peltigera rufescens*, 113, 191, 208, 222,
 254, 255
Rhizocarpon, 163
superficiale, 6, 7, 23, 27, 28, 148, 150, 264
 boundary layer, 27–9
 and snow melt, 23
 thallus temperatures, 27–9
 ridge, 50, 51, 175, 207, 250
 summits, 22
 tops, 17, 22, 23, 208
- saturation vapour pressure, 36, 38, 43, 45
Selaginella lepidophylla, 31
 sensible heat,
 exchange, 18, 24, 45, 48, 162, 256, 260
 flux, 4, 12, 18, 27, 37, 48
 silver, 69
 snow, 3, 140
 accumulation, 266
 cover, 17, 22, 125–7, 132, 260
 melt, 17, 22, 23, 29, 131, 162, 192, 205, 218,
 230, 231, 260, 263, 266
 melt pockets, 17, 22, 23
 and nitrogenase activity, 125–7, 129, 131,
 132, 218
 SO₂,
 concentration, 63, 76, 78, 81, 96, 143, 145
 fumigation, 75, 81, 82, 86, 88, 90
 plume, 83, 84
 pollution, 74, 75, 81, 83, 86, 88, 90
 Sodium, 65, 81
 Soil,
 moisture, 4, 6, 12, 37, 55, 58, 59, 100, 101,
 257
 surface, 1, 3, 4, 6, 11, 12, 18, 25, 37, 53, 55,
 58, 91, 92, 98, 208, 211, 257
 temperature, 1, 3, 4, 6, 11, 12, 18, 25, 55, 59,
 98, 100, 101, 139, 208, 211, 257
 temperature profile, 1, 3, 4, 55
 solar radiation, 1–3, 5, 7, 22, 25, 27, 29, 30,
 43, 158, 160, 162, 250
Solorina crocea,
 nitrogenase activity in, 113, 117, 119
 Sonoran desert, 37
 Sr²⁺, 65–7
⁹⁰Sr²⁺, 94, 95
Stereocaulon,
paschale, 14–16, 83, 110, 117, 199, 131–6
saxatile, 31, 32, 79
vulcani, 93
 woodland, 9–12, 14, 58, 215
Sticta,
 CO₂ diffusive resistance in, 159, 234
weigeli, 97
 stress,
 drought, 39, 109–11, 136, 228
 high temperature, 210, 211, 214, 216, 218,
 222, 223, 226
 light, 19, 248, 249
 low temperature, 223–6
 strong field exchange, 63–5
 strontium, 64, 65
 succession,
 fire, 9, 11, 12, 53, 58, 215
 sequence, 9, 11, 14, 53, 58, 215, 248
 sulphate, 74, 76, 86
 sulphur, 69, 76, 78, 80–4, 86–8, 90
 emissions, 60, 74, 75
 surface area, 11, 37, 47, 61, 80, 248
 and energy exchange, 18, 260
 to volume ratio, 33, 162
 to weight ratio, 18, 31, 33, 38, 46–7, 259, 260
 surface,
 active, 1, 4, 36, 37
 albedo, 3, 4, 11, 18, 22, 260
 leaf, 7, 18, 24, 25, 142
 ground, 1, 3, 4, 12, 25, 27, 36, 248, 260
 maximum temperature of, 5–8, 12, 14, 19,
 24, 27, 162, 208, 211, 216, 218, 257–9
 reflectivity of, 3
 rock, 1, 6–9, 25, 27, 37, 91, 92, 206, 244
 soil, 1, 3, 4, 6, 11, 12, 18, 25, 37, 53, 55, 58,
 91, 92, 98, 208, 211, 257
 temperature, 1–4, 6–9, 11, 12, 14, 17–19,
 22, 24, 25, 27, 36, 42, 43, 45, 52, 55, 98,
 142, 152, 162, 206, 208, 211, 215, 216,
 218, 239, 257, 259, 260
 temperature,
 acclimation, 175–7, 187, 191–5, 223, 260–3
 air, 1, 2, 4, 6–8, 12, 14, 18–20, 22–5, 27, 28,
 35, 36, 42, 43, 45, 48, 198, 210, 211, 218
 gradient, 1, 2, 43, 51, 55, 56, 95
 leaf, 7, 18, 24, 25
 profile, 1, 3, 4, 8, 13, 24, 51, 55, 56
 rock, 1, 6–9, 27, 28, 206, 241
 stress, 12, 19, 29, 136, 162, 209–16, 218–20,
 222–7, 256, 257
 surface, 1–4, 6–9, 11, 12, 14, 17–19, 22,
 24–8, 36, 42, 43, 45, 52, 55, 56, 162, 206,
 208, 211, 215, 216, 218, 257–9, 260
 thallus, 1, 4–9, 12, 14–29, 36, 39, 40, 41, 45,
 48, 55, 56, 95, 118, 124, 127, 131–6, 151,
 162, 206–10, 212, 216, 222, 250, 253, 256,
 258–60, 263

293 *Index*

- thallus,
 albedo, 18, 22, 258, 260
 anatomy, 31, 44, 153, 159, 160, 237, 256
 colour, 18–20, 22–4, 29, 45, 216, 250, 256, 260
 evaporation, 19, 22, 24, 29–31, 33, 40, 41, 45, 46, 48, 50, 52, 160, 162, 222
 hydration, 18, 31–42, 95, 104–7, 10, 116, 121, 125, 126, 131, 135, 138, 139, 141, 148–153, 247, 248, 250, 251, 259, 260–3
 internal resistance, 44, 48, 145, 152–6, 158, 160, 162, 207, 234, 247, 248, 250, 259
 microclimate, 50, 55–8, 95, 246, 248
 morphology, 18, 25, 33, 41, 45–8, 159, 256, 258, 260
 operating temperature, 1, 4, 8, 29, 206, 208–10, 212, 222, 238, 239, 256, 259, 260, 262, 263
 saturation, 31–4, 105, 109, 113, 116, 117, 141, 145, 151–3, 155, 156, 161, 162, 166, 231, 232, 234, 248
 surface area, 18, 31, 33, 38, 162, 258, 259
 temperature, 1, 4–9, 12, 14–29, 36, 39, 40, 41, 45, 55, 56, 95, 118, 124, 127, 131, 136, 151, 162, 206–10, 212, 216, 222, 250, 253, 256, 258–60, 263
 water economy, 158–60
 thallus saturation,
 and internal resistance, 145, 152–6, 162, 207, 234, 247, 248
 and net photosynthesis, 141, 145, 148–50, 152, 153–6, 160–2, 207, 208, 234, 248, 250
 relative, 34, 38, 50, 145, 152, 162, 167, 248
 and respiration rate, 231, 232, 234, 236, 237, 248
Thamnolia, 19–20
 thermal environment,
 of bark, 25–7
 of a canopy, 24, 25–7, 211
 of rock, 8, 25, 206
 of soil, 4, 13, 98
 thermal operating environment, 4, 8, 29, 206, 212, 238, 259, 260, 262, 263
 thermal stress, 29, 209–16, 218–20, 222–7
 tomentum,
 and diffusive resistance, 155, 161, 162
 of *Peltigera aphthosa*, 161
 tropical lichens, 222, 257, 259
 photosynthetic temperature optima, 206, 207, 210
Umbilicaria, 48, 149, 176, 224, 225, 230, 238–40
cylindrica,
deusta, 33, 176, 192
mammulata, 32, 176
muhlenbergii, 68–70, 73, 74, 78–81, 176
papulosa, 33, 97, 176
rigida, 23
vellea, 32, 176
 uptake,
 anion, 63, 66, 67, 71, 73, 74, 91
 cation, 63–7, 91, 95, 96
 extracellular, 63, 96
 extracellular, 63, 96
 intracellular, 67, 71
Usnea, 32, 76, 206, 234, 259, 260
fulvoreaegens, 27
subfloridana, 76, 77
 vapour phase, 34, 35, 38
 vapour pressure deficit, 36
Verrucaria, 163, 166
elaomelaena, 163, 165, 166
 woodland, 59
 canopy, 5, 11, 53, 187, 211, 215, 233, 248
Cladonia, 11, 12, 14, 58
 lichen, 5, 6, 9, 11, 12, 14, 53, 58, 196, 211, 212, 215, 218, 233, 248, 264, 266
 spruce-lichen, 10, 11, 53, 54, 218, 248
Stereocaulon, 9–12, 14, 215
 wetting,
 and drying cycles, 96, 138, 139, 165, 167, 169, 230
 requirement for, 164, 167, 169
Xanthoria parietina, 72, 78, 250
 Xanthorion association, 90
 xeric, 12, 33, 38, 41, 58, 107, 152, 160, 162, 170
 zinc, 66, 69