

Index



- absorbance 7, 114
 absorption 6, 12, 18, 22, 37–40, 58, 60, 62, 63, 104
 absorption coefficients 20, 38, 47, 53
 absorption underwater 60, 62, 63
 acclimation 161, 168, 177–8, 183–4, 190–1, 195–7
 acrylic OP3 221
 action spectra 56, 58, 103, 115, 117, 267, 287
 aerosols 38, 42, 46, 54
 amino acids 138, 151, 152, 162, 163, 251, 254
 ammonia 136, 137
 ammonium 108, 249–51, 265
 ammonium uptake 162, 163,
 Antarctica 2, 9–14, 28, 142, 157, 159, 170, 171,
 240–2, 244, 246–7, 249, 251, 256, 259, 261–2,
 263, 266–8, 279
 antioxidant 178, 191–5
 Arctic 132
 Arctic ozone hole 2
 artificial UVR 57–8, 281
 atmosphere 36, 37, 39, 40
 attenuation 18, 38–40, 58, 60–3, 65, 116, 141,
 265, 296

 bacteria 109, 115–16, 133, 139, 141, 239, 279,
 291, 299, 313–17
 bacterioplankton 3, 30, 134, 153, 171
 bandwidth 73
 biogeochemical cycling 1, 3, 29, 30, 100, 130–1
 biological systems 311
 biological weighting function (BWF) 93, 169,
 248, 249, 258, 280, 285, 287, 301
 body size 292, 298, 299
 Bunsen–Roscoe Principle 297

¹⁴C 100, 118, 138, 239

 cadmium 249
 carbon allocation 158
 carbon budget 116
 carbon cycle 113–14, 311
 carbon dioxide 25, 29, 103, 108, 112–15, 117,
 317, 318
 carbon fixation 112
 carbon flow 310, 317
 carbon monoxide 29, 108, 112–15, 117
 carbonate radical 106
 carbonyl sulfide 29, 108, 112, 113
 carcinogenesis 153, 164
 carotenoids 159, 161, 177, 179, 191, 192
 cataracts 154, 282
 cell cycle 153
 CFCs; *see also* halocarbons 49–51
 Chapman's Photochemical Theory 47
 chlorofluorocarbons (CFCs) 1, 2, 9, 23
 chlorophyll 20, 25–6, 112, 159–61, 171, 240, 260,
 264
 chloroplast 76, 155, 249
 chromium 106
 chromophores 74, 130, 287
 ciliate 316
 clouds 12, 14, 38, 39, 42–4, 46, 49, 50, 55, 61
 coagulation 116
 community 310, 311, 317, 318
 copepods 280–1, 283, 286, 291–2, 294, 312, 314
 Cu 106, 109, 167, 249
 cyanobacteria 154, 155, 157, 158–63, 169, 170,
 246, 248, 253, 256, 261, 314
 cyclobutyl pyrimidine dimer (CPD) 216–21, 227

 D1 protein cycle 28, 156, 157, 168, 244
 Delaware Bay 110

322 Index

- detoxification 191
 Dewar pyrimidinone 216
 diatoms 136, 153, 157, 158, 243–4, 249–52, 254,
 256, 258–61, 223, 265, 312, 314
 dimer 151–5, 214, 262, 283
 dimethylsulfide 105, 112
 dinoflagellate 242, 256, 260–1, 263, 291
 dissolved organic carbon (DOC) 20, 110,
 114–17, 133, 285, 313
 dissolved organic matter (DOM) 20, 29, 30, 100,
 102–4, 106–8, 110, 112–17, 130–44, 207, 212,
 213, 215, 311
 diversity 260
 DNA 29, 76, 152, 178, 180, 186, 187, 190, 246,
 247, 252, 258, 259, 265, 267, 280, 283, 286
 damage 130, 151–4, 169, 207, 216–22, 225–8,
 259
 dimerisation 76
 polymerase 152
 Dobson units 8
 dose 28
 dose-dependence 82
 dosimeter 214, 217, 218

 ecological effects 312
 ecosystem 310–12, 314–18
 effective irradiance (E^*) 78
 enzyme 178, 181, 186, 189–91, 194, 195
 erythema 164, 279
Escherichia coli 208, 217–19
 euphausiids 283, 289
 exposure 169
 exposure response curve (ERC) 80
 extraterrestrial solar radiation 35, 36, 40, 46
 eyespots 166

 fatty acids 290
 Fenton reaction 158
 filters, longpass (cutoff) 88, 89
 fish 3, 153, 162, 164, 279, 282–3, 285–6, 288, 293,
 300, 312, 313, 315
 flagellates 158, 163, 164, 316
 fluorescence 21, 23, 104, 114, 244, 247
 food web 140, 267, 310, 313, 314, 317
 free radicals 8, 105, 109, 131, 280, 290, 291
 fulvic acids 103, 138

 gadusol 185
 glucoside 185
 grazing activity 237, 270, 314, 316
 growth efficiency 223

 halocarbons 49, 50; *see also* CFCs
 heat shock 190
 herbivorous food web 312, 313, 316
 heterocysts 163
 humic substances 20, 103, 108, 114, 117, 130,
 132, 133, 135, 136, 138, 139, 141, 142
 hydrodynamic effects 171
 hydrogen peroxide 30, 103, 106–8, 165–7, 282,
 290
 hydroxyl radical 8, 30, 103, 105, 106, 110, 166–8,
 217, 290

 immune response 164
 interspecific differences 249, 286
 iron 30, 106, 136, 166, 167

 Lambert–Beer law 38, 295
 leucine (Leu) 134, 210–12, 214, 222
 lipids 158, 167, 168
 lysogeny 229

 manganese 106, 109, 249
 mechanism 177, 179, 180, 183, 186, 188, 190,
 192, 196
 melanoma 153
 membrane damage 162, 167
 mercury 112
 mesocosm 315
 methyl bromide 49–50
 microbial activity 117
 microbial food web 30, 144, 312–14, 316, 318
 microbial loop 143, 209, 254
 microzooplankton 314
 Mie scattering theory 39
 mixing 265
 models 12, 52, 285, 297, 301
 atmospheric 35, 46, 53
 hydrologic 60, 62
 mole photon 4, 25
 Montreal Protocol 2, 51
 motility 163, 287
 mycosporine-like amino acids (MAAs) 78, 178,
 181–3, 185, 191, 195, 254, 291
 Mylar 209, 211, 222, 225

 new production 314
 nitrate 103, 168, 264
 nitrite 103, 138, 251, 252
 nitrogen 114
 assimilation 163
 deficiency 162

Index

323

- fixation 163
Nitrosomonas 215
 NO 103, 108
 NO₂ 8, 10, 108
 nucleic acids 109, 115, 151–4, 168
 nucleotide 186–9
 nucleotide excision repair 219–21, 223
 nutrient uptake 162, 163

 ontogenetic development 281, 293
 ozone 1, 6, 7–9, 12, 14, 22, 242, 255, 265
 absorption coefficient 38, 47, 53, 58
 depletion 2, 12, 30, 35, 49, 53, 54, 56, 58, 144,
 208, 217, 241, 262, 280
 hole 1, 10, 11, 13, 35, 49–53, 268, 279
 measurement 47, 51, 52, 56, 57
 natural variability 47–9
 vertical distribution 46, 47

 PAR, *see* photosynthetically available radiation
 particulate organic carbon (POC) 314
 penetration depth 60, 62–5
 peroxides 161, 167, 280, 290
 pesticides 109
Phaeodactylum 86
 photoprotective pigments 291, 292, 294
 phosphate 108, 136, 138, 252
 phosphorescence 21, 23
 phosphorus 114, 163
 uptake 163
 photobleaching 108, 110, 116, 117, 142, 181
 photodamage 182
 photodegradation 115
 photoFenton reaction 166
 photohydrates 151–4
 photoinhibition 28, 29, 182, 183, 187, 189, 109,
 133, 244
 photolyase 219
 photolysis 21, 22, 109, 130, 135, 136, 139, 141,
 143
 photoproduction 137, 141
 photoproducts 151–4
 photoprotection 181, 191, 192
 photoreactivation 178, 186, 187, 189, 219–23,
 225, 226, 228, 283, 285, 287, 289, 290, 298
 photoreceptor 164, 179, 254, 293
 photorecovery 290, 297
 photoreduction 30, 109
 photorepair systems 110, 283
 photosensitisers 155, 160, 161,
 photosynthesis 12, 25, 26, 28, 60, 114, 155, 156,
 237, 249, 252, 253, 258, 263, 265
 photosynthetically available radiation (PAR)
 3–5, 12, 15, 29, 241, 243, 244, 248, 257–9, 261,
 263–6
 photosystem II (PS II) 25, 26, 28, 29, 75, 77,
 155–7, 168, 243, 244, 258
 phycobiliproteins 159, 160, 171, 246
 phycocyanin 159, 160, 171
 physics of light 35, 36
 phytoplankton 3, 20, 28, 171, 237, 238, 239, 240,
 241, 242, 244, 245, 247, 248, 249, 250, 253,
 254, 256, 259, 260, 261, 263–9, 285, 290, 294,
 289, 312–17
 pigments 158–61, 186, 194
 plankton 109, 130, 131, 136, 141
 plants 154, 157, 168
 polar stratospheric clouds (PSC) 10, 11, 49, 50,
 130
 polar vortex 11, 49, 50
 primary productivity 29, 30, 60, 113, 114, 240,
 245, 252, 260, 262
 protection 149, 168, 169, 170, 179, 181, 183, 185,
 186, 190–2, 194, 197
 proteins 153, 154, 159, 160, 162, 164, 168, 179,
 186, 189, 190, 195
 protozoa 314
 pseudo-ecosystem (mesocosm) 316
Pseudomonas stutzeri 210
 pyrimidine (6–4) pyrimidinone photoproduct
 216, 227
 pyrimidine dimers 151, 152–5

 quantum yield 21, 22, 25, 246
 quenching 149, 150

 radiation amplification factor 95
 radiation flux 36, 44, 60
 radiative transfer models 35, 53, 62
 Rayleigh scattering theory 38
 reactive oxygen species 149, 150, 161, 165–8
recA gene 219, 221
 reciprocity 74, 82, 85, 168, 287–9, 297
 regenerated production 314
 remote sensing 60, 112
 repair 149, 150, 156, 157, 177, 178, 180, 183, 186,
 187, 188, 189, 190, 195, 196, 282, 287, 289
 resistance 181, 195, 196
 respiration 162, 168, 237
 Rubisco 155, 157, 158, 171, 244
 Sargasso Sea 110

324 **Index**

- satellite, inferred UV 46, 55, 56
 satellite, ozone measurement 51, 52, 56, 57
 scattering 37, 38, 39, 44, 58, 61, 62
 screening 178, 179, 180, 181, 184, 185, 195, 196
 selenium 249
 shrimp 289
 singlet oxygen 105, 155, 161, 167, 168
 solar simulator 85, 137
 solar spectrum 117
 solar zenith angle (SZA) 6, 12, 14, 38–41, 44, 53, 61
 SOS regulon 219
 Southern Ocean 85
 spectral irradiance 169
 stress 177, 178, 183, 186, 190, 191, 195, 196, 197
 sunburn 164, 279, 281–2, 288
 superoxide 23, 24, 30, 105, 106, 165–7
- temperature 170
³H-thymidine (TdR) 210–14, 220, 222
 tolerance 191, 195–7
 transmission 240
 transmittance 19
 trophic interaction 315
 trophic levels 311–13, 315, 316
 turnover 156
- UF-3 209, 211
 underwater UV
 absorption 58, 60, 62, 63
 models 60, 62
 penetration depth 60, 62–5
 radiant flux 60
 transmission 58
- UV (radiation)
 absorption 150, 151
 damage 149–76
 damage signatures 170, 171
 diffuse 38, 44, 54
 direct 38, 44, 54
 exposure 169
 instrumentation for 43–6, 62–4
 natural variability 39–43
 protection from 149, 168–70
 repair 149, 150
 scattering 37–9
 screening 169
 stress 149, 150, 169
 trends 54–6
- UV lamps 57, 58, 87, 156, 169, 170, 244
 UV measurements 43–6, 53, 63, 64
 UV models 35, 46, 53
 UV radiation spectra 13
 UV-A, UV-B, *see* UV (radiation)
 UVR, *see* UV (radiation)
- vanadium 167
Vibrio natriegens 210, 226
Vibrio parahaemolyticus 226
 viruses 313, 315
 vitamin D 185
- Weddell–Scotia confluence 85
 weighting coefficients 74
- zeaxanthin 179, 192
 zooplankton 3, 153, 154, 279–80, 282, 285–6, 292–3, 297, 299–300, 312–15