

## Subject Index

### a

acetyl-CoA 216  
 agriculture 17  
 – conventional 17  
 – dry 17  
 – waterless 17  
 Alberta Basin 306  
 alcohol 32  
 alcohol dehydrogenase 217  
 algae, biotechnology 229, 233  
 anaerobiosis 215  
 antenna-reaction center complexes 199 ff.  
 ATP  
 – synthase 29  
 – synthesis 204 ff.  
 – – mechanism 189, 204  
 ATPase 16  
 Australian Petroleum Cooperative  
 Research Centre 306

### b

bacterial reaction centre 78, 131  
 biodiesel 287  
 bioenergetic converter 29  
 bioenergetics 189  
 bioluminescence assay 205  
 bio-mimetic 22  
 biotechnology, green algae 229  
 BRC *see* bacterial reaction centre  
 British Petroleum (BP) 305

### c

calcium, transport 206 ff.  
 Calvin cycle 14  
 carbohydrate 287  
 carbon  
 – end products 283 ff.  
 – fixation 32  
 – fixation rate 294  
 – sequestration 13

– tax 305  
 carbon dioxide 5, 7, 14, 302  
 – assimilation 286  
 – – rate 255, 286  
 – capture 301, 306  
 – emission 301  
 – mitigation 302  
 – ocean 303  
 – – geological 304 ff.  
 – – mineral 304  
 – separation 294  
 – storage 303 ff.  
 carboxylation 245  
 – cycle 265  
 carotenoid 192  
 CD *see* circular dichroism  
 cell 9  
 – culture 229  
 chaperone 253  
 charge recombination 196  
 charge separation 109 ff.  
 chemical energy 187, 283  
 chemistry, computational 266  
*Chlamydomonas reinhardtii* 214, 221,  
 230, 235  
*Chlorella fusca* 221  
 chlorophyll 22, 230 ff., 234  
 – antenna 13  
 – – size 230 ff., 234  
 chlorophyll a oxygenase 233  
 chlorophyll b-less mutant 233  
 chloroplast 17  
 – genome 243  
 – metabolism 216  
 – plant 255, 284  
 – transcription 258  
 chromophore 21  
 – linkage 147 ff.  
 – scaffolds 24

- spacing 147
- zinc porphyrin 190, 198
- circular dichroism 94
- Clark electrode 219
- climate change 5
  - global 10
- Clostridium pasteurianum* 222
- CO<sub>2</sub> *see* carbon dioxide
- coal 3 ff.
- combustion, oxyfuel 302
- computational programs 267 ff.
- Cooperative Research Centre 8
  - Australien Petroleum 306
  - Greenhouse Gas Technologies 306
- cosmetic products 288
- current, bioelectric 14
- cyanobacteria, carbon concentrating
  - mechanism 296
- cytochrome b/c1 complex 189
- cytochrome b6/f complex 15, 215

**d**

- dark reactions 13
- detergent 204
- Dexter mechanism 192
- DNA shuffling
  - insertional mutagenesis 230, 235
  - shuffling 249
- driving force 195
- DSSC *see* dye-sensitized solar cell
- dyad, porphyrin fullerene 196

**e**

- ecology, riverine 10
- economic growth 9
- efficiency, photosynthetic 293
- electricity 10
  - generation 304
- electrochemical energy 187, 194
- electrolysis 13
- electron
  - acceptor 134 ff.
  - donor 136 ff.
  - transport 220
- electronic coupling 195
- emission 10
- energy
  - chemical 187, 283
  - efficiency 170, 292, 294
    - – thermodynamic 6, 8, 13
  - electrochemical 187, 194
  - needs 9
  - nuclear 7

- quenching 79
- solar 6, 8, 13
  - thermodynamic 13
  - transfer, singlet 192
  - use 3 ff.
- engineering 292
  - molecular 221
- environment, problems 9
- enzyme bed reactor 28
- enzyme reactor 31
- Escherichia coli* 32
- ethanol 217
- evolution, artificial 249

**f**

- FCCP 205
- feedstock 17
- Fe-S cluster 135 ff.
  - structure 135
- fiber 17
- Flaveria bidentis* 250
- fluorescence, excitation spectrum 192
- fluorescent dye 203
- Foerster mechanism 190
- Foerster theory 67 ff.
  - conventional 69
  - generalized 69 ff.
- food 13, 17, 287
  - production 13
- Franck-Condon factor 195
- fuel 4, 187
  - coal 3 f., 7
  - diesel 287
  - energy 3, 5
  - fossil 5
  - green 287, 291
  - liquid 17
  - natural gas 3
  - oil 3
  - wood 4

**g**

- Galdieria sulfuraria* 255
- gas turbines 172
- gene deletion 231
- genetic control 232
- GEODISC project 305 f.
- geo-sequestration 7
- GESTCO study 305
- global warming 8, 291
- Graetzel cell 38
- greenhouse gas 5
  - technologies 301 ff.

**h**

- hexad 200
- hydrogen
  - economy 25
  - production 19, 214, 229, 304
  - photoproduction 213 ff.
- hydrogenase
  - algal 213 ff., 229
  - anaerobic induction 224
  - DNA sequences 223
  - oxygen inhibition 224
  - oxygen tolerance 224
  - protein 215
  - Western blot 223
  - X-ray structure 225

**i**

- industry
  - algal biotechnology 233
  - gas 301 ff.
- isoprene 32, 285, 288
- isoprenoid, synthesis 284, 287

**k**

- Kyoto protocol 1 ff.

**l**

- land, use 293
- leaves 14
- light
  - penetration 231
  - reactions 13
  - utilization efficiency 229
- light harvesting
  - complex 231
  - regulation 79 ff.
- lipid bilayer membrane 201
- liposome vesicle 201

**m**

- Mehler reaction 218
- melanin 50 ff., 61 ff.
- membrane 13
  - technology 20
- metabolism, aerobic 215
- microorganism 229
- mitochondrion, metabolism 216
- Mn cluster 20
- molecular genetics 229
- molecular rotary motor 204
- monoterpene 288

**n**

- NADPH 13, 29 ff.
- nanomorphology 42 ff.
- nanotechnology 20
  - natural 187
- NMR *see* nuclear magnetic resonance
- North Sea Basin 305 ff.
- nuclear magnetic resonance 133
- nucleus, genome 243, 250

**o**

- operon 255
- oxidative phosphorylation 216
- oxygenase 17
- oxygen evolution, rate 214
- oxygen-evolving complex 15
- oxygenation 245, 263
  - cycle 265

**p**

- peer review 6
- pentad 197
- peptide *see* protein 138
- Phaeodactylum tricorutum* 255
- phenome 244
- photo-bioreactor
  - design 219, 294 ff.
- photoelectric generator 22
- photoinhibition 232
- photon 9
  - dissipation 232
  - harvesting 61 ff.
- photoprotection 78
- photorespiration 245, 263
- photosynthesis
  - artificial 5, 6, 17 ff., 187, 190 ff.
  - – antenna systems 190 ff.
  - – reaction center 194 ff.
  - bacterial 109 ff.
  - – apparatus 188
  - light saturation curve 234
  - natural 13 ff., 188 ff.
  - – limitations 292
  - – productivity 294, 236
  - – reaction center 127 ff.
  - oxygenic 13
- photosystem I 14, 75 ff.
  - capacity 218
- photosystem II 14, 87 ff.
  - capacity 218
  - complex 16
  - P680 14 f.
  - – special pair 109 ff.

- photochemical activity 220
- reaction centre
- – cyanobacteria 94 ff.
- – plant 94 ff.
- X-ray crystal structure 88
- photovoltaics
- in silico 169
- organic 21
- thin film 170
- phthalocyanine 192 f.
- physiology
- algal 213
- plant 244 f.
- pigment
- antenna
- – bacteriochlorophyll 50 ff.
- – chlorophyll 230
- – chlorophyll b 234
- – euromelanin 50 ff.
- – melanin 50 ff.
- mutations 22, 230, 234
- photosynthetic 22
- reaction centre
- – artificial 194 ff.
- – PSI 131
- – PSII 131
- – purple bacterial 131
- – synthetic 130 ff.
- plant 17
- carbon fixation 32
- plastics 287
- plastocyanin, structure 135
- plastome 255
- plastoquinone 16, 220
- political issues 3 ff.
- polyhydroxyalkanoate 287
- polyhydroxybutyrate 287
- polymer 17
- polynorbornane
- dyads 151 ff.
- scaffolds 147 ff.
- porphyrin 22
- protein 15
- design 140
- natural 132, 214, 263
- synthetic 132
- proton
- channel 266
- pumping 201
- – transmembrane 202
- proton motive force 201
- PSI *see* Photosystem I
- PSII *see* Photosystem II

**q**

- qE *see* energy quenching
- quantum mechanics 266
- quenching, feedback re-excitation 79 ff.
- quinine 134 ff.
- shuttle 202

**r**

- reaction center, antenna-reaction center complexes 199 ff.
- Research Council 7
- Resource Assessment Commission 8
- respiration 214
- Rhodobacter sphaeroides* 110
- Rhodospseudomonas viridis* 133
- Rhodospirillum rubrum* 248, 254
- rubber 288
- rubisco
- activase 243, 247, 255
- active site 268, 280
- activity regulation 244, 247
- assembly 244
- chemistry 264
- – carboxylation 273 ff., 280
- – enolization 271 ff.
- – hydration 275 ff., 280
- directed molecular evolution 249, 259
- Form-I 248
- Form-II 248
- gene expression 258
- genetic manipulation 243 ff., 250 ff., 257
- hypothetical 246
- kinetic efficiency 247
- mechanism 281
- – catalytic 244, 265
- – chemical 263 ff.
- – CO<sub>2</sub> addition 278 ff.
- mutagenesis 256, 265
- “perfect” 246 f.
- protein 20, 215
- red algal 246
- spinach 268
- – X-ray structure 269
- subunits 243, 255
- – assembly 258 ff.
- – hybrids 256
- – mutation 257
- synthesis 244
- tobacco 243 ff.

**S**

*Scenedesmus obliquus* 221  
 semiconductor 21  
 sesquiterpene 288  
 silicon  
 – thin film 173 ff.  
 – third generation 178 ff.  
 – wafer 169, 171 ff.  
 simulations  
 – computational 263 ff.  
 – spectral 116 ff.  
 social issues 3 ff.  
 solar cell 173 ff.  
 special pair 109 ff.  
 spectroscopy  
 – absorbance-difference kinetic 229  
 – circular dichroism 94  
 – optical 90 ff.  
 – vibrational infrared 110  
 starch 214, 284  
 Stark effect 125  
 Statoil 305  
 sucrose 284  
 sulfur, deprivation 214  
 sustainability science 9, 10

**t**

technology 6  
 – military 8  
 thylakoids 13  
 translation 253  
 transpiration 263  
 tricarboxylic acid cycle 216  
 triose phosphate 284

**u**

U.S. Department of Energy 302

**v**

valinomycin 204  
 water  
 – requirement 293  
 – sources 13  
 – usage 263

**w**

Western blot 234  
 Weyburn Project 304  
 wind generators 172

**z**

Zero Emission Coal Alliance 304  
 Z-scheme 14

