

Index

Note: numbers shown in *italic* type refer to illustrations, and those shown in **bold** type refer to tables.

- abiotic soils, 57, 58
abrasion
 destructive process, 223, 224, 224, 225, 225, 233, 237
 taphofacies, 258, 258, 259, 260, 262, 263
abrasive techniques, preparation, 500
Acanthina, 368
acanthocephalans, parasites, 377
acanthodian fish, extinction, 185
Acanthorhina, 284
Acanthostega, 69
Acanthocephalus, 287
Acarina, Baltic amber, 297, 297
acceleration, heterochrony, 111, 113, 113, 114, 117
acceleration forces, hydrodynamics, 323, 324, 324, 325
acetic acid, sample preparation, 501, 501, 502, 503
Acheulean, 89–90
acid rain, 163, 165
acids, sample preparation, 501, 501, 502, 503
aclonal organisms, 43, 47, 331
acme biozone, stratigraphy, 461, 467, 467
acritarchs
 Hunsrück Slate, 279
 Palaeozoic, 51, 52, 182, 183
Precambrian, 11, 15, 17, 50, 179–80
problematic taxa, 443
stratigraphy, 461, 478
thermal maturity, 513, 514, 514
actinopterygians
 biogeography, 449, 450, 450, 451
 extinction, 189, 192
 feeding, 366
Adapoidea, stratophenetics, 440, 441
adaption, 139–46
 ‘adaptationist programme’, 143
 ‘adaptive gaps’, coevolution, 137
 ‘adaptive peaks’, selection, 128
 ‘adaptive value’, 140
 experimental morphology, 308–9
 predation, 368
 radiations, 127
Adaptive Aspekt, morphology, 311
adhesives, sample preparation, 501–2
Aegyptopithecus-like, 440, 441
Aepycerotini, lineages, 128
aerobic environment
 decay, 213–14, 216, 223
 diagenesis, 251, 252
 fossil indicators, 409, 410
Precambrian, 13–14, 14, 16
source rocks, 221
taphofacies, 259, 259, 260, 261, 262, 263
aerodynamics, flight, 75, 76
aetosaurs, predators, 373
agamids, 205, 206
Agaricia, 343
Agerostrea mesenterica, 142, 142
aggregation
 colonies, 331
 encrusters, 350
Aglaophiton major, 62
agnathans
 feeding, 366
 Hunsrück Slate, 279
Agnostus pisiformis, 275, 276
agrichnia, trace fossils, 356
Agricola, G., (1494–1555), 537
Ain Deliouine, Morocco, 481–2
air embolism, trees, climate indicator, 402
Akidograptus ascensus 480
akinetes, Precambrian, 13
Alamosaurus, 205, 207
alanine, brachiopods, 98
Albertosaurus, 205, 207
Albumares, 18, 19
Alcelaphini, lineages, 128
n-alcohols, organic components, 219
alcyonarian octocorals, 26, 45, 48
Aldanella, 34
Aldrovandi, U., (1522–1605), 537–8
alete spores, 60
algae
 brown, 30
 destruction of, 224
 diagenesis, 247, 248, 250
 encrusters, 346, 349
 endolithic, 224, 248
 environmental indicators, 406, 411, 412
 Hunsrück Slate, 279
 mats, 336
 Ordovician, 54–5
 prasinophyte, 15, 50, 51
Precambrian–Cambrian, 14, 15, 29, 30, 50, 51, 53
problematic taxa, 443
prymnesiophyte, 220
receptaculitid, 54, 443
reefs, 341, 342, 342, 345
skeletons, 316, 316
source rocks, 220
terrestrialization of, 60, 61
Vendotaenian, 17, 180
 see also green algae; red algae
alkalinity, ocean, 163, 165
alkanes, source rocks, 219
n-alkanones, organic components, 219
Alken fauna, Germany, 68
alkenones, source rocks, 219, 220
alleles, 100, 101, 102, 103, 104, 327
allometry, 111
allopatric speciation, 104, 105, 107, 448
Allosaurus, 363, 374
allozymes, populations, 327–9, 327, 328, 329, 329
Alnus glutinosa, 231
Alpha diversity, 133, 134, 134
Alpine belt, biostratigraphy, 484
Alum Shale, Sweden, 274–7, 275
Alvarez hypothesis, extinction, 167
amber, Baltic, 294–7, 294, 295, 296, 297
Ambitisporites, 62, 64
amino acids
 origin of life, 3, 4, 5, 7
 sequences, 17, 31, 95, 97–8, 98, 99, 100
 source rocks, 217
ammonia, taphonomy, 241, 252, 292
ammonites
 adaption, 143
 baculitid, 114
 extinction, 160, 166, 167, 172
 Cretaceous–Tertiary, 202, 400
 end-Permian, 189, 191, 192
 end-Triassic, 194, 195, 196, 196
biogeography, 457, 458
biomechanics, 320, 321
biostratigraphy, 461, 462, 463, 465, 466, 467, 484
environmental indicators, 412
feeding, 364
goniatic, 189, 484
heterochrony, 114, 115, 117
lineages, 428
Lagerstätten, 267, 268, 270, 283, 284
 Solnhofen Limestone, 285, 286, 287, 288
phragmocone, 244, 244, 245
speciation, 108
taphonomy, 244, 244, 245, 251, 252, 259
ammonium chloride, photography, 505
amniotes
 classification, 435–6, 436
 terrestrialization, 68, 69, 70
amoebae, parasitic, 380
amorphous organic material (A.O.M.),
 vitrinite reflectance, 512, 514
amphibians
 branchiosaurid, 114, 115
 evolutionary faunas, 39, 41
 extinction, 189, 190, 190, 194
 heterochrony, 114, 115, 117–8
 morphology, 312, 313
 predators, 373, 376
 temnospondyl, 70
 terrestrialization, 69, 70, 71
amphicyonids, predators, 375
amphipods, terrestrialization, 66, 67, 68
Amphipora, 56
Amplexopora, 351
Anabarites, 44
anabaritids, 24, 25
 Precambrian–Cambrian, 34
Anadara montereyana, 409
anaerobic environment
 decay, 213, 214, 223

- diagenesis, 251–2, 252, 253, 254, 255
fossil indicators, 409, 410
Lagerstätten, 270, 283
Precambrian, 7, 12, 13–14, 14, 16
source rocks, 221
taphofacies, 259, 260, 261
anagenesis, 106, 107, 109, 115, 126
computer analysis, 498
Anahuac Formation, Texas, 411, 412
anamniotes, compared to amniotes, 70
anaspids, evolutionary faunas, 39, 41
Anatolepis, 27
Anceps Bands, Dob's Linn, Scotland, 479, 480
Architherium, 86
Ancorichnus, trace fossils, 358
Anfesta stankovskii, 18, 20
Angaran flora, 191
angiosperms
climate indicators, 401, 402
evolution, 39, 40, 67, 79–83, 80, 81, 82, 83, 85, 101, 102, 354
processes of, 133, 135, 138, 147, 148
hydrodynamics, 232
nomenclature, 422
preservation, 264
resin, 295
anguidae 205, 206
ankylosaurs
defence, 375
feeding, 363
Ankylosaurus, 375
ankylosis, palaeopathology, 382
annelid worms
feeding, 364, 388
Lagerstätten, 240, 276, 277, 278, 288
parasitic, 378
Precambrian–Cambrian, 18, 21, 25
size constraints, 149
terrestrialization, 64, 65
trace fossils, 360
Anomalocaris canadensis, 215
Anomalodesmata, predation, 389, 390
anoxic environment
Cambrian, 36
decay processes, 214, 223
extinction, 161, 162, 163, 189, 198
indicator fossils, 409, 410
Lagerstätten, 239, 241, 267, 268, 290–1
taphofacies, 259, 259, 261, 262, 263
Anoxium, 49, 50
anteosaurs, predation, 373
anthoecia, grasses, 84
anthophyte, clade, 79, 80, 81, 82
anthozoans *see* corals
antibodies, molecular fossils, 98–9
Anticosti Island, Canada, 182, 479
antilocaprids, 87
antimony oxide, photography, 505
Antiquilima, 283
Antrimpus, 287
apatite skeletons, 24, 27, 256, 256, 257, 314, 316
Apatosaurus, 319, 382
apical angle, shells, 227, 229
Apidium-like, 440, 441
aplacophorans, trace fossils of, 360
Apollon natator, 390
Appalachians, 184, 185, 186, 396, 396
‘aptations’, 145
apterygote insects, 65, 72, 73, 74
Baltic amber, 297, 297
Aptian, extinction, 174, 175
appychi, Lagerstätten, 286
arachnids
Baltic amber, 297, 297
coevolution, 137
terrestrialization, 59, 65, 66, 67, 68
trigonotarbid, 59, 65
aragonite
diagenesis, 247, 248–9, 248, 249, 250, 256
durability, 225
environmental indicators, 403, 408
precipitation, 35, 36
Lagerstätten, 267, 283, 288
skeletons, origin of, 24, 25, 25, 26, 28, 201, 314, 315, 315, 316, 316, 317
Araneae, Baltic amber, 297, 297
arborescent, skeletal type, 225, 226
Archaean, 10–13, 11, 13, 14, 16
stratigraphy, 471, 474
stromatolites, 336, 338–9, 338
Archaeanthus, 82, 82
archaeabacteria
Precambrian, 7, 12, 16
taphonomy, 219, 292
archaeocyathids
hydrodynamics, 325
Precambrian–Cambrian, 22, 23, 25, 26, 44, 45, 45, 53, 54
problematic taxa, 442
reefs, 342
archaeogastropods
extinction, 193
predation, 371
Archaeoleersia, 84
Archaeopteris, 422
Archaeopteryx, 375, 427, 543
flight, 76, 78
Lagerstätten, 270, 287, 288, 289, 543
Archaeopteryx lithographica, 125
Archaeoscypnia, 54
Archaeosphaeroïdes, 50, 51
Archimedes intermidius, 325
Architectonica nobilis, 455
archosaurs
classification, 436
extinction, 190, 190, 194, 195, 195
flight, 76, 78
predators, 373, 374, 374
see also pterosaurs
arctocyonids, predators, 375
Arctodus, 208, 208
Arenicolites, 359
aridity, extinction, 197
Arizona fossil forest, 264, 266
armadillos, extinction, 208, 208
Arnioceras, 364
Arpylorus, 50
Arthropleura armata, 364
arthroleurids, 65
arthropods
biomechanics, 318, 319, 320, 320, 321, 322
Cambrian, 33, 44
coevolution, 137–8
environmental indicators, 406
extinction, 187, 189
feeding, 362, 364, 365–6, 370, 388
flight, 72–5, 73
heterochrony, 116, 118
Lagerstätten, 268, 269, 271, 272, 281, 286, 286
Hunsrück Slate, 277, 278, 279
‘Orsten’ deposits, 274, 275, 276–7
moulting, 26, 68, 149, 317, 319
parasitic, 377–8, 377
phyllocardids, 370
plants, and, 354
podomere, 319, 320
Precambrian, 18, 21, 22, 27, 34
predators, and prey, 370, 371, 373
resin trapped, 296, 296
size constraints, 149
taphonomy, 223, 245, 246, 257
terrestrialization, 41, 64, 65, 66, 67–8
see also arachnids; chelicerates;
crustaceans; insects; ostracods;
trilobites
articulate brachiopods
environmental indicators, 406
extinction, 189, 192, 193
Palaeozoic fauna, 38
articulation, taphonomy, 223, 225, 226, 237
taphofacies, 258, 259, 260–1, 260, 263
262, 263
Lagerstätten, 277, 286, 291
artificial intelligence programming, 498
Asaphocrinus ornatus, 240
Ascarina, 79, 82
ascidians, encrusters, 350
ascomycetes, terrestrialization, 58, 59, 63
ascothoracicans, parasites, 378
Ashgillian extinction, 37, 40, 181
aspartic acid, effect on skeletons, 317
Aspidoceras, 287
asses, evolution, 86
assemblages
biozone, stratigraphy, 461, 467, 467
communities, 237–8, 238, 391
association, communities, 391
Asteriacites, 359
asteroids
extinction process, 164, 165, 167, 203
Lagerstätten, 268
predation, 370
astogenetic heterochrony, 117
astogeny, colonies, 330
astrapotheres, size, 150
atmosphere, origin of life, 8–9
atolls, 56
atrypid brachiopods, biofacies, 399
Atypoidea, extinction, 400
attitude, shells, 226, 227–8, 229, 239, 258, 259, 260, 262, 281
Auchenorrhyncha, in amber, 297
Aulichnites, 359
Aulopora, 348
aurochs, size, 150
Ausia, 21
Australopithecus afarensis, 88, 89
autapomorphies, 431, 431, 432
autochronology, 473
autochthonous deposits
amber, 294, 295
Solnhofen Limestone, 288
autocorrelation analysis, extinction data, 174, 176
autoregressive models, extinction, 176
autotrophic evolution, origin of life, 6, 7, 8, 12
‘avatars’, 126, 126
Aves *see* birds
Avogadro’s Principle, 213
Aysheaia, 65
Backlundtoppen Formation, Spitsbergen, 11
backwards-smearing, of stratigraphic

- ranges, 166
 bacteria
 decay, 213–16, 215, 216
 green, 49
 infection, 382–3, 384
 molecular evidence, 96
 Precambrian, 7, 17, 49, 50
 stromatolites, 336
 taphonomy, 220, 223, 253, 254, 256
 Lagerstätten, 268, 273, 281, 282, 288, 292–3
 baculitid ammonites, heterochrony, 114
 Bahama Banks, compared Archaean, 11
 Bajocian extinction, 167
 Bala unconformity, Wales, 483
 Baltic amber, 294–7, 294, 295, 296, 297
 Baltic Sea, salinity, species diversity, 407, 407
 Baltica, biostratigraphy, 485, 487
Baltoeurypterus, 321, 322
 banded iron formations, 49
Baragwanathia 61, 62, 64
 barium sulphate, Burgess Shale, 273, 274
 barnacles, encrusters, 346, 347, 348, 350
 barrier reefs, 56
Baryonyx, 363, 375, 501
 basaltic volcanism, 170, 178
 basidiomycete fungi, terrestrialization, 59
Basilosaurus, 148, 151
 bathymetry
 extinction, 184–5
 trace fossils, 360
Bathydiolus thermophilus, 390
 bats
 feeding, 365
 flight, 75, 76, 77, 78
 Lagerstätten, 241, 292
 Bautechnischer Aspekt, morphology, 311
Bavarisaurus, 363
Bavlinella faveolata, 179–80
 beam theory, biomechanics, 319, 320
 bears
 extinction, 208, 208
 feeding, 367
 palaeopathology, 382, 382
 Beaufort Series, South Africa, 190–1
 Beck Springs Dolomite, California, 51, 53
 beetles, predators, 373
 behavioural classification, trace fossils, 355–6, 355
 Belcher Supergroup, Hudson Bay, Canada, 13, 51
 belemnites
 extinction, 400
 geochronology, 483
 oxygen isotope ratios, 403
 taphonomy, 227, 228, 229, 247, 252
 Lagerstätten, 283, 284, 284, 286, 288
 Bennettitales, Cretaceous, 80, 81, 81
 benthic environment
 biofacies, 396–7, 397
 Lagerstätten, 283, 284, 284, 286, 288
 microevolution, 108, 110
 bentonites, stratigraphy, 465
 Bermuda lagoonal patch reef, 343, 345
 Bernal's clay theory, 5, 8
 Bernoulli equation, 323, 325
Berriochlora, 84
 bicarbonate ion, diagenesis, 251, 252
Bija, 26
 Bilateria, Precambrian, 18, 21–2
 Binomial Nomenclature, Principle of, 417, 422–3
 biochronology, 464, 465
 biocoenoses, 258
 biodepositional structures, trace fossils, 355
 bioerosion
 skeletons, 223, 224–5, 237, 258
 structures, trace fossils, 355
 biofabric
 fossil concentration, 235–6, 236, 237, 258
 shells, 227–8, 228, 229
 biofacies, 391, 395–400, 395, 396, 397, 399
 oxygen indicators, 409, 410
 tectonics, 485–6, 487
 'Biogenetic Law', 111
 biogeography
 palaeobiogeography, 452–60, 452, 453, 454, 455, 456, 457, 458, 459
 vicariance, 448–51, 450, 451
 bioherms, 53, 54, 55, 184
 biohopanoids, molecular fossil, 95, 96
 bioimmuration, encrusters, 346
 biological marker, 217, 218–20, 292
 biomass
 increase due to new habitats, 120
 trophic structures, 388, 388, 389
 biomechanics, 318–22, 319, 320, 322
 biomineralization *see* mineralization
 biominerals, organic compounds, 97–9, 98
 biopolymers, diagenesis, 217
 biostratigraphy, 461–5, 463, 464, 549
 International Commission on Stratigraphy, 468–9
 International Geological Correlation Programme, 469–70
 trace fossils, 355, 357
 zone fossils, 466–7, 466, 467
 see also global standard stratigraphy
 biostromes, 53, 54, 55, 343
 biotaxonomic classification, trace fossils, 424–5
 bioturbation
 evidence from, 43, 45, 389
 palaeosols, 58
 Precambrian–Cambrian, 23, 31
 structures, trace fossils, 355
 taphonomy, 221, 225, 283–4, 291
 biozones, 461, 462, 463, 463, 464, 466, 467
 compared to biofacies, 395
 bipeds
 archosaurs, 76
 hominids, 88
 birds
 biomechanics, 319, 321
 classification, 436, 436
 diversity of species, 132, 132
 evolutionary faunas, 39, 41
 extinction, 207
 flight, 75, 76, 77, 78
 heterochrony, 114
 Lagerstätten, 241, 292
 predators, 368, 375, 376
 skeleton, 314
 speciation, 105
 Birkhill Shale, Dob's Linn, Scotland, 479, 480
 bison, 55
 bisporangiate condition, coevolution, 138
 Bitter Springs Formation, Australia, 11, 51, 53
 bituminous deposits, Lagerstätten, 270, 282, 283, 283, 286, 290
 bivalves
 biofacies, 396, 397, 398, 399, 399, 400
 biogeography, 454, 455, 456, 457, 459, 460
 conchiolin, 223
 destruction, 223, 224, 225, 226
 diagenesis, 249, 250
 diversification, 38, 46, 47, 48, 52
 encrusters, 346, 347, 349
 environmental indicators, 403, 404–5, 405, 406, 409
 extinction, 184, 187, 189, 191, 192, 194, 195, 201–2, 400
 feeding, 363, 389–90, 390
 fossil concentrations, 236
 heterochrony, 115
 heterodont, 400
 immunological techniques, 99
 inoceramid, 201, 400
 Lagerstätten, 242, 243, 267, 270, 279, 281, 283–4
 lucinid, 390
 nuculid, 224
 parasites of, 380
 pearls, 378–9
 preadaptive hypothesis, 144, 145
 prey, 368, 369, 370, 371
 reefs, 341, 342, 342, 343
 size, 151
 solemyid, 390
 speciation, 108
 stratigraphy, 465
 survivorship curves, 120, 122, 124
 thyasirid, 390
 transport, 227, 228, 229
 trophic structure, 389–90
 see also rudist bivalves
 Black Sea, 221
 black shales
 extinction, correlation with, 161, 182
 obrution deposits, 239
 blastoids
 completeness of record, 301
 Palaeozoic, 46, 47, 89
 Blind River Formation, Ontario, 57
 bloodsucking parasites, 376
 'blue earth', Baltic amber, 294, 294
 blue-green algae, *see* cyanobacteria, stromatolites
 Bodo, Ethiopia, 90
 Bog people, Iron Age, 213, 214
 'Bohemian' sediments, 277
 boids, record of, 205, 206
 bolides, extinction process, 165
Bomakellia kelleri, 20
 Bomakellidae, Precambrian, 20, 21, 21–2
 bone beds, concentration deposits, 267
 bones
 diagenesis, 254, 255
 fracture healing, 381–2, 384
 transport–hydrodynamics, 232–5, 234
 book-lungs, terrestrialization, 67
 bootstrapping, computer analysis, 495
 Bopyridae, parasites, 378
 boreal forest, Pleistocene, 84
 borers, effect on reefs, 54, 55, 56
 Borhyenidae, predators, 151
Bositra, 284
 botryococcane and botryococcenes, biomarkers, 219
Botryococcus braunii, 219
 Boundary Stratotype Point *see* Global Stratotype Section and Point (GSSP)
 bovids, Tertiary, 87
 Bowen Basin, Australia, 265
Braarudosphaera, 201, 316, 316

brachiopods
 amino acid profiles, 98
 atrypid, 399
 biofacies, 396, 398, 399, 400
 biostratigraphy, 480, 481, 485, 486
 Cambrian, 23, 24, 25, 34, 44, 45
 origin of hard parts, 27, 28, 29
 community evolution, 392
 completeness of fossil record, 302
 coquinas, 267, 269
 craniacean, 114
 destruction of, 223, 224, 225, 226
 diagenesis, 247, 248, 249, 250, 255
 encrusters, 346, 347, 349
 environmental indicators, 403, 405, 405,
 406, 409, 411, 412
 extinction
 Cretaceous–Tertiary, 160, 200, 202
 Frasnian–Famennian, 184, 186
 Ordovician, 181, 181, 182, 183
 Permian, 187, 187, 189, 191, 193
 Triassic, 192, 194, 195
 flattening, 245, 246
 geochronology, 483
 heterochrony, 114, 115, 116
 hydrodynamics, 227, 229
 inarticulate, 192, 433
 Lagerstätten, 240, 272, 273, 273, 276, 277,
 279
 lineages, 428
 modern, 48
 orthid, 189, 398, 399
 Palaeozoic, 38, 40, 45, 46, 47, 52, 54, 55,
 480
 parasites of, 380
 pentamerid, 399, 400
 prey, 369, 370, 371, 371, 372
 productid, 160, 189, 400
 rhyonchonellid, 400
 size constraints, 149–50
 skeleton, 318
 strophomenid, 194, 399
 taxonomy, 433
 terabratulid, 400
 thecidieidine, 114
 Vendian, 22
 see also articulate brachiopods
Brachiosaurus, 147, 148, 149
 brachyuran crabs, predation, 370
 bradoriids, biomineralization, 25, 27
 'bradytely', 153, 158–9, 158
 Braggs River, U.S.A., 201
 Braidwood biota, 279, 281
 brain size, hominids, 88, 89, 90, 91
 branchiosaurid amphibians, heterochrony,
 114, 115
 Brazons River, U.S.A., 201
Bredocaris admirabilis, 276
 breeding time, reproductive isolation, 101
 brittle stars, preservation, 240, 242, 243,
 268, 283
 bromoform, concentration techniques, 504
 Brongniart, Adolphe, (1801–1876), 540–1,
 542
 Brongniart, Alexandre, (1770–1847), 540
 Bronn, H.G., 545
 brontosaurs, predation, 375
Brooksella canyonensis, 30
 brown algae, diversification, 30
 browsers
 grasslands, 85, 86
 trophic structure, 385, 386, 388

bryophytes, terrestrialization, 58–9, 58,
 60, 62, 63
 bryozoans
 biofacies, 398, 399
 biomineralization, 25
 coloniality, 330, 332, 332, 333, 334
 cryptostomate, 160, 189
 diversification, 40, 46, 47, 48, 54, 55
 encrusters, 346, 348, 349, 350, 351
 environmental indicators, 411
 extinction, 160, 187, 187, 189, 192, 201,
 202
 gymnolaemate, 40, 48
 heterochrony, 117
 hydrodynamics, 325, 325
 parasites of, 379
 reefs, 342, 342, 343, 345
 size constraints, 149
 speciation, 108
 stenolaemate, 38, 46, 347
 taphonomy, 224, 247, 248, 279
 trepostome, 160, 189
 Buckland, W., (1784–1856), 542, 542
 Buffon, G.L. Compte de (1707–1788), 539
Bugula turrita, 325
 build-ups, 53, 54, 55, 56, 341–5, 342, 343,
 344
 Bundenbach district, West Germany, 254
 buoyancy, biomechanics, 49–50, 320
 Burgess Shale, British Columbia, 52, 215,
 239, 269, 270–4, 272, 273, 398, 426,
 548–9
 dietary evidence, 362, 364
 flattening, 245, 246, 246
 Hunsrück Slate compared, 278
 parasites, 377
 terrestrialization, 65
 tiering structure, 45
 Burgess Shale-type assemblages, 33, 34
Burgessochaeta, 364
 burial
 obrution deposits, 239–43, 240, 241, 242
 plant material, 232
 skeletons, 226, 235
 Burin Peninsula, Newfoundland, Canada,
 476, 477
 burrowers
 Cambrian, 29, 31
 destructive processes, 223
 Precambrian, 22, 23, 180
 reefs, effect on, 54
 see also infauna
Busycon, 368
 'Bynes Disease', fossil storage, 516

Cache Creek Terrane, British Columbia,
 487
Calamites, 151, 245
Calappa, 369
Calathium, 54
 calcareous rocks, extraction techniques,
 502, 503
 Calceolaria, F., (c.1521–c.1606), 538
 calcic horizons, grassland soils, 85
 calcite
 destruction of, 225
 oxygen isotope ratios, 403
 plant preservation, 263, 264, 281
 skeletons, 314, 315–16, 315, 316, 317, 318
 diagenesis, 245, 247, 248–9, 248, 249,
 250, 251, 252, 256

durability, 201, 225
 Lagerstätten, 267, 283
 Precambrian–Cambrian, 24, 25, 26,
 28, 29, 35, 36
 size, 150
 calcium
 binding proteins, 99
 salinity indicator, 407
 calcium carbonate
 concretion, 259
 plant preservation, 264
 skeletons, 247–50, 248, 249, 256
 Precambrian–Cambrian, 24, 25, 25,
 26, 29, 34
 stromatolites, 337–338, 339–40
 supersaturation, 15
 see also aragonite; calcite
 calcium phosphate
 coprolites, 366
 polymorphs, 36
 skeletons, 25, 27, 34, 254, 317
 Caledonian mountain belt, 485
Calippus, 86, 87
Callianasa, 364
Callixylon, 422
 callus, bone, 382
Calyptogena magnifica, 389–90
 Cambrian
 biofacies, 396, 398
 communities, 393
 decay process, 215
 diversification, 34–6, 35, 132, 133
 marine habitats, 45, 45, 46, 47, 47,
 50–2, 51, 53, 54
 evolutionary faunas, 37, 38, 38, 39–40,
 39
 extinction, 160, 179–80, 180
 global boundary stratotypes, 475–8, 477
 heterochrony, 117, 118
 morphology, 309
 parasites, 378, 379
 predation, 370, 371
 problematic fossils, 442, 443, 444
 skeletal composition, 318
 stratigraphy, 461, 470, 475–8, 477, 486
 stromatolites, 336, 337, 339, 340
 terrestrialization, 57–8, 58, 59, 65
 trace fossils, 360
 Vendian compared, 23
 see also Burgess Shale; 'Orsten'
 cambroclaves, Cambrian, 25, 34
 camels
 decline, 208, 208
 dentition, 86
Camenella, 27
 camerata crinoid, extinction, 160, 189
 Canada, legislation concerning status
 material, 517
 Cancilleridae, parasites, 390
 cancer, palaeopathology, 382
 cannibalism, 364
 Canning Basin, Western Australia, 56, 345
 carbohydrates, decay, 217
 carbon, organic
 biogeochemical cycle, 120
 decay processes, 213, 214
 Precambrian, 49
 source rocks, 220, 221
 carbon dioxide, 292, 293
 decay product, 213
 diagenesis, 251, 252
 extinction process, 164, 165, 178

- Precambrian–Cambrian, 12, 36
terrestrialization, 57
carbon isotopes
 decay processes, 216
 extinction processes, 167
Precambrian–Cambrian, 12, 35, 35, 36, 49, 58
carbonate-fluorapatite, 256, 257
carbonates
 biofacies, 398, 399–400
 extinction events, 181, 182, 183, 184, 199
 molecular palaeontology, 97
 mounds, 341
 nodules, 240–1, 250–2, 251, 252
 skeletal fossils, 24–7, 25, 28, 28, 29, 314, 315
 salinity indicator, 407
 stromatolites, effect on, 337–8
 see also aragonite; calcite; calcium carbonate
Carbondale Formation, Illinois, 279
carbonic acid, diagenesis, 251
Carboniferous, 40
 adaptation, 142
 biomechanics, 319
 coevolution, 137
 decay process, 214, 215
 dietary evidence, 364, 365
 diversification, 40, 47, 132
 environmental indicators, 405, 405, 408, 411, 412
Lagerstätten, 239, 297
nomenclature, 422, 423
parasites, 377
plant
 communities, 352, 354
 preservation, 264, 265
predation, 371, 373
reefs, 344
size, 150, 151
terrestrialization, 58, 59, 65, 67, 71, 71, 72
 see also Mazon Creek
Carcharodon, 148, 149, 363
Carnian, extinction, 174, 175
Carnic Alps, Italy, Devonian, 277
carnivores
 bone transport, 233
 coevolution, 137
 coprolites, 366
 evolution rate, 153
 extinction, 193
 feeding, 362
 land vertebrates, 373, 374–5
 size, 150
carnosaurs, feeding, 363, 374
carpel, angiosperms, 80, 82
Carpolestidae, stratophenetics, 439, 439
carpometacarpus, birds, 78
caryopses, grasses, 84
cassid gastropods, predation, 370
cat, predators, 375–6
catabolic processes, 8
catastrophism
 extinction process, 171
 Lagerstätten, 271
Catinula, 108
cation concentration, Precambrian, 31
Caturus, 364
caves
 dietary evidence, 367
 hominids, 90, 91
caviomorph rodents, extinction, 208
Claytonia, 80, 81
Ceoidea, stratophenetics, 440, 441
cells
 eukaryotes and prokaryotes, 30
 plant preservation, 264, 264, 266
cellular control, heterogeneity, 118
cellularity, origin of life, 3, 4
cellulose
 decay, 214, 215
 diagenesis, 254
 digestion, 85, 87
cementation, Solnhofen Limestone, 287
cemented forms, encrusting, 346
Cenomanian extinction, 167, 170, 173, 174, 175, 176, 177
Cenozoic
 biogeography, 456, 457
 coevolution, 136, 137, 138
 communities, 391
 diagenesis, 250
 dietary evidence, 367
 diversification, 40, 48, 132
 encrusting, 347, 349
 environmental indicators, 404, 404, 405, 406, 408
 heterochrony, 115
 microevolution, 109
 molecular palaeontology, 97
 parasites, 377–8
 predation, 370, 372, 373, 376
 stratophenetics, 439, 440, 441
 stromatolites, 336, 340, 340
 taxonomy, 447
 trophic structure, 386, 387
centipedes
 Lagerstätten, 279
 terrestrialization, 65
Cepaea nemoralis, 140, 141, 143
cephalon, taphofacies, 259
cephalopods
 biomechanics, 320, 321
 ceratitid, 194
 environmental indicator, 406
 extinction, 187, 191, 194
 feeding, 362, 363
 hydrostatics, 322
 Lagerstätten, 254, 279, 281, 288
 Palaeozoic, 38, 40, 46, 52, 54
 predators, 368, 369, 370
 prey, 372
 rhyncholites, 370
 shell, transport, 227
 see also ammonites, belemnites
Cerastoderma, 228
ceratitid cephalopods, extinction, 194
ceratopsian dinosaurs
 defence, 375
 extinction, 205, 207
 feeding, 364
Ceratosaurus, 374
cerberoid colonies, 333
Cercopithecoidea, stratophenetics, 440, 441
cerium phosphate, Burgess Shale, 273, 274
cervids, diversity, 208
cestodes, parasites, 377
Cetacea
 evolution rates, 15
 size, 148
chaetognaths
 Cambrian, 28, 34
 marine habitat, 64
chalk production, Cretaceous, 201, 202
Chambers, R., 545
chamosite, taphofacies, 259
chancelloriids, Cambrian, 34
chaotic behaviour, computer modelling, 296, 297
charge free anticontamination system (CFAS), 509, 511
Charnia, 19, 20, 21, 180
Charnian Subgroup, U.K., 17
Charniodiscus, 21, 44, 180
Charophyceae, terrestrialization, 63
Charnwood Forest, U.K., 32
chartaceous leaves, hydrodynamics, 231
cheiostomes, encrusting, 347
chelating agents, sample preparation, 500–1
chelicerates
 biomechanics, 320, 320
 Lagerstätten, 276
 terrestrialization, 67, 68
Cheloniellon, 278
Cheloniidae, 205, 206
chemautotrophic bacteria, 49, 51
chemical fossils, 217–22, 218, 221
chemostratigraphy, 469, 471, 472, 478
cherts, extraction techniques, 503–4
chirality, coccoliths, 316
Chiroptera, flight, 78
chitin, preservation, 214, 215, 276
Chitinobulus, 284
Chitinozoan Reflectivity (Rch), 513
chitinozoans
 biostratigraphy, 461
 diversity, 51, 52
 extinction, 182
 parasites of, 380
 problematic taxa, 443–4
 sample preparation, 502, 504
 thermal maturity, 513, 513, 514
chitons, Lagerstätten, 279, 281
Chloranthaceae, evolution, 79, 80, 81, 82
Chloranthus, 82
Chloroflexus, 7
chlorophycid, Proterozoic, 50, 51
chlorophyll A, breakdown, 96, 97
chlorophytes, terrestrialization, 57
choana, tetrapods, 69
Choia, 273
cholesterol, zooplankton, 217, 218
chondrichthyan fishes
 feeding, 366
 Palaeozoic, 38, 40
 size, 148
Chondrites, 283, 359
chondrophorans, Vendian, 32, 50
Chondroplon, 18
Chondrostei, extinction, 189, 192
Chondrostetus, 284
chordates
 biomineralization, 27
 Burgess Shale, 272
chromatographic techniques, 96
chromosomes, reproductive isolation, 101–2
chronostratigraphy, 462–5, 463, 464, 468, 471, 472, 474
chronozones, 461, 463, 464
chroococcaleans, Precambrian, 50, 180
chrysophytes, Cambrian, 25, 28, 50
Chuar Group, Arizona, 11
cichlid fish, experimental morphology, 308

- ciliates, parasitic, 380
 cirripedes
 encrusters, 346, 347, 348, 350
 parasites, 378
 clade, 134–5, 436
 cladistics, 426–7, 428–30, 430–4, 431, 435, 436, 437
 angiosperms, 80–1
 biogeography, 449–50, 450, 451, 452–3, 452, 454, 455
 computer analysis, 497
 diversity, 448
 fossil record, 299
 future of, 551, 554
 morphology, 313
 stratophenetics, compared, 438, 441
 see also cladogenesis
 cladogenesis, 106, 107, 108, 109, 126, 138
 community, 394
 computer analysis, 498
 evolution rates, 154, 158, 158
 heterochrony, 115
 parasites, 377
 cladograms, 433–4
Claria, 191
 Classes, evolutionary faunas, 37
 classification
 definition of, 434
 evolutionary systematics, 435–6
 nomenclature, 422–3
Clavatipollenites, 79, 80, 82
 clay deposition, extinction events, 167, 169, 169, 202
 clay minerals, origin of life, 5, 6
Climacograptus extraordinarius, 181, 478, 479
 climate
 biostratigraphy, 461
 effect on diversification, 133–4
 factor in extinction, 160, 162–3, 164, 166
 Cretaceous–Tertiary, 199, 203–4
 Miocene, 86
 end-Ordovician, 183, 183
 end-Permian, 190, 191, 192, 193
 Pleistocene, 208–9
 end-Triassic, 197
 Vendian, 180
 Lagerstätten, 291
 molecular evidence, 220, 221
 palaeopathology, 383
 plant indicators, 354, 401–3, 401, 402
 clines, reproductive isolation, 101
 clinoid sponges, durability, 224, 225
 clonal organisms, 43, 47, 331
 clonopary, colonies, 330, 331, 331, 333
 clonoteny, colonies, 330, 331, 333
Cloudina, 22, 24, 33, 34, 443
 clubmosses, size, 150, 151
 clypeasteroid echinoids, heterochrony, 114
 cnidarians
 biomineralization, 27, 28, 29
 colonies, 330, 331, 333, 334
 extinction, 189, 194
 Lagerstätten, 271, 272, 277, 279, 281, 282, 286, 287, 288
 marine habitat, 64
 Precambrian–Cambrian, 18, 21, 22, 30, 32, 33, 44, 50, 51, 180
 see also coelenterates; corals
 coevolution, 136–8, 351, 368, 372, 373, 393, 494, 554
 ‘co-optation’, 145
 Co-ordination, Principle of, 417–18
- coal balls, Carboniferous, 264, 265, 352
 coal beds, Permian, 192
 coccoliths
 algae, 316, 316
 diagenesis, 247
 electron microscopy, 509, 511
 environmental indicator, 412
 evolution, 121, 123
 extinction, 201
 extraction techniques, 502
 Lagerstätten, 283, 286, 288
 Red Queen Hypothesis, 136
 coefficient of drag, 324
 coelacanths, 157
 biogeography, 449
 feeding, 366
 Lagerstätten, 284
 coelenterates
 colonies, 333
 encrusters, 346
 island faunas, 192
 Lagerstätten, 279, 282, 286, 287, 288
 Precambrian, 18–21, 19, 20, 22, 23
 size constraints, 149
 see also cnidarians; corals
 coelobionts, encrusters, 349
 coelobites, reefs, 342
Coelodiscus, 284
 coelomate radiation, 50
Coelophysis, 363
 coeloscleritophorans,
 Cambrian, 25, 34
 exoskeleton, 26
 coelurosauers, feeding, 363, 374, 375
 Colchester Coal Member, Illinois, 279, 280
Coleia, 284
Coleochaete, 63
 coleoids, Lagerstätten, 284
 coleoloids, problematic taxa, 443
 coleopterans
 Baltic amber, 297, 297
 coevolution, 138
 predators, 373
 collagen
 skeletons, 27, 98, 317
 ‘collapse calderas’, flattening, 287
 collection management, museums, 517–9
 coloniality, 21, 330–5, 331, 332
 encrusters, 346–7, 347, 349, 350
 heterochrony, 117
 colour, thermal maturity, 511, 512, 513, 513, 513, 514, 514
 Colour Alteration Index, 275
 Columbia River basalts, 178
 combined gas chromatograph mass spectrometers (C-GC-MS), 96
 comets, extinction process, 164, 165, 170, 177, 178
 Comley, U.K., Lower Cambrian, 277
 commensalism, 138, 376, 380
 Commission on Stratigraphy, International Union of Geological Sciences, 462, 465, 468–9, 471, 476, 478–80, 482
 communities, 551, 553
 biofacies, 396
 biostratigraphy, 485
 evolution of, 391–4, 392, 393, 394
 nomenclature, 426
 succession, 392
 compaction
 diagenesis, 248
 Lagerstätten, 278, 283, 287
 plants, 353
- see also* flattening
 competition
 adaption, 139
 benthic habitat, 43
 encrusters, 348, 439–50, 351
 evolution, 119, 122, 124
 extinction, effect on, 160
 heterochrony, 115
 predator diversity, 376
 completeness of fossil record, 298–303, 298, 300, 301, 302
 compressions, plants, 245, 263, 264
Compsognathus, 287, 363, 381
 computer applications, 246, 312–3, 326, 493–9, 494, 496
 documentation systems, collections, 518–19
 concentrations, of fossils, 235–7, 236
 see also Lagerstätten
 concentration Lagerstätten, 267–8, 269
 concentration techniques, sample preparation, 504
 Conception Group, southeastern Newfoundland, 17
 conchiolin, bivalves, 223
 concretions, diagenesis, 244, 245, 255, 284
 concurrent range biozone, stratigraphy, 461, 467, 467
 condensation deposits, 269
 condylarthrans, record, 86–7, 87, 137, 204, 204, 205
 cone-in-cone pyrite, 255
 confrontational strategy, encrusters, 347
 congruent communities, 397
 conifers
 evolution, 83, 191, 197
 hydrodynamics, 232
 preservation, 264, 352
 Conodont Alteration Index (CAI), 513–4
 conodonts
 biomineralization, 25, 27
 biostratigraphy, 461, 467, 468, 479, 480, 484
 extinction, 182, 183, 187, 194, 195
 Lagerstätten, 274–5, 276
 maturity, 511
 nomenclature, 417, 420–1, 420, 421
 Ordovician, 479, 480
 parasites of, 379
 problematic taxa, 442
 sample preparation, 502, 503, 504
 thermal maturity, 513–4, 513, 514
Conomedusites, 18, 20
Conophyton, 179, 339
 consecutive range biozone, stratigraphy, 461, 467, 467
 consensus model, global diversity, 446, 447
 conservation, stratigraphy, 474
 conservation deposits, 268–70, 269
 conservation Lagerstätten, 277
 consolidants, sample preparation, 501–2, 501
 constant generic associations (CGAs), 485
 constructional morphology, 142, 310, 311, 318
 continental drift, 547
 continental shelf, species diversity, 133
 continental uplift, extinction, 160, 164
 conularids
 biomineralization, 25, 27
 extinction, 189, 194
 Lagerstätten, 279

- Conulata, Precambrian, 18, 21, 44
 convergence, evolution, 142, 143, 435, 551
 convex up-and-down orientations of shells, 226, 227–8, 229, 258, 259, 260, 262, 281
Cooksonia, 62
 ‘copal’, amber, 294
 Cope, E.D., 543, 545
 Cope’s Rule, 115, 118, 150
 copepods, parasites, 378
 coprolites
 accumulations, 217, 257, 259, 267, 268, 292
 dietary evidence, 362, 364, 365–7, 366, 372, 389
 nomenclature, 424
 parasitism evidence, 380
 copulatory organs, terrestrialization, 68
 coquinas, 54, 267, 269
 coracoids, flight, 77, 78
 coralline sponges, problematical fossils, 443
 corals
 banks, 341
 biofacies, 398, 399, 400
 biomineralization, 26
 colonies, 330, 333, 334, 335
 destruction of, 224
 diagenesis, 247, 248
 diversification, 39, 40, 45, 46, 48, 54, 55, 56
 encrusters, 347, 348, 349, 350
 environmental indicators, 403, 406, 412
 extinction, 160, 182, 183, 184–5, 187, 189, 192
 heterochrony, 113
 Precambrian, 32, 33
 parasites of, 380
 problematic taxa, 443
 reefs, 288, 341, 342, 342, 343, 343, 345
 scleractinian, 26, 189, 347
 skeletons, 316–17
 symbiotic, 138
 trace fossils, 360
 see also rugose corals; tabulate corals
Corbula, 388
 cordaites, extinction, 191
 Cordillera, North America, biogeography, 458, 458
 coriaceous leaves, 231
 Coriolis forces, 220, 221
Corixa, 321
 cormidia, colonies, 332, 333
 cornulitids
 encrusters, 347
 symbiotic, 138
 corrosion, 225
 correlation *see* biostratigraphy
 corrosion
 skeletons, 223, 225, 226
 taphofacies, 258, 258, 262, 263
 ‘cortical bandages’, graptolites, 442
 corytosperms, cladistic analysis, 80, 81
 cosmic radiation, extinction, 164, 191
 cosmopolitan species
 biogeography, 448
 extinction, 456–7, 459, 460, 466, 467
 Precambrian, 18
Cosmophloe, 359
Cothionion, 26
 Cotylosauria, paraphyletic group, 433
 ‘coupled logistic’ model, diversity, 496
 Cow Head Group, Newfoundland, 486
 crabs
 brachyuran, 370
 predation, 368, 369
 terrestrialization, 66, 67, 68
 craniacean brachiopods, heterochrony, 114
 cratering, extinction evidence, 169–70, 177
 cratonization, and stromatolites, 339
 Crawfordsville crinoid beds, Indiana, 239
 crayfish
 Lagerstätten, 287
 terrestrialization, 67, 68
 Creodontia, predators, 375
 Cretaceous
 adaption, 142
 angiosperms, 79, 80–3, 80, 83
 biogeography, 455, 456, 457, 457, 459
 biomechanics, 319
 coevolution, 137, 138
 completeness of fossil record, 299
 diagenesis, 253, 257
 dietary evidence, 362, 363, 364, 366–7
 diversification, 40, 41, 48, 133
 encrusters, 349
 environmental indicators, 401, 403, 404, 404, 410, 412
 extinction
 compared other events, 193, 194
 earth-bound causes, 160, 161, 163
 extra-terrestrial causes, 164, 165, 166, 167, 168, 169, 169, 170, 553
 marine, 133, 198–203, 200, 400
 periodicity, 171–2, 173, 174, 175, 175, 176, 177
 terrestrial, 41, 132, 133, 203–5, 204, 205, 206, 207–8, 400
 flight, 76, 78
 heterochrony, 115
 Lagerstätten, 297
 macroevolution, 127
 molecular palaeontology, 98, 99
 parasites, 378, 379
 plant
 communities, 354
 preservation, 264, 265
 predation, 370, 371, 372, 375
 size, 150, 151
 source rocks, 222
 stratigraphy, 465, 488
 trace fossils, 361
 terrestrialization, 67
 trophic structure, 386
 crinoids
 biofacies, 398, 399, 400
 camerate, 160, 189
 commensalism, 380
 destruction of, 223
 diversification, 38, 40, 45, 46, 47, 48, 54, 55
 encrusters, 346
 extinction, 160, 187, 189, 193
 flattening, 246
 hydrodynamics, 227, 229
 inadunate, 160, 189
 Lagerstätten, 239, 240, 267, 268, 269, 284, 288
 prey, 372
 reefs, 343
 crocodiles
 bones, 234
 diversification, 194, 195, 205, 206
 evolutionary faunas, 39, 41
 feeding, 366–7, 370, 375
 Lagerstätten, 284, 292
 size, 148
 taphofacies, 259
Crocodylus, 234
Crocuta crocuta, 233
 crowding, effect on extinction, 160
 crustaceans
 biomechanics, 320
 feeding, 362
 Lagerstätten, 279, 280, 284, 288, 289
 modern, 40, 48
 predators and prey, 368, 369, 370
 Precambrian, 21
 terrestrialization, 65, 66, 67, 68
Cruiziana, 362, 424
 ichnofacies, 356, 357–8, 358, 359, 361, 412
 cryptalgalaminites, stromatolites, 336
 cryptic habitats, reefs, 342
 cryptospores, evolution, 60, 61
 cryptostomate bryozoans
 diversity, 189
 extinction, 160
 ctenophore, Hunsrück Slate, 279
Ctenostreton, 267
 cubichnia, trace fossils, 355
 cubomedusoids, Vendian, 32
Cuculacea, 283
 cued testing, exhibit strategies, 521–2, 521
 currents
 destructive process, 223, 226
 Lagerstätten, 283
 stromatolites, evidence from, 336
 curvature, shells, 227
 cuticle
 climatic indicators, 402
 invertebrates, 27, 65, 318
 plants, 60, 61, 62, 84, 231, 241, 245, 351
 cutins, diagenesis, 217
 cuttlefish, hydrodynamics, 227
 Cuvier, G., (1769–1832), 539–40, 540, 542, 543
 cyanobacteria
 acritarchs, compared, 180
 biomineralization, 24, 25, 26, 29
 diversification, 49–50, 53, 54–5, 56
 Lagerstätten, 286, 287
 nostocalean, 13
 origin of life, 7
 Precambrian, 11, 12, 13, 14, 15, 16, 30, 49, 51
 reefs, 53
 skeletons, 318
 stromatolites, 336, 336, 337, 338, 339, 340
 terrestrialization, 57, 58, 59, 60, 63
 cyanophytes, Vendian, 49, 50
 Cyathocyatidae, completeness of record, 299
 cycads
 climate indicator, 402
 evolution, 81, 83, 138, 191
 Lagerstätten, 283
 cyclocrinitids, problematic taxa, 443
 cyclocystoid echinoderms
 completeness of record, 301
 extinction, 181
Cyclomedusa, 18
 cyclostomes, encrusters, 347
 Cyclozoa, Precambrian, 18, 19, 20, 21
 Cymatiidae, predators, 390
Cymbosporites magnificus Biozone, 466

- cynodont therapsids
 predators, 373, 374
 size, 151
- Cyrtoceras* Mudstones, 395
- Cyrtograptus lundgreni* Biozone, 463, 463
- cystoid echinoderms
 completeness of record, 299, 300, 300, 301
 extinction, 181, 183
 obrution deposits, 239
- Cystosporites*, 422, 423
- cytosol, Precambrian, 8, 15, 16
- Dactyloteuthis*, 284
- Dakota Formation, Kansas, U.S.A., 82
- Dala peilertae*, 276
- Damaliscus*, 234
- Dapodium*, 284
- Dapedius*, 364
- Dart, R., 545
- Darwin, C., (1809–1882), 3, 9, 542, 543–7, 552
- 'Darwinian fitness', 140
- dasyclads, problematic taxa, 443
- data handling, plant communities, 353–4
- dating *see* geochronology
- Dawson, J.W., 545
- Dawsonites*, 61, 63
- de-watering, 251, 282
- death assemblages, 237–8, 238, 258
- death marks, trace fossils, 355
- debris flows, obrution deposits, 241
- decay processes, 213–16, 215, 216
- Deccan Traps, India, 163, 178
- Dechenella rowi*, 242
- deciduous plants, climate indicators, 203–4, 204, 402
- Deep Sea Drilling Project (DSDP), 108, 404, 548, 549
- deer, biomechanics, 320
- 'degenerate forms', heterochrony, 111
- dehydration
 preservation, 270
 terrestrialization, 69
- Deinonychus*, 375
- Deinotherium*, 543
- Deltoidium delta*, 510
- 'deme', microevolution, 125, 126, 126, 128, 129, 327
- demosponges
 biomineralization, 25, 28
 modern fauna, 38, 48
 trace fossils, 360
- dendrogram, systematics, 435
- density, hydrodynamics, 323
- deposit feeders
 bivalves, 400
 modern, 48
- Palaeozoic, 47
- Precambrian–Cambrian, 22, 38, 41, 42, 43, 44, 45, 180
- trace fossils, 356, 358, 359, 360
- trophic structure, 385, 386, 386, 388, 388, 389, 390
- depth, indicators, 411–12, 411, 412
- Dermoptera, 78
- desiccation
 preservation, 268
- stromatolites, 337
- terrestrialization, 60, 65
- destructive processes, taphonomy, 223–6, 224, 225, 226, 233, 237
- determinants, immunological techniques, 98–9
- detritus feeders
 evidence of, 362
- Precambrian, 18, 22
- trophic structure, 385, 386, 386, 386, 387
- developmental processes, morphology, 309
- Devonian
 biofacies, 396, 397, 400
 coevolution, 137
 completeness of fossil record, 299
 diagenesis, 252, 255
 diversification, 47, 45, 46, 47, 132
 environmental indicators, 402, 405, 405, 411
 evolutionary fauna, 40
 extinction, 160, 167, 194
 parasites, 378–9
 plant
 communities, 352
 preservation, 265
 size, 151
 predation, 370, 371, 371, 372, 373
 problematic fossils, 444
 reefs, 55, 56, 345
 stratigraphy, 466, 468, 475, 480–2, 481
 stromatolites, 340
 taphofacies, 259, 260
 terrestrialization, 58, 59, 60, 61, 62, 63, 64, 65, 67, 68–71, 72, 75
 see also Hunsrück Slate
- diacladogenesis, 394
- diagenesis
 carbonate nodules and plattenkalks, 250–3, 251, 252
 coprolites, 366
 flattening, 244, 245
 fossil concentrations, 236, 236, 240, 267, 268, 270, 283
 Burgess Shale, 273–4
 Hunsrück Slate, 278–9
 Mazon Creek, 281–2, 281, 282
 'Orsten' deposits, 275–6
 Solnhofen Limestone, 287–8
 fossil record, effect on, 445
 iridium enrichment, 168
 organic matter, 96, 97–8, 100, 217, 219–20
 phosphate, 256–7, 256
 plants, 351, 352
 pyrite, 253–5, 254
 reefs, 343, 344
 skeletal carbonates, 247–50, 248, 249
 trace fossils, 356, 357
- diapsids, evolutionary faunas, 39, 41
- diastrophism, extinction process, 160
- diatoms
 electron microscope, 511
 environmental indicators, 412
 evolution, 121
 stromatolites, 336
- Dicellograptus anceps*, 478, 479
- Diceras*, 145
- Dichoporita*, extinction, 181
- Dickinsonia*, 20, 21, 33
- Dickinsoniidae*, 21
- dicotyledonous plants, 82, 85
- Dicroidium* flora, 197
- Dictyonema*, 379
- Dictyonina*, 273
- dicynodonts
 predators, 373
 size, 151
- diet
 evidence of, 293, 362–7, 363, 365, 366
 see also coprolites
- digits, horses, 86
- differentiative heterochrony 111, 117
 see also coprolites
- Dilleniidae*, 81
- Dimetrodon*, 373
- dinocephalians, size, 151
- dinoflagellates
 Cretaceous, 201
 thermal maturity, 513, 514
- Dinosaur Provincial Park, Alberta, 204, 205
- dinosaurs
 angiosperms, effect of, 81, 83
 biomechanics, 320
 evolutionary faunas, 39, 41
 extinction, 194, 195, 202, 203, 204–5, 205, 206, 207–8
 feeding, 268, 363–4, 366, 367, 370, 373, 374–5, 374
 flying vertebrates compared, 76, 78
 gastroliths, 363, 364
 heterochrony, 114
 palaeopathology, 381, 382
 radiation, 194, 195, 195
 saurischian, 374–5
 size, 147, 148, 150, 150, 151
 skeletons, 234, 382
 theropod, 114, 374
 see also archosaurs; ceratopsians
 dinosaurs; ichthyosaurs
- diphytic, tetrapods, 69
- Diplorenozoa, Precambrian, 21
- Diplocraterion*, 359, 360
- Diplodocus*, 148, 150
- diploporitids
 diversification, 46, 47
 extinction, 181
- Diploria*, 343
- dipnoans
 feeding, 366
 terrestrialization, 69
- Diprotodontidae, extinction, 208
- dipterans
 Baltic amber, 296, 296, 297
 coevolution, 138
- disarticulation, Lagerstätten, 283
- 'disaster forms', Tertiary, 201
- disease, study of, 381–4, 382, 383, 384
- dispersal
 ability, evolutionary rate, 157
 biogeography, 448, 455–6, 455
 colonies, 331
 plants, 60, 64, 82, 83
- dissolution, skeletons, 223, 225, 258
- distance communication, exhibit strategies, 519–22, 521
- divergent upward, stratophenetics, 440
- diversification
 angiosperms, 79
 Cambrian, 34
 data, and nomenclature, 426
 patterns, 130–5, 131, 132, 134
 adaption, due to, 141–2
- Precambrian, 17, 18, 22
 see also evolutionary faunas
- diversity
 analysis of, 445–8, 446
 biofacies, 398, 399
 brackish water, 407
 colonies, 334, 339
 community groups, 393, 394, 394

- computer analysis, 495, 496, 497
 encrusters, 350
 predation, 376
 trace fossils, 357, 360, 361
 'diversity-pump hypothesis', 457
 DNA
 fragment preservation, 99
 genetic analysis, 327, 328, 329
 heterochrony, 118
 molecular palaeontology, 95, 153, 154
 Dob's Linn, Scotland, 182, 479–80, 479
 documentation systems, museum collections, 517–9
 dogs, predators, 375
 dolomite, stratigraphy, 476
 dolomitization, 249–50
 domical stromatolites, 336, 337, 337, 338, 338, 339, 340
 domichnia, trace fossils, 356
 Dominican Republic, amber deposits, 297, 297
Dorygnathus campylognathoides, 284
 Doushantuo Formation, Yangtze Gorges, China, 31
 Downton Castle Sandstone, Shropshire, 480, 481
 drag, hydrodynamics, 323, 324, 324
 drilling, predation, 369–70, 371–2
Drosophila, 101, 102, 103, 104
 drought avoidance, land plants, 60
 DSDP (Deep Sea Drilling Project) cores, 108, 404, 546, 548
 Dubois, E., 544
 Duck Creek Dolomite, Western Australia, 13
 Dunham, Sir Kingsley, 469
 durability, skeletons, 223
Durania, 145
 durophagous predation, 38, 42, 47, 368, 370, 371, 372
 dust proofing, specimen storage, 516
 dwelling structures, trace fossils, 355–6
 dyads, terrestrialization, 60–2, 61
 dynamic viscosity, hydrodynamics, 323
 'dynasties', compared evolutionary faunas, 37
 see also megadynasties
 dysaerobic environment
 biofacies, 397
 environmental indicators, 409, 410, 410
 extinction, 182
 Lagerstätten, 270
 taphofacies, 259, 259, 260, 261
- ear, vertebrates, 70
 earthbound extinction processes, 160–4, 161
 earthworms, terrestrialization, 65, 67
 eburnation, bones, 382
Eccentrotheca, 27
 ecdysis
 biomineralization, 26
 terrestrialization, 68
 echinoderms
 biomineralization, 25, 26
 completeness of record, 299, 300, 300, 301, 301
 cyclocystoid, 181, 301
 destruction of, 223, 224, 225
 diagenesis, 247, 248, 250
 diversification, 46, 47, 46, 89
 environmental indicators, 406
 eocrinoid, 38, 39, 45, 46
 Euechinioidea, 433
 extinction, 175, 181, 183, 187, 187, 189, 192
 feeding, 389
 Lagerstätten, 239, 240, 242, 243, 281, 282, 283
 Burgess Shale, 271, 272
 Hunsrück Slate, 277, 278, 278, 279
 Solnhofen Limestone, 286, 288
 marine habitat, 64
 parasites of, 378, 379
 pelmatazoan, 54, 187, 189, 233
 Precambrian–Cambrian, 22, 33, 34, 45
 preservation, 268–9
 size constraints, 149, 150
 skeleton, 315–16, 318
 stelleroids, 38, 46
 stereom, 26, 62, 315–6, 318
 trace fossils, 360
 see also asteroids; crinoids; cystoid echinoderms; echinoids; edrioasteroid echinoderms; holothurians
 echinoids
 biofacies, 397, 400
 clypeasteroid, 114
 feeding, 389
 heterochrony, 113, 114, 115, 116, 117, 117
 Lagerstätten, 268, 270, 283
 modern fauna, 38, 40, 46, 48
 neolampadoid, 114
 oxygen isotope ratios, 403
 paraphyletic groups, 443
 saleniid, 114
 skeleton, 314
 spatangoid, 115
 tiarechinid, 114
Echinus, 300
 echiurans, trace fossils, 360
 echiuroids
 marine habitat, 64
 Precambrian, 18
 ecology, 548
 biofacies, 396–7, 396, 397
 evolutionary units, 393, 393
 information, fossil concentrations, 235, 236, 236
 macroevolution, 125, 126
 microevolution, 101, 105
 reef, 341, 342
 economic success, selection, 126, 127, 128, 129
 ecophenotypy, computer analysis, 498
 ecostratigraphy, 472
 ectocochleates, biomechanics, 320, 321
 ectomycorrhizae, terrestrialization, 59
 ectothermic predators, 374, 374
 Edentata, extinction, 208
 Ediacara Hills, South Australia, 44, 548
 Ediacaran see Vendian
Ediacaria, 18, 19
Edmondia, 281
Edmontosaurus, 205, 207
 edrioasteroid echinoderms
 completeness of record, 299
 encrusters, 347
 extinction, 181
 heterochrony, 114, 115
 obrution deposits, 239, 240
 Palaeozoic, 46
 'effect hypothesis', selection, 127, 152
 eggs
 composition, 314, 318
 terrestrialization, 70
 El Kef, Tunisia, standard boundary sequence, 199, 200
Elasenia, 18
 elasmobranchs, extinction, 189
 Elbobreen Formation, Spitsbergen (Svalbard), 11
 Elburz mountains, Iran, 476, 477
Eldonia, 273
 electrical discharge, origin of life, 5
 electromagnetic separation, sample preparation, 504
 electron donors, decay processes, 213
 electron microscopy, 508–11, 510
 electrophoretic techniques, 96, 101
 Eleonore Bay Group, East Greenland, 15
 elephants
 palaeopathology, 383, 383, 384
 size, 147, 150, 151
Elephas, 148, 150
 Ellis Bay Formation, Anticosti Island, Canada, 479
 elongation, shells, 227
Elonichthys peltigerus, 281
 embryology, evolutionary systematics, 435
 emigration, speciation, 108
 empirical model, global diversity, 446–7, 446
 encrusters, 237, 341–2, 346–51, 347, 348
 endemic species
 biostratigraphy, 484
 extinction, 456, 459, 460
 endobionts, encrusters, 346
 endocochelates, biomechanics, 320, 321
 endolithic algae, effect on shells, 224, 248
 endomycorrhizae, terrestrialization, 59
 endoskeletons, Cambrian, 24, 26
 endosymbionts, Precambrian, 16, 22, 23
 endothermic predators, 373, 374, 374
 energy
 Lagerstätten, 241, 290
 origin of life, 5, 6
 Red Queen Hypothesis, 120
 taphofacies, 258, 258, 259, 260, 261, 262, 263
 trophic structure, 385, 389
 enteropneusts, trace fossils of, 360
 enterospirae, 366, 366
Entobia, 360
 environment
 conditions
 animal size, 151
 evolution rate, 156
 heterochrony, 116
 molecular fossil evidence, 96, 100
 indicators
 climate from plants, 401–3, 401, 402
 depth from trace and body fossils, 411–2, 411, 412
 oxygen levels from biofacies and trace fossils, 408–10, 410
 salinity from faunal analysis and geochemistry, 406–8, 407
 temperature from oxygen isotope ratios, 403–5, 404, 405
 enzymes, genetic analysis, 327
Eoanthropus, 544
 Eocene
 biofacies, 400
 biogeography, 450, 451
 decay processes, 214
 diagenesis, 253, 254, 254, 255

- dietary evidence, 364, 367
 environmental indicators, 404, 404, 405, 411
 extinction, 161, 167, 169, 170, 173, 174, 175, 176, 177
 flight, 78
 grasslands, 84, 85, 86
 obrution deposits, 241
 parasites, 377
 predation, 370, 375
 Red Queen Hypothesis, 121
 size, 150, 151, 151
 stratophenetics, 441
 terrestrialization, 67
 trophic structure, 389, 389
Eocoelia, 392
 eocrinoid echinoderms, Palaeozoic, 38, 39, 45, 46
Eohippus, 544
Eohostinella, 62
Eoporpita, 18, 19
Eosphaera, 50, 51
 eosuchians, range, 205, 206
Eosynechococcus moorei, 57
 epeirogenic changes, extinction, 163
 Ephemeroptera, flight, 72, 73–4, 73
 epibionts, 239, 346
 epifauna, 41, 42, 43
 extinction, 185
 modern, 48
 Palaeozoic, 38, 45, 46, 47
 Precambrian, 22, 33, 45
 trophic structure, 385, 386, 387
 epiphytes
 encrusters, 349
 terrestrialization, 63
Epiphyton, 54
 epizoans
 encrusters, 349, 350
 parasitic, 380
 epoxy resin, SEM, 509, 510
Equidae, 86–7, 87
 equilibrium
 experimental morphology, 308, 309
 model, global diversity, 446, 446, 447
Equisetites, 283
Equus, 86, 208
Eremotherium, 207
 ernietiids, Vendian, 21, 33
Ernietta plateaueensis, 21
Eryon, 286, 366
 erythrosuchids, predators, 373, 374
 escalation, predation, 368
 escape traces, trace fossils, 356
Esocidae, biogeography, 449
 Essex fauna, 279, 281, 282
Essexella asherae, 281
 ethylene diaminetetraacetic acid, specimen preparation, 501
 eubacteria
 origin of life, 7
 Precambrian, 12, 53
 terrestrialization, effect on, 63
Eucalyptocrinites caelatus, 379
Euechinioidea, 433
 eukaryotes
 extinction, 179
 origins of, 7, 13, 15–16, 30, 50, 51, 53
 stromatolites, influence on, 337, 340
Euplococephalus, 205, 207
 Euramerican plate, 71
Eurhinosaurus, 284
Europolemur koenigswaldi, 292
 euryhaline environment
 environmental indicators, 406, 407
 fish, extinction, 189
 eurypterids
 biomechanics, 320, 320, 321, 322
 extinction, 189
 feeding, 370
 Lagerstätten, 279
 terrestrialization, 65, 66, 67
 eurytopic taxa, 128, 158–9, 160, 258
Eusmilus, 381
 eutherian mammals, predators, 375
Euthynotus, 284
 euxinic condition
 decay processes, 213, 214
 Lagerstätten, 283
 evaporite deposits
 Cambrian, 35
 Permian, 188, 192
 event stratigraphy, 472, 474, 478
 Everglades (National Park), Florida, 408
 evergreens
 climate indicators, 401, 402
 forests, decline, 204
 leaves, hydrodynamics, 230
Evmiakia, 18
 evolution
 adaption, 139
 cladists, 429
 classification, 422, 425–6, 432, 435
 floras, 39, 40, 41
 novelty, 435
 rates, and biogeography, 456
 'synthesis', 124
 systematics, 434–7, 436
 theory of, 3
 evolutionary faunas
 marine, 37–40, 38, 39
 terrestrial, 39, 40–1
 exaaerobic facies, 409, 410
 'exaptation', adaption, 145, 146
 excretion, terrestrialization, 65, 69
 exhibit strategies, 519–22, 521
Exogyra, 283
 experimental approaches, morphology, 307–9, 308
 extinction
 adaptive gaps, 137
 angiosperms, 82
 benthic species, 110
 biogeography, 459, 460
 community groups, 393
 computer analysis, 495, 497
 data, and nomenclature, 426
 diversification, effect on, 37, 39, 40, 42, 47–8, 133, 134
 diversity analysis, 447–8
 earth-bound causes, 160–4, 161
 events, effect on reefs, 52–3
 parasitic hosts, 380
 periodicity, 171–8, 172, 173, 174, 175
 physical environment, 119, 167–70, 168, 170
 rate, 136, 185, 186, 186, 553
 size, effect of, 151, 152
 speciation, 128
 Vendian, 17, 22–3, 33, 44, 179–80, 180
 see also extra-terrestrial cause; Red Queen Hypothesis
 extra-terrestrial cause, extinction, 119, 164–70, 168, 169, 171–2, 177, 182, 191, 198, 553
 extraction techniques, microfossils, 502–4, 503
Extraordinarius Band, Dob's Linn, Scotland, 479, 480
 Exxon sea-level changes, 161
 eyes, experimental morphology, 308
 F1 hybrid individuals, 101, 102, 103
 fabricational element, morphology, 311
 facies studies
 plants, 353
 trace fossils, 362
 faecal pellets *see* coprolites
Fagus, 265, 231, 232
 Fahrenholz's Rule, 138
Falites, 275
 false rings, trees, climate indicator, 402
 Famennian
 extinction, 184–6, 186
 red beds, East Greenland, 68
 family level
 diversity, 134
 immunological techniques, 99
 farming systems, trace fossils, 356
 faros, Silurian–Devonian, 56
n-fatty acids, organic components, 219
'Fäulen', Solnhofen Limestone, 286
 faunal association, 396
 favositids, reefs, 55
Favreina, coprolites, 366
 feathers, classification, 436
 fecundity, colonies, 332–3
 feeding
 adaption, 143
 burrows, trace fossils, 356
 Cambrian, 23
 evidence of diet, 362–7, 363, 364, 365
 Precambrian, 22, 23
 trophic structures, 385–90, 385, 386, 386, 387, 388, 389, 390
 felids, extinction, 208
fenestra ovalis, terrestrialization, 70
 ferns
 extinction, 203
 hydrodynamics, 232
 terrestrialization, 40, 63
 fertilization
 angiosperms, 82
 terrestrialization, 65
 fibrous habit, aragonite, 315, 315, 317
 field emission, SEM, 511
 Fig Tree Group, South Africa, 10, 51, 53
 filamentous fossils, Precambrian, 10, 12, 53
 filter feeders
 extinction, 184, 193
 Lagerstätten, 276
 Precambrian, 18
 size constraints, 149
 trophic structure, 386
 fire
 extinction, 203–4
 hominid, 88, 89, 90
 First Appearance Datum (FAD), 478
 First Reviser, Principle of, 417
 fish
 acanthodian, 185
 biogeography, 449, 450, 450, 451
 biomechanics, 320, 321
 cichlid, 308
 chondrichthyan, 38, 40, 148, 366

- diversification, 38, 40
 environmental indicators, 406
 extinction, 185, 189, 194
 feeding, 364, 366, 369, 370, 371
 heterochrony, 118
Lagerstätten, 270, 279, 280, 284, 287, 288, 292
 osteichthyan, 38, 40, 69
 placoderm, 148, 185, 194, 279, 370
 sample preparation, 502
 size, 148
 taphofacies, 259
 tetrapod relationship, 69
see also teleostean fishes
 'fitness', adaptation, 140
 flattening, fossils, 244–6, 244, 246, 253, 279, 287
 flatworms, terrestrialization, 65
 'fliesen', resin, 296
 flight
 aerodynamics, 325
 arthropods, 72–5, 73
 biomechanics, 319, 320
 experimental morphology, 307
 vertebrates, 75–8, 77
Flinders Ranges, South Australia, 31–2, 33
 'Flinze', Solnhofen Limestone, 286
 floating theory, flight, 74, 75
 'floats', graptolites, 52
 flood basalt, Cretaceous, 163
 flora *see* plants
Florida Bay, reefs, 343, 344
 flowering plants *see* angiosperms
 fluorapatite, diagenesis, 257
 fluorescence, thermal maturity, 511, 512–13, 513, 513
 fluoridization, extraction techniques, 504
 fluorine, diagenesis, 256, 257
 fodenichnia, trace fossils, 356
 folding, geochronology, 483
 food supply
 benthic habitat, 42, 42, 43
 hominids, 88, 90, 91
 size advantage, 151
 terrestrialization, 68
 trace fossils, 356
 trophic structures, 385, 386
Foraminifera
 biogeography, 457, 458, 458, 457, 457, 487–8
 biomineralization, 25
 biostratigraphy, 461, 462, 467
 Cambrian, 52
 diagenesis, 247, 248, 250, 256
 electron microscopy, 509, 510
 encrusters, 346, 347, 348
 environmental indicators, 403, 404, 404, 406, 407, 409, 411, 412
 evolution, 121, 123
 extinction, 160, 184, 187, 189, 191, 198, 199, 200
 fusulinid, 160, 189, 458, 458
 Lagerstätten, 283, 288
 parasitic, 380
 phylogenies, 427
 Red Queen Hypothesis, 136
 reefs, 342, 342, 343
 sample preparation, 504
 speciation, 108
 use of, 220
 forelimbs, flight, 78
 forests, fossil, 264, 266, 352
 form genus, plant fossils, 422
 formation, stratigraphy, 462
 formative education, exhibit strategies, 521–2, 521
 formic acid, sample preparation, 502, 503
 fossil assemblage, 237, 238
see also obrution deposits
 fossil concentrations, 235–7, 236
see also Lagerstätten
 fossil forests, 264, 266, 352
 fossil fuels, study of, 96, 100
 fossil record, completeness of, 298–303, 298, 300, 301, 302, 388
 Fossil-Lagerstätten, 235, 266
see also Lagerstätten
Fossundecima konecniorum, 280
 founder effect, speciation, 103
 Fourier analyses, extinction data, 172, 174–5
 fractures, bone, 381–2, 384
 fragmentation
 destructive processes, 223–4, 225, 226, 237
 taphofacies, 258, 258, 259, 260–1, 262, 263
 frambooids, diagenesis, 255, 266
Francis Creek Shale Member, Illinois, 279–82, 280, 281, 282
Frankfort Shale, New York, 240
Frasnian, extinction, 37, 40, 161, 184–6, 186, 400
 freezing, preservation fossils, 268
 frequency curves, fossil record, 301–2, 302
 freshwater
 diagenesis, evidence from, 252, 255
 extinction, 185
 taxa, 406, 407, 407, 408
 trace fossils, 361
 fringing reefs, 56
 frogs, *Lagerstätten*, 292
 frost rings, trees, climate indicator, 402
 Froude number, 320, 321
 fruits
 angiosperms, 82, 83
 hydrodynamics, 231
 fugichnia, trace fossils, 356
 fugitive strategy, encrusters, 347
 fulvic acid, organic matter, 217
 functional element, morphology, 76, 311
 fungi
 basidiomycete, 59
 oomycete, 63
 preservation, 216
 terrestrialization, 59, 61, 63
 furcula, birds, 77, 78
 fusain, plants, 263, 264, 264, 265
 fusulinid foraminifera
 biogeography, 458, 458
 extinction, 160, 189
 Gaia, concept of, 136
 Galapagos finches, speciation, 105
 galls, trilobites, 379–80
 gametogenesis, colonies, 335
 gametophytes, preservation, 264
 Ganbour Basin, Morocco, 256
 ganoids, *Lagerstätten*, 284
 gas production, 220
 gas vacuoles, graptoloids, 52
Gastrochaenolites, 360
 gastroliths, dinosaurs, 363, 364
 gastropods
 biofacies, 400
 biogeography, 454, 455, 455, 456, 456, 459
 Cambrian, 34
 coevolution, 137
 commensalism, 380
 destruction of, 223, 224
 environmental indicators, 406, 412
 experimental morphology, 309
 extinction, 167, 187, 189, 194
 feeding, 362, 368, 369, 369, 370
 hydrodynamics, 227, 228, 229
Lagerstätten, 267, 279, 292
 modern, 38, 48
 muricid, 370, 371, 372
 naticid, 122, 137, 370, 371, 372
 parasitic, 378
 prey, 369, 371, 372
 prosobranch, 65, 66, 67, 68
 radula, 362
 reefs, effect on, 54
 survivorship curves, 122, 389, 389
 terrestrialization, 65, 66, 67, 68
 zygopleurid, 189
see also snails
 Gaudry, A., 543
Geiseltal brown coal, East Germany, 214
 gel electrophoresis, 327, 327, 328, 329
Geminospora lemurata Biozone, 466
 genealogical hierarchy, 125, 126
 generation time, rates of evolution, 156
 generative paradigms, morphology, 309
 generic level, immunological techniques, 99
Genesee Formation, New York State, 255
 genet, colonies, 331, 332, 333, 335
 genetics
 analyses, population studies, 326–9, 327, 328, 329, 329
 classification, 236–7
 evolution, 153, 154
 genetic drift hypothesis, 95, 109
 history of, 546–7, 548
 origin of life, 3, 6
 regulation, heterochrony, 118
 reproductive isolation, 101–2, 114
 genotype
 evolution rate, 153
 natural selection, 140, 141
 origin of life, 6–7
 populations, 329
see also speciation
 geochemical evidence, 10, 216
 extinction, 164, 167–9, 168, 170, 199
 geochemistry
 decay processes, 213
 taphofacies, 258, 259
 geochronology, 469, 471, 474, 483–4
 amino acid dating, 97, 98, 99, 100
 geochronometry, 464, 465
 geographical distribution
 evolutionary systematics, 435
 speciation, 101, 103, 104, 105, 108, 127
 geography, development of, 547
 geomagnetic field, extinction, 163
 geometry, fossil concentration, 235, 236, 236
 geopolymers, formation of, 217, 218
Georgina Basin, northern Australia, 57
 geothermal H₂S, 49, 50
Gervillia, 283
 Gesner, C., (1516–1565), 537

- Gila monster, 205
 Gilboa fauna, New York, 68
 gills
 suspension feeding, 142, 142
 terrestrialization, 67
Ginkgo, 283, 422
 biloba, 232
 ginkgoes, 191, 232
Girvanella, 54
 glaciation
 extinction, 162, 183, 183, 208, 209
 Permian, 187, 190, 191, 192
 Precambrian, 17, 50
 isotope ratios, 403–4
 molecular evidence, 220
 Ordovician, 478
 palaeopathology, 383
 reefs, effect on, 344
 sea-level, effect on, 488
Glaessnerina, 44
 glauconite, extinction evidence, 169
 Gleedon Chronozone, Welsh borderland, 463, 463
 glide reflection, bilateral animals, 21, 23
 gliding, flight, 75, 78
 global cooling, extinction, 191, 192
 global diversity, 445–7, 446
 global standard stratigraphy, 462–5, 463,
 464, 468, 472–5, 476
 global boundary stratotypes 471–5, 472
 Ordovician–Silurian, 478–80, 479
 Precambrian–Cambrian, 475–8, 477
 Silurian–Devonian, 480–2, 481
 Global Stratotype Section and Point,
 (GSSP), 462, 463, 465, 468, 472–5,
 476
Globidens, 363
Globigerina eugubina, 199
 globigerinid species, extinction, 172
 globines, metazoans, 17
Glochiceras, 287
Gloeotheca coerula, 57
Glossifungites ichnofacies, 356, 358, 359,
 360, 412
 glossopterids, evolution, 80, 81, 191
Glossopteris, 265, 366
Glossotherium, 207, 208
 glycine, 98
Glyphaea, 366
 glyptodonts
 extinction, 208
 size, 150
Glyptograptus persculptus, 181, 478, 479,
 480
Glyptotherium, 208
 Gmünd horizon, southern Germany, 239
Gnathichnus, 351
 gnathostomes, terrestrialization, 69
 Gnetales, evolution, 80, 81
 goethite, extinction evidence, 169
 'golden spike', stratigraphy, 462, 463, 463,
 464, 465, 468, 482
 Gondwanaland
 biogeography, use of, 458
 biostratigraphy, 485, 487
 diversification, 134
 glaciation, extinction, 162, 183, 183, 187
 IGCP project, 470
 goniatic ammonites
 biostratigraphy, 484
 extinction, 189
Goniomyia, 283
 horizon, stratigraphy, 462
Gothograptus nassa, 463, 464
 gradualism, speciation, 107, 108, 109, 110
 gradualistically derived species, 427–8
Gramineae, Miocene, 84
Graminophyllum, 84
 Grand Canyon Series, 30
Grandagnostus falanensis, 302
 graphical representation, computer
 analysis, 493, 495
 graptolites
 biofacies, 485, 487
 biostratigraphy, 461, 462, 463, 466, 467,
 468
 coloniality, 330, 332, 333, 334
 destruction of, 224
 diversification, 38, 45, 46, 47, 51, 52
 electron microscopy, 509
 environmental indicators, 412
 extinction, 181, 183, 183
 flattening, 246
 floats, 52
 gas vacuoles, 52
 heterochrony, 115, 117
 global boundary stratotypes, 478, 479,
 479, 480, 481, 482
 lineages, 428
 nemata, 52
 parasites of, 380
 problematic taxa, 442
 rhabdosomal stabilizers, 52
 size constraints, 149
 thecal spinosity, 52
 tubothecae, 380
 vanes, 52
 webs, 52
 grasses, preservation, 352, 354
 grasslands, 59, 83, 84–7, 85, 87
 grazing
 marine habitats, 38, 42
 biomineralization, cause of, 29
 encrusters, 350
 reefs, effect on, 53, 54, 56
 source rocks, 221
 stromatolites, effect on, 31
 trophic structure, 385, 390
 terrestrial habitats, 83, 85–7, 87, 180, 354
 trace fossils, 356, 361
 Great Barrier Reef, 52, 345
 Great Plains, North America, 86, 87
 green algae
 biomineralization, 25
 environmental indicators, 411
 stromatolites, 336, 340
 terrestrialization, 51, 63
 green bacteria, Vendian, 49
 Green River Formation, Wyoming, 253,
 364, 370
 greenhouse effect, extinction process, 164,
 165, 166
 greenstone belts, Archaean, 10
 greigite, diagenesis, 253
 grinding techniques, preparation,
 499–500
 'group selection', adaptation, 141
 growth
 banding, diagenesis, 248, 249, 249
 population studies, 326
 Grube Messel, West Germany, 289–93,
 290, 291, 292, 293, 365
Gryphaea, 108
 Guadalupian extinction, 174, 175
 guerilla strategy
 colonies, 334
 encrusters, 347
 Gulf of Mexico coast, fauna, 411, 412
 Gunflint Iron Formation, Ontario, 11, 13,
 50, 53, 336, 339, 548
Gunflintia minuta, 11, 13
 gut contents, dietary evidence, 364
 gymnolaemate bryozoans, modern fauna,
 40, 48
 gymnosperms
 evolution, 39, 40, 138
 resin, 295
 size, 147, 148, 151
Gyronites Zone, 188
 habitat
 adaptation to, 141–2
 diversity, effect on extinction, 160, 185,
 193, 198
 evolution rate, 157, 158
 islands, 349
 hadrosaur
 extinction, 205, 207
 feeding, 364
 Haeckel, E., 545, 547
 haematoma callus, palaeopathology, 381–2
 haemoglobins, metazoans, 31
 Haldane's rule, 102
Halkieria, 45
 halkieriids, Cambrian, 34, 45
Hallidaya, 18
 halysitids, Ordovician, 55
 Hamamelidae, compared Albian forms, 81
 Hamelin Pool, Shark Bay, Western
 Australia, 337
 Hamilton Group, New York State, 259, 260
 hand axes, hominids, 89–90
 Haqel Limestone, Lebanon, 253
 hard parts, flattening, 244
 Harland, W.B., 469
Harlanella, 34, 180, 180
 Hawaiian Islands, 192, 457
 hearing, terrestrialization, 70
 heat conservation, size advantage, 151
 heat, effect on fossil molecules, 96
 'heavy water', Cambrian, 35
 hederellids, encrusters, 347
Hedinapis fauna, 398
 heliolitids, Ordovician, 55, 182
 Hell Creek Formation, Alberta, 204, 205
 Helodermatidae, extinction, 205, 206
Helodus, 370
 hematite, diagenesis, 259
Hemiasper, 115
 hemichordates, marine habitat, 64, 272
Hemicystites parasiticus, 240
 herbaceous plants, preservation, 352
 herbivores, 373, 375
 angiosperms, effect on, 83
 evolution, 84, 85–7, 87, 137
 herbs, habitats, 81
 heredity, 'evolutionary synthesis', 124
Hesperornis, 78
Hesslandona unisulcata, 275, 276
Hesthesia immortua, 377
 heterochrony, 111–118, 309, 498
 heterocysts, Precambrian, 13
 heterodont bivalves, 400
 heterogametic sex, reproductive isolation,
 102
 heterogeneity, colonies, 335
 heterotrophs
 evolution, 4, 5–6, 14, 16, 29

- reefs, effect on, 53
heterozygosity
 individuals, 327, 327, 328, 328, 329
 population, 328, 328, 329
 reproductive isolation, 102
hexactinellid sponges, biomineralization, 25, 26, 27, 28
Heydenius antiquus, 377
Heydenius matutinus, 377
Hibbertopterus, 319
Hiemalora, 18, 20, 21
'Hierarchy theory', 125–9, 126
Highland Border Complex, Scotland, 484
Hildoceras, 283, 364
Hindeodella confluens, 421
hippo, teeth, 86
Hippurites, 145
Hirnantian fauna, 182, 183, 183, 478
see also Ordovician, extinction
Historischer Aspekt, morphology, 311
history of palaeontology
 before Darwin, 537–42, 537, 538, 540, 541, 542
 Darwin to plate tectonics, 543–7, 544, 546
 past decade and the future, 550–5
 plate tectonics to *Paleobiology*, 547–50
Hjoula Limestone, Lebanon, 253
Holocene
 biofacies, 400
 biogeography, 449, 451
 coevolution, 137
 grasslands, 86
 nomenclature, 424, 426–7, 432, 433
 parasites, 380
 reefs, 344, 345
 trophic structure, 390
holocephalians
 extinction, 189
 Lagerstätten, 284
Holmesina, 208
holophyletic taxa, 39–40, 436
holosteans
 extinction, 189
 Lagerstätten, 284
holostratigraphy, 469, 471
holothurians
 diversity, 46
 Lagerstätten, 279, 281, 282
 trace fossils, 360
Holzmaden, West Germany, 270, 282–4, 283, 284, 285
homeostasis, earth's surface, 136
hominids
 diet, 88, 89, 90, 91, 150, 208, 367
 evolution, 88–91, 89, 110, 144, 149, 428, 544–5, 544, 546, 547
 jaws, 88, 90, 91
 stratophenetics, 440, 441
Homo, 110, 149, 428
Homo Diluvii Testis, Scheuchzer, J., 539
Homo erectus, 88–90, 89
Homo habilis, 88, 89
Homo sapiens, 89, 90
Homo sapiens neanderthalensis, 383
Homocrinus, 240
homoiohydry, terrestrialization, 60, 62, 64
Homonymy, Principle of, 417, 418, 424
homoplasy
 computer analysis, 497
 evolution, 434, 435
Homotherium, 207, 208
Homotrema, 343
homozygous individuals, 327, 327
Hooke, R., (1635–1703), 538, 539
hooved mammals, evolution, 86–7, 87
hopanoids, diagenesis, 218, 219
hormonal control, heterochrony, 118
'horotely', 153
horses
 evolution, 85, 86, 107, 118, 121, 138
 extinction, 208, 208
 feeding, 365
 Lagerstätten, 292, 234
 study of, 543–4, 544, 545
Horseshoe Canyon Formation, Alberta, 204, 205
horseshoe crabs, living fossils, 157, 157
horsetails
 Lagerstätten, 283
 size, 150, 151
Hostinella, 62
human evolution, *see* hominids
humerus, flight, 76, 77
humic acid, diagenesis, 217
humidity, specimen storage, 515–6
Hungaia fauna, 398
Hunsrück Slate, 239, 245, 254, 269, 277–9, 278
Hunsrückschief *see* Hunsrück Slate
hunting, hominids, 88, 89, 90, 91, 208
see also feeding
Huroniospora, 11, 13, 50, 51
Huxley, T.H., 543, 544, 544, 545
hyaenas, feeding, 367, 375
hyalosponges, extinction, 184, 185
Hyatt, A., 545, 546
hybodonts, predation, 370
Hyodus, 284, 364, 365
hybrid zones, reproductive isolation, 101
Hydra, 333
hydrocarbons
 source rocks, 217–8, 220–1, 221
 thermal maturity, 512, 514
hydrochloric acid, sample preparation, 502, 504
hydroconozoa, biomimetic, 25, 26
hydrodynamics, 322–5, 324, 325
 decay, 214–5, 216
 information from concentrations, 236, 237
 obrution deposits, 241
 reefs, 344
 transport, 227–9, 228, 229
hydrofluoric acid, extraction techniques, 504
hydrogen peroxide, sample preparation, 500, 503
hydrogen sulphide
 diagenesis, 253, 254, 255
 Lagerstätten, 271, 279, 292
 origin of life, 12
 Precambrian, 49, 50
hydrolyzation, organic debris, 95
hydrostatics, 322
 skeletons, 67, 314, 320
hydrothermal metamorphism, Cambrian, 36
hydrothermal vents, origin of life, 8
hydroxy-fluorapatite, diagenesis, 256
hydroxyapatite, diagenesis, 256
hydrozoans
 coloniality, 330, 334
 Lagerstätten, 279
 Vendian, 44
Hylochoerurus, 234
Hyénomus, 70, 71
hymenopterans
 Baltic amber, 296–7, 297
 coevolution, 138
hyolothelminths
 biomimetic, 27
 problematic taxa, 443
hyoliths
 Cambrian, 25, 25, 34, 38, 39, 45, 272, 273
 problematic taxa, 442, 443
hypermorphosis, 111, 112, 113, 114, 117, 118
hypersaline taxa, 271, 407, 407
see also salinity
hypocleidium, 78
Hypohippus, 86
hypsilodonts, extinction, 205, 207
hypodont teeth, grazers, 86, 87, 138
Hyracotherium, 86

Iapetus, biostratigraphy, 485, 486, 489
Icaromycterus, 78
ichnofacies, 356–60, 358, 359, 360
ichnofossils *see* trace fossils
ichnological nomenclature, 423–5
Ichnusina, 18
Ichthyornis, 78
ichthyosaurs
 classification, 435, 436
 feeding, 363, 364–5, 370, 372
 Lagerstätten, 284, 285
 skeleton, 382
 taphofacies, 259
Ichthyostega, 69, 69, 70
ichthyostegarians
 predators, 373
 terrestrialization, 68–9, 69, 70
Ichthyostegopsis, 68–9
Iguanidae, 205, 206
Iguanodon, 366, 543
iguanodonts, 543
 feeding, 364, 366
Illinois, marine reef, 55–6
Ilyanassa obsoleta, 390
image analysis, 498
immunological techniques, molecular fossils, 98–9
Imperato, F., (1550–1625), 538
inadunate crinoids, extinction, 160, 189
inarticulate brachiopods
 taxonomy, 433
 Triassic, 192
incertae sedis, nomenclature, 423
index fossils, 295, 461, 466–7, 466, 467
Indo-west Pacific region, species richness, 456, 457
Indricotherium, 149, 150
infauna, 41, 42, 42, 43
 Cambrian, 38, 45
 modern, 48
 Palaeozoic, 47
 Precambrian, 22, 33, 44
 suspension feeding, trophic structure, 385, 386, 387
infections, skeleton, 382–3
information, collections, 517–18
inoceramid bivalves, extinction, 201, 400
Inoceramus, 364
Inordozoa, Precambrian, 18, 21
insectivores, size, 150
insects
 adaption, 142

- apterygote, 65, 72, 73, 74, 297, 297
 coevolution, 136, 137–8
 flight, 72, 73, 74, 307
 Lagerstätten, 268, 279, 288, 289, 297, 297
 protopterygote, 72, 74
 pterygote, 65, 321
 speciation, 104
 terrestrialization, 64, 65, 66, 67
 intelligence, size advantage, 151
 intensity of selection, 156
 interactor, selection, 127
 intercellular space, plants, 60
 International Association for Plant Taxonomy (IAPT), 419
 international bodies, 419, 470, 522
 see also under individual names
 International Botanical Congress, 419
 International Code of Botanical Nomenclature, 418, 422, 516
 International Code of Zoological Nomenclature, 417, 418, 419, 420, 423, 516
 International Commission on Stratigraphy (ICS), 468–469
 International Geological Congress, 476, 522
 International Geological Correlation Programme (IGCP), 469–70
 International Palaeontological Association (IPA), 470, 522
 International Palaeontological Union (IPU), 522
 International Union of Biological Sciences, 419
 International Union of Geological Sciences (IUGS), 462, 465, 468–70, 471, 474, 476, 478–80, 482, 522
 intravittive overgrowth, encrusters, 350
 invertebrates
 coevolution, 137
 diagenesis, 257
 extinction, 200, 201–2
 genetic variability, 328, 328
 size constraints, 149–50
 terrestrialization, 64–8, 66
 ion balance regulation, terrestrialization, 65
 iridium, extinction evidence, 163, 164, 165, 167, 168, 169, 170
 Cretaceous–Tertiary, 199, 203
 Ordovician, 182
 periodicity, 177
 Permian, 191, 193
 Triassic, 198
 Irish Elk, biomechanics, 319–20, 319
 iron
 decay process, 213, 216
 diagenesis, 250, 251, 252, 252, 253, 254, 255
 Lagerstätten, 240, 273, 281, 282, 293
 Precambrian, 12, 13
 island faunas, 106, 193, 376, 457
 isograptid biofacies, 485, 487
 isomerization, organic compounds, 219
 isometric growth, heterochrony, 111
 isopods
 parasites, 378
 terrestrialization, 66, 67, 68
 isoprenoids, biomarker, 219
 Isoptera, amber, 297
 isotope data, 200, 201, 471
 see also oxygen isotopes
- Isua, southwest Greenland, Archaean, 12, 51
 iteration, colonies, 330, 333, 334
- Jaccard similarity coefficient, 453, 454, 454
 Jameson, R., (1774–1854), 542
 jaw articulation, classification, 436
 jellyfish *see Scyphozoa*
 Joint Oceanographic Institutions for Deep Earth Sampling (JOIDES), 548
 journals, 524–9, 530–4
 Juniata Formation, Pennsylvania, 58
- Jurassic
 biofacies, 395, 400
 biogeography, 458
 coevolution, 137, 138
 decay process, 214, 215
 diagenesis 251, 251, 252
 dietary evidence, 362, 363, 364–5, 366
 diversification, 40, 41, 48, 133
 flight, 78
 Lagerstätten, 267, 268
 microevolution, 108
 molecular palaeontology, 98, 99
 obtrusion deposits, 239
 palaeopathology, 382
 parasites, 378, 379
 plant communities, 352
 predation, 372, 374, 375
 size, 150, 151
 source rocks, 222
 stratigraphy, 463, 465, 466, 488
 taphofacies, 259
 terrestrialization, 67
 see also Holzmaden; Solnhofen Limestone
- K–T boundary event sequence, standard, 198–9
 K-selection 115, 117
 Kabwe, Zambia, 90
 kangaroo, size, 150
 kaolinite, Lagerstätten, 281
 Karoo beds, South Africa, 373
 karst surfaces, Ordovician, 182
 karstic phenomena, reefs, 344, 344
 Karweil type diagram, thermal maturity, 512, 512, 513
 Kazakhstan block, 187, 188
Kellibrookia macrogaster, 280
 kerogens
 Precambrian, 12, 13
 source rock, 217, 218, 220
 thermal maturity, 512, 514–5
 Khorbusuonka Series, Northern Yakutia, 17
 Kilauea volcano, Hawaii, 167
Kildinella lophostriata, 179
 kinematic viscosity, hydrodynamics, 323
 Klönk, Czechoslovakia, stratigraphy, 468, 481, 482
Knightia, 364
Knightia eocaena, 305
 Knorria, 423
 Konservat-Lagerstätten, 245
 see also Lagerstätten
 Konstruktionsmorphologie, 310, 311
 Koobi Fora Formation, Lake Turkana, Kenya, 340
 Korytnica Clays, Poland, 386, 388
- Kukalova americana, 73
 Kullingia, 18
- labechiids, Femennian, 184
Labyrinthitos, 55
 labyrinthodonts
 evolutionary faunas, 39, 41
 extinction, 194
 predators, 373
Labyrinthus, 26
Lagania cambria, 215
 Lagerstätten, 34, 239, 240–1, 243, 266–70, 269, 380
 effect on diversity, 445
 and nomenclature, 426
 see also Baltic amber; Burgess Shale; Grube Messel; Holzmaden; Hunsrück Slate; Mazon Creek; 'Orsten'; Solnhofen Limestone
 lagoonal conditions, 287, 345
 Lake Tanganyika, 221
 Lamarck, J.B., (1744–1829), and Lamarckism, 540, 544, 546
 Lance Formation, Alberta, 204, 205
 land bridges, theory of, 547, 549
 land snails, speciation, 107
 Laplandian glaciation, 17
Lapworthella, 44
 laser disc technology, 497–8
 Last Appearance Datum (LAD), 478
 lateral lobes, flight, 73
Latimeria, 157
Latirus moorei, 389, 389
 latitudinal effect
 biogeography, 456–7, 457
 extinction, 184
 Laurasia, 134
 Laurentia, 485, 487
 Law of Constant Extinction, 119, 122, 136
 Lazarus taxa, 166, 167, 189, 193, 299, 448
 leaves
 angiosperms, 79, 80, 80, 81, 82, 83, 84, 85
 climate indicators, 401–2, 402
 hydrodynamic properties, 230–1, 231, 232
 stomata, 60, 62, 231, 402
 Lebensspuren, 356
 lecithotrophic molluscs, biogeography, 455, 455, 456, 456
Leclercqia, 62
 Lee Stocking Island, Bahamas, 337
 leeches
 parasites, 378
 terrestrialization, 65, 68
 Leica 'R' system, photography, 507–8
 Leitz systems, photography, 505, 506, 507–8,
 Lemuroidea, stratophenetics, 440, 441
 leperditiid ostracods, extinction, 189
Lepidocarpon, 423
Lepidodendron, 151
Lepidophloios, 422, 423
Lepidophylloides, 423
 Lepidoptera, amber, 297
 lepidosaurs, Triassic, 194
Lepidostrophiphyllum, 422, 423
Lepidostrobus, 423
Lepidotes, 284, 363
Lepisosteus, 157, 367
Leptoceratops, 205, 207
Leptolepis, 284, 364

- Leptopterygius*, 284
 Levallois technique, 90
 level bottom communities, biofacies, 397–8
 Liaoning Peninsula, China, 339
 lichens, analogues for bryophytes, 58
 life assemblages, 237–8, 238
 life expectancy, hominids, 91
 lift, hydrodynamics, 323, 324, 324
 lignin
 decay, 214, 215, 217
 diagenesis, 254
 terrestrialization, 60, 63
 limbs
 grazers, 86
 hominids, 88
 limestone
 Lagerstätten, 274, 275, 277
 stratigraphy, 476
 stromatolites, 336
 see also Solnhofen Limestone
 Limestone-Dolomite ‘Series’, East Greenland, 11
 limnic stagnation deposit, Lagerstätten 290–1
 limonite
 coprolites, 366
 permineralization, 266
Limulus, 157, 157, 319
 lineages, 106, 127, 151, 154, 155, 427–8, 473
 linear form, encrusters, 347, 347, 350
Lingula, 98, 157, 302, 399, 411
 Linnaean taxonomic classification, 108, 422, 426, 433, 539
Liopleurodon macromerus, 382
Liosstrea, 283, 288
 lipids
 diagenesis, 217–8, 218
 origin of life, 8
 lissamphibians
 evolutionary faunas, 39, 41
 predators, 376
 Triassic, 194
 Lister, M., (c.1638–1712), 538–9
 lithistid sponges, Palaeozoic, 54
 lithographic limestones, 252–3, 269–70
 lithoherms, reefs, 341, 342–3
Lithophaga, 343
 lithostratigraphy, 462, 464, 471, 474
Lithothamnion, 247
 liverworts, terrestrialization, 60, 64
 ‘living fossil’, 152–3, 157–8, 158
 lizards
 Cretaceous, 205
 evolutionary faunas, 39, 41
 Lagerstätten, 292
 local range biozone, stratigraphy, 461, 467, 467
 locomotion
 adaptation, 143
 biomechanics, 320
 hydrodynamics, 325
 mammals, 375
 size, relationship to, 147
 terrestrialization, 65, 70
 trace fossils, 355, 356
Loliginites, 284
Loligosepia, 284
 London Clay, Kent, 254, 254, 255
 longevity
 biogeography, 459, 460
 size advantage, 151
 longitudinal diversity gradients, biogeography, 456, 457
 Longport, New York, Lower Rochester Shale, 240
 lophodonts, horses, 86
 lophophorates, marine habitat, 64
Lorenzinia, 359
Lorenzinites, 18
Loripes, 388
Lorisoidae, 440, 441
Lovenia, 115
 lucinid bivalves, trophic structure, 390
 Ludlow Bone Bed, Shropshire, 480–1, 481
Lumbricaria, 364
 lungfish
 Lagerstätten, 279, 292
 terrestrialization, 69, 70
 lungs, terrestrialization, 67, 69
 lycopods, evolution, 40, 62–3, 352, 354
Lycospora, 423
 Lyell, C., (1797–1875), 542
 lysogenic mode, resin production, 295
 Maastrichtian extinction, *see* Cretaceous extinction
Macanopsis, trace fossils, 358
 Machairodontidae, predators, 151
 mackinawite, diagenesis, 253
Macoma balthica, 229
 macroevolution, 119, 124–9, 126, 550, 552, 553
 macromolecular templating, origin of life, 4
 macrophotography, 505, 507, 508
 Macropodidae, extinction, 208
Macropoma mantelli, 366
 magnesium, diagenesis, 247, 248, 249–50, 257
 magnesium : calcium ratio, seawater, Cambrian, 36
 magnesium carbonate, biomineralization, 24, 26, 36, 264, 314, 315, 316
 magnesium oxide, photography, 505
 magnetite
 extinction evidence, 169, 170, 178
 skeletons, 314
 magnetostratigraphy, 461, 469, 471, 472, 473, 474, 478
 Magnoliales, flower, 82
 malacostracans
 modern fauna, 38, 40, 48
 terrestrialization, 66, 67
 Mallophaga, coevolution, 138
 mammals
 adaptive features, 145
 classification, 436, 436
 characteristics, 190
 coevolution, 137
 dentition, 363
 eutherian, 375
 evolution rates, 153
 evolutionary faunas, 38, 39, 41
 extinction, 204, 204, 207–9, 208
 feeding, 365, 367, 375
 heterochrony, 118
 hooved, 86–7, 87
 jaw, 320
 Lagerstätten, 292
 proteutherian, 204, 204
 radiations, 106, 194
 size constraints, 147, 148, 150, 151
 speciation, 109
 survivorship curves, 119, 120
 terrestrialization, 68
 mammoth
 extinction, 208, 208
 feeding, 365
 human influence on, 150
 Lagerstätten, 268
Mammal, 208, 208
Mammuthus
 jeffersoni, 208
 primigenius, 208
 manganese
 diagenesis, 251, 252, 252
 oxidizing bacteria, 13
 reduction, decay process, 214, 216
 Manicougan crater, Canada, 198
 manoxylic wood, climate indicator, 402
 mantle plumes, extinction, 162, 163, 164, 167, 170, 178
 marcasite, Lagerstätten, 291
Macoma, 389
 marine environment, 41–8
 benthic habitat, 42–4, 42, 43, 44
 coevolution, 137
 diversity of species, 130, 131–2, 131, 133, 134, 135, 192
 evolutionary faunas, 37–40, 38, 39, 41
 extinction, 189, 189, 190, 198–203, 200
 faunal histories and ecological structure, 44–8, 45, 46, 47
 heterochrony, 115
 Precambrian, 18, 22
 predation, 368–72, 369, 371
 source rocks, 220
 Marrellomorpha, Precambrian, 21
 Marsh, O.C., 543–4, 544
 marsupials
 extinction, 204, 204
 predators, 376
Martinssonia elongata, 275, 276
Marywadea, 21
 mastodon, extinction, 208
 mat building communities, 13, 15
 mathematical modelling, 493
 Matthew, W.D., 546, 547
 mating behaviour, reproductive isolation, 101
 martix algebra, use of, 246
 matter–energy transfer, hierarchy theory, 126
 maximal congruence, 434
 mayflies, 72, 73, 73–4
 Mayr’s allopatric speciation model, 107
 Mazon Creek, Illinois, 72, 214, 215, 240, 279–82, 280, 281, 282
 Mecca Quarry Member, Illinois, 279–80
 mechanical methods, preparation, 499–500, 500
 mechanical strength, flattening, 244
Mecochirus, 288, 289
 media
 communication, exhibit strategies, 520–1
 developmental testing, exhibit strategies, 521–2, 521
 Medicine Peak Quartzite, Wyoming, 30
 ‘Mediterranean-like’ basins, Cambrian, 35
 medusae
 Lagerstätten, 279, 281
 Precambrian, 18, 21, 30, 32, 44, 50, 51, 180

- Medusae Incertae Sedis, 424
Medusinites, 18
 megadynasties, tetrapods, 373–6, 374
Megagraptos, 359
Megalippus, 86
Megalomoidea, 151
 Megalonichidae, extinction, 208
Megalonyx, 207, 208
Megaptera, 321
 megasporophyll, angiosperms, 80
 Megatheriidae, extinction, 208
 Meishucun, Yunnan Province, China, 476, 477
Melanorosaurus, 150
Meleagrinella, 284
 membranes, origin of, 8
 Mendelian populations, 327, 546
' Mendelian revolution', 546
 Mercati, M., 538, 538
Merychippus, 86
 Mesogastropoda, predators, 372
 mesohaline taxa, 407, 407
Mesolimulus, 288
 mesonychids, predators, 375
 Mesozoic
 biofacies, 400
 biogeography, 457
 coevolution, 137
 communities, 391
 diagenesis, 250
 dietary evidence, 363, 366
 diversification, 40, 48, 132, 133, 134
 encrusters, 347, 347
 environmental indicators, 406, 408
 molecular palaeontology, 97
 parasites, 378
 plant communities, 354
 predation, 370, 372, 373–5, 374
 size, 151
 stratigraphy, 461, 463, 467
 terrestrialization, 67
 Messel Lake, Germany, 241
 messelite, Lagerstätten, 291
Messor barbarus, 233
 metacarpus, flight, 76, 77
 metacladogenesis, 394
 metal tolerance, plants, reproductive isolation, 101
 metamorphism, Precambrian, 21, 23
 metamorphism, effect on fossil record, 445
 metaphytes
 Precambrian, 15, 16
 problematic taxa, 443
 metapopulation, colonies, 332
Metasequoia, 422
 metazoans
 effect on stromatolites, 179, 339, 340
 hard parts, origin of, 24–9, 25, 28
 Late Precambrian–Early Cambrian
 diversification, 30–6, 32, 35, 44, 45, 180, 548, 549
 parasites, 376–7
 Precambrian, 15, 16, 17–23, 19, 20
 meteoric environment, diagenesis, 248, 249
 meteorites, extinction, 182, 198
 methane
 decay product, 213, 214, 216
 diagenesis, 251, 252, 252, 281
 methanogens, biomarkers, 219
 methylotrophy, Precambrian, 12–13, 15
 4-methylsteroids, biomarkers, 219
Metrarabdoto moniliferum, 510
Mialsemia, 20, 21
 micritic deposits
 diagenesis, 248, 249
 Lagerstätten, 285, 286
 microarthropods, terrestrialization, 58, 59, 68
 microbenthos, Precambrian, 13, 14
 microbial decay, organic matter, 217
 microbial mats
 decline of, 31
 Metazoans, effect on, 179
 stromatolites, 336, 339, 340
 terrestrialization, 57, 58
 microbial soils, terrestrialization, 57–8, 58, 59
Microdictyon, 25, 27
 microevolution, 106–110, 109, 119, 124
 microfossils
 Archaean, 10–12, 11, 50
 cyanophytes, 49, 50
 extraction techniques, 502–4, 503
 evolution, 121, 123
 grasslands, 84
 lineages, 428
 problematic taxa, 443–4
 spheroids, 10, 11, 12, 14
 stromatolites, 338
 study of, 461, 549, 553
 micropalaeontology *see* microfossils
 microplankton, 199, 200
 microsporophyll, angiosperms, 80
Microsyopoidea, evolution, 440, 441
 microtektite horizons, extinction evidence, 167, 169, 170, 177
 migration, speciation, 108
 millipedes
 Lagerstätten, 279
 terrestrialization, 65
 mineral surfaces, origin of life, 5, 8
 mineralization
 decay process, 213, 214, 215, 216
 diagenesis, 253–4
 oxygen, effect on, 409
 skeletons, 24, 97, 224, 317–8, 339–40
 mineralogical evidence, extinction, 169
 Miocene
 angiosperms, 83
 biofacies, 500
 environmental indicators, 404, 404, 405, 409, 410, 411
 extinction, 170, 173, 174, 174, 175, 176, 177
 grasslands, 84, 85, 86
 macroevolution, 128
 microevolution, 109
 molecular palaeontology, 98, 99
 parasites, 378
 predation, 370, 375
 Red Queen Hypothesis, 121
 size, 151
 trophic structure, 386–7, 387
Miohippus, 86
Mioplusus, 364
labracoides, 305
 Mistaken Point Formation, southeast Newfoundland, 31, 32–3, 32
 mites, terrestrialization, 58, 59, 65
 mitosis, heterogeny, 118
 mitotic heterochrony, 111, 113, 117, 118
 Mivart, G., 546
 moa, size, 149, 150
Mobergella, 25, 27, 371
 modules, colonies, 333
 Moffat Shale Group, Dob's Linn, Scotland, 479–80, 479
 molars, hominids, 90
 molecular clock hypothesis, 31, 95, 155
 molecular palaeontology, 95–100, 97, 98, 153–4, 155, 548
 metazoan evolution, 31
 population studies, 326
 Cambrian, 22, 25
 terrestrialization, 64
 molluscs
 biofacies, 398, 399
 biogeography, 455, 455, 456, 456
 biomineralization, 25
 coevolution, 137
 destruction of, 224, 225, 226
 diagenesis, 255
 expansion, 187, 189
 extinction, 162, 187
 environmental indicators, 408, 409, 411, 412
 feeding, 362, 368, 369, 371
 heritability, 127
 heterochrony, 113
 hydrodynamics, 227, 228–9
 Lagerstätten, 271, 272, 277, 279, 281
 lecithotrophic, 455, 455, 456, 456
 monoplacophoran, 38, 39, 45, 273
 morphology, 311
 periostreum, 25
 planktotrophic, 455, 455, 456, 456
 predators, 368, 369, 371
 prey, 372
 problematic taxa, 443
 size constraints, 149–50, 151
 skeletons, 317, 318
 speciation, 108, 192
 survivorship curves, 389, 389
 taphofacies, 259
 see also ammonites; amphipods;
 belemnites; bivalves; cephalopods;
 gastropods
 monads, terrestrialization, 60, 61, 62
 monocotyledons, Cretaceous, 81
Monocraterion, 359
 monogeneans, parasites, 377
Monograptus ludensis, 463, 464
Biozone, 466
Monograptus transgrediens, 481
Monograptus ultimus, 481
Monograptus uniformis, 481, 481, 482
Biozone, 468
 monophyletic groups
 cladistics, 431, 432
 computer analysis, 497
 diversity analysis, 447, 448
 problematic taxa, 443
 taxonomy, 427, 428
 tetrapods, terrestrialization, 69
 monoplacophoran molluscs, Cambrian, 38, 39, 45, 273
Monopleura, 145
 montane forests, fossil record, 83
Montastrea, 343
 Monterey Formation, California, 409, 410
 montgomeryite, Lagerstätten, 291
 morphology, 307–13, 308, 310, 312
 basis for nomenclature, 422–3
 computer analysis, 497, 498
 developments, 551, 553
 evolution, 153, 154, 155, 156, 156, 158, 550
 flattening, 244

- phylogenetic approaches 309–10, 310, 311, 312
 similarity *see* stratophenetic classification
 stratophenetics, 437, 438, 439, 439
- mortality
 populations, 326
 size advantage, 151
- mosaic heterochrony, 117
- mosasaurs
 extinction, 202
 feeding, 363, 368, 369, 370
 size, 148
- motility, and biogeography, 455
- moulting
 arthropods, 26, 68, 149, 317, 319
 bradoriids, 27
- mounting, palynological technique, 504
- Mousterian, culture, 90
- movement, vertebrate terrestrialization, 70
- multielement, skeletal type, 225, 226
- multituberculates, Tertiary, 204, 204
- Murex fulvescens*, 369
- muricid gastropods, predators, 370, 371, 372
- muscles, relationship to size, 147
- Musée National d'Histoire Naturelle, Paris, 549
- museology, 515–22, 521
- Museum Data Standard of the Museum Documentation Association (MDA), 519
- museums, 529–30, 535–6
- mussels, concentrations, 236
- mutations, 100, 156
- myacids, predators, 375
- Myalina*, 364
- mycophagous feeders, terrestrialization, 58, 59
- mycorrhizal association, terrestrialization, 59
- Mylodontidae*, extinction, 208
- Mylohyus*, 208, 208
- myriapods
 predators, 373
 terrestrialization, 65, 66, 67, 68
- Mytilus*, hydrodynamics, 228
- Mytilus edulis*, 229
- myzostomids, parasitic, 378
- nacre, skeletons, 25, 224, 225, 317, 318
- Nama Group, Namibia, 17
- Name-bearing Types, Principle of, 417, 418
- Namibia, Vendian metazoans, 31, 33
- Nannippus*, 86
- nannoplankton, 198, 199, 201, 443, 549
- nappes, biostratigraphy, 484
- Nassariidae, predators, 390
- Nassella*, 84
- Natica severa*, 369
- naticid gastropods
 coevolution, 137
 predators, 370, 371, 372
 survivorship curves, 122
- nautiloids
 amino acid profiles, 97
 biomechanics, 320
- Nautilus*, 143, 157, 314, 316, 316, 317, 321
- Neanderthal man, 89, 90, 91, 381, 383, 544, 544
- Nearest Living Relative (NLR), plants, 401, 403
- Necrolemur*, 440, 441
- necrolysis, Lagerstätten, 268
- necrosaurs, extinction, 205, 206
- Nemagraptus gracilis*, 479,
- Nemakit-Daldyn assemblage, Siberian Platform, 24, 25, 26–7
- nematodes
 habitat, 65
 parasites, 377, 377
 Precambrian, 31
 size constraints, 149
 trace fossils, 360
- nematomorphs
 parasites, 377
 trace fossils, 360
- Nematophytale, terrestrialization, 61, 62, 63
- Nematoplexus*, 63
- Nematothallus*, 61, 62, 63
- nemerteans
 habitat, 65
 trace fossils, 360
- 'Nemesis', extinction cause, 177–8
- Nemiana*, 18, 19
- neogastropods
 biofacies, 400
 palaeobiogeography, 456
- Neogene
 diversification, 48
 grasslands, 85
 microevolution, 108
 taphofacies, 259–60
 terrestrialization, 67
see also Miocene; Pliocene
- Neohippurion*, 86
- neolampadoid echinoids, heterochrony, 114
- Neonoxites*, 180, 180
- Neopilina*, 157
- neoteny, 111, 112, 112, 114, 117, 117
- Nephrops*, 214, 216
- Nereis*, 214
- Nereites* ichnofacies, 356, 358, 359, 359, 412
- neurological control, flight, 76
- Nevada, U.S.A. 481, 482
- Newell's mass extinction events, 160, 161
- niche, adaption to, 128, 141–2, 146, 151
- Nikon 'Multiphot' system, photography, 505, 506, 507
- Nimbia*, 18
- Nimravus*, 381
- Niobrara Formation, Colorado, 410
- nitrate, diagenesis, 213, 214, 216, 251, 252
- nitric acid, sample preparation, 504
- nitric acid rain, extinction process, 165
- nitrogen fixation, Precambrian, 49, 50
- nodules,
 carbonates, diagenesis, 250–2, 251, 252, 257
 Lagerstätten, 273, 274
- nomen nudum*, AAP, 523
- nomenclature, 425–30
 disarticulated animal fossils, 419–21, 420, 421
 disarticulated plant fossils, 421–3, 423
 international Codes, 417–9
 trace fossils, 423–5
- 'nonaptations', adaption, 145, 146
- Nopsca*, F., 543
- Norian extinction, 40, 133, 173, 174, 175
- North American Cordillera, 487–8, 488
- North China block, 187, 188
- Norway, policy concerning status material, 517
- nostocalean cyanobacteria, 13
- not polynomial-complete optimization problems, phylogenetic analysis, 497
- nothosaurs
 extinction, 194
 predation, 370
- Nothrotheriops*, 207, 208
- notocacids, diversification, 50, 51
- Notoporyctes stokesi*, 377
- Notosaria*, 115, 116
- Notoungulata, extinction, 208
- Nubculinella*, 348
- nucleic acid, origin of life, 4, 6, 7, 8, 31
- nucleotide sequences, 95
- nucleus, eukaryotes, 30
- nuculid bivalves, destruction of, 224
- nutrients, extinction, 192
- nutrition, terrestrialization, 65
- Nye Kløv, Denmark, 200, 201, 202
- Obruchevella*, 26
- obrution deposits, 239–43, 240, 242, 245, 268–9, 269, 270
see also Hunsrück Slate
- Occam's razor, 454
- ocean chemistry, Cambrian, 35–6, 35
- ocean repository, origin of life, 3–7, 8
- ocean tectonics, biostratigraphy, 484–5
- 'oceanic anoxic events', 222
- oceanic water circulation
 effect on diversification, 133–4, 192
 extinction, 183–4, 183
- octocorals, 25, 26, 32, 33, 45, 48
- Odaraia alata*, 246
- Ohmdenosaurus*, 284
- Oichnus*, 369
- oil, study of, 96
- oil shale, 289, 290
- Oldowan, tradition, 88, 89
- 18α(H)-oleanane, biological marker, 219
- Olenek uplift region, Siberia, 476, 477
- 'Olenellus Zone', 475
- Olenoides*, 273, 362
- Oligocene
 angiosperms, 83
 biogeography, 449, 450, 451
 environmental indicators, 404, 404, 405, 411, 412
- grasslands, 84, 85, 86
- Lagerstätten, 297, 297
- molecular palaeontology, 98
- palaeopathology, 381
- predation, 370, 375
- sea-level changes, 160, 161
- size, 150, 151
- oligochaetes, terrestrialization, 66, 68
- oligohaline taxa, 407, 407
- oncolites
 Precambrian, 10
- stromatolites, 336, 337, 339, 340, 340
- onychophorans, habitat, 65, 66
- Omega*, 20, 21
- ontogenetic development
 evolutionary systematics, 435
- heterochrony, 117
- preservation, 292
- trajectories, 431, 498
- Onverwacht Group, South Africa, 10, 11, 12
- oomycete fungi, terrestrialization, 63

- Oort cloud of comets, extinction cause, 165, 177, 178
 opaline skeletons, 24, 25, 27–8, 29, 314
 Oparin, ocean scenario, 3–5, 7
Ophiceras Zone, Triassic, 188, 191
Ophiomorpha, 359
 ophiuroids
 feeding, 389
 Lagerstätten, 240, 242, 243, 283
 opossum, Tertiary, 204
 Oppel's use of zones, 461
 opportunist species, 237–8, 238
 see also Burgess Shale; Hunsrück Slate;
 Solnhofen Limestone
 ophthalmosaurs, feeding, 363
 optimality, experimental morphology, 308–9
 Ordovician
 biofacies, 396, 396, 397, 398–400
 biomineralization, 26, 27
 completeness of record, 299
 diagenesis, 253–4
 dietary evidence, 365, 366
 diversification, 45, 46, 46, 47, 47, 132
 encrusters, 347, 349, 350–1
 evolutionary fauna, 40
 extinction, 37, 181–4, 181, 183, 187, 194, 478
 causes, 160, 161, 162, 167
 Lagerstätten, 239, 240
 microevolution, 108, 109
 parasites, 378, 379
 plankton, 51, 52
 predation, 370, 371, 371
 reefs, 53, 54–6
 stratigraphy, 461, 468, 478–80, 479, 483, 484, 485, 486, 486, 487, 488–91, 489, stromatolites, 336, 340
 terrestrialization, 58, 58, 60, 61
 taxonomy, 446
 oreodonts, dentition, 86
 organ genus, plant fossils, 422
 organic acids, soil, 57
 organic carbon
 decay processes, 213, 214
 Precambrian, 49
 source rocks, 220, 221
 organic components, record of, 95–6, 217–22, 218, 221
 organic connection, plant fossils, 422
 orientation, fossils, 227, 228, 244, 258, 259, 263, 286
 origin of life, 3–9
 conventional primitive ocean scenario, 3–7
 alternative scenarios, 7–9
 origination rate, species, 154–5, 156, 185, 186, 189–90, 189
 Oriskany Sandstone, Maryland, 224, 225
 Ornithischia
 classification, 435, 436
 defence, 375
 herbivores, effect of angiosperms, 81
 ornithomimids
 extinction, 205, 207
 feeding, 363
 ornithopod, extinction, 205
 orogenic activity, extinction cause, 198
 'Orsten', Upper Cambrian, Sweden, 274–7, 275
 Orthacea, extinction, 400
 orthid brachiopods
 biofacies, 398, 399
 extinction, 189
 orthocones
 shells, 227, 229
 orthogenesis, 126, 546, 547
Orthonota Mudstone, 395
 'orthoselection', macroevolution, 126
 orthostratigraphy, 461
 Osborn, H.F., 544, 546
 oscillariacids, Archaean, 50, 51
 osteichthyan fishes
 modern fauna, 38, 40
 terrestrialization, 69
 osteoarthritis, palaeopathology, 381, 382, 383, 384
 osteocalcin, skeletons, 317
 osteolepiforms, terrestrialization, 69, 70
 osteomyelitis, palaeopathology, 382–3, 383
 osteophytosis, palaeopathology, 382
 osteoporosis, palaeopathology, 382
 ostracodes
 biomineralization, 25, 28, 29
 biostratigraphy, 461, 468, 481, 486
 completeness of record, 299
 environmental indicators, 406, 407
 experimental morphology, 307–8
 extinction 182, 183, 187, 189
 hydrodynamics, 227
 Lagerstätten, 276, 277, 279, 284, 292
 leperditiid, 189
 Palaeozoic, 38, 40, 46
Ostrea ventilarium 295
Otoceras Zone, Triassic, 188, 191
Otozamites, 283
Ottoia, 364
 outgroup analysis, 431–2
Ovaloscutum, 18, 19
 overpyrite
 diagenesis, 255
 taphofacies, 259
 Owen, R., 545, 546
 oxalic acid, lichens, 58
 Oxford Clay, Wiltshire, 214, 215, 259
Oxroadia, 265
 oxyaenids, predators, 375
 oxygen levels
 amber concentration, 294
 biofacies and trace fossil indicators, 356, 361, 398, 409
 decay processes, 213–4
 diagenesis, 251
 extinction cause, 199, 202
 fossil concentrations, 237, 269, 270, 274, 283, 292, 293
 molecular evidence, 219
 Precambrian, 12, 13–14, 29, 548, 549
 source rocks, 221, 221, 222
 stromatolites, effect on, 337
 taphofacies, 258–9, 259, 260, 261, 262, 263
 terrestrialization, 64–5
 oxygen isotopes, use of, 162, 167, 220
 isotope ratios, environmental indicators, 403–5, 404, 405, 407–8
 oxygen-related ichnocoenosis (ORI), 410
Oxytoma, 283
 oysters
 adaption, 142, 142
 amino acids, 99
 diagenesis, 247
 encrusters, 346
 heterochrony, 115
 Lagerstätten, 267, 287
 speciation, 108
Ozarkodina confluens, 421
Ozarkodina typica, 421
 ozone layer
 extinction cause, 163
 Vendian, 50
Pachycomus, 364
Pachycephalosaurus, 205, 207
Pachydiscus, 363
Pachypteris, 283
Pachylthea, 63
Pachytraga, 145
 Pacific basin biogeography, 457, 458
 paedomorphic processes, 108, 111, 112, 112, 114, 115, 116, 116, 117, 118, 312
Pagiophyllum, 283
 paitiuids, biomineralization, 25, 27
Palaemon, 214, 215
 palaeoagranostology, 59, 83, 84–7, 85, 87
 palaeobiogeography, 484–5, 549
 palaeobiology, 551–2
Palaeobatrillus, 27
 Palaeocene
 biogeography, 449
 environmental indicators, 411
 predation, 375
 size, 150
Palaeochiropteryx tupaiodon, 291
 palaeoclimate
 biogeography, use of, 458
 biostratigraphy, 485
 palaeocommunity, biofacies, 396
 palaeocontinental distributions, 35
 palaeoecology
 history of, 549, 550
 trace fossils, 361
 palaeoenvironmental classification, trace fossils, 425
Palaeofusulina Zone, 188
 palaeogeography, 426, 452–60, 452, 453, 454, 455, 456, 457, 458, 459
 palaeomagnetic signatures, use of, 438
Palaeopascichnus, 180, 180
 palaeopathology, 381–4, 382, 383, 384
Palaeopleurosaurus, 284
 palaeosols, evidence for grasslands, 85
Palaeospinax, 284
 palaeotemperatures, 404–5, 404, 405
Palaeotherium, 365
 Palaeozoic
 coevolution, 137
 diagenesis, 250
 dietary evidence, 363, 366
 diversification, 37, 38–9, 38, 39, 40, 41, 44, 45–6, 132, 133
 environmental indicators, 404, 405, 405, 408, 412
 encrusters, 347, 347, 349
 heterochrony, 118
 morphology, 307
 parasites, 378, 379
 predation, 370, 371, 371, 373
 problematic fossils, 443
 plankton, 49, 50–2, 51
 size, 151
 stratigraphy, 463, 467, 482, 484
 taxonomy, 433
 thermal maturity, 514
 trophic structure, 386
Palaeozygopleura, 369
Palagosaurus, 284

- Paleodictyon*, 359
Paleoeriocoma, 84
Paliella patelliformis, 20
 Palorchestidae, extinction, 208
 palynological techniques, extraction procedures, 503, 504
 palynomorphs, sample preparation, 502–503, 504
 pampas, Oligocene, 85
Pangaea, 187, 188, 191, 192, 457, 484
Panicum, 84
Panoplosaurus, 205, 207
 Panthalassic ocean, biogeography, 457
Paracharnia, 21
 parachuting/gliding theory flight, 74–5
 paradigm method, analogy, 143, 310–11
 Paradise Creek, Australia, 53
Parahippus, 86
Parakidograptus acuminatus, 478, 479, 480
 parallel evolution, 435, 546, 547, 551
 biofacies, 398
 paranotal lobes, flight, 72, 73
Paranthropus boisei, 88, 89
Paranthropus robustus, 88, 89
Paraorthograptus pacificus, 478, 479
 parapatric speciation, 104
 paraphyletic groups
 Cambrian, 39
 cladistics, 428, 431, 432–3
 computer modelling, 497
 diversity analysis, 447, 448
 systematics, 436
 taxonomy, 427, 428
Pararenicola, 30
 parasitism, 136, 138, 376–80, 377, 379, 385, 388, 390
 parasitoids, 376
 parastratigraphy, 461
 parataxonomy, 419–20
 Paratrilobita, classification, 22
 Paris Basin, diagenesis, 257
Parka, 63
 Parkinson, J., (1755–1824), 541
 parsimony, 432, 434, 497
 parthenogenesis, 102
 particle size, source rocks, 221, 221
 particulates, extinction cause, 178
Parvancorina, 21
pascichnia, trace fossils, 356
Passaloteuthis, 284, 284
 passive feeding, suspension feeders, 43
 pattern cladists, 429–30, 431–2, 435
Paxiella, 18, 20
 pearls, formation, 378–9
 peat formation, 352, 353, 354
 peccaries, extinction, 208, 208
 pecopterid ferns, extinction, 191
Pecopteris, 281
Pecten, 391
 Pee Dee Formation, South Carolina (PDB), 403
 Peking Man, 545
 pelagic sediments, fossil record, 299
 pelecosaurs, predators, 373
 pelmatozoan echinoderms
 destruction of, 223
 Palaeozoic, 54, 187, 189
 Pelycosauria, paraphyletic groups, 433
 penguins, biomechanics, 321
 Penn Dixie Quarry, Blasdell, New York, 242
 pennatulacean octocorals
 biomimicry, 26
 Precambrian, 32, 33
Pentacrinites, 284
 pentamerid brachiopods, biofacies, 399, 400
Pentamerus, 391, 395
Pentoxyton, 80, 81
 peptides, molecular fossils, 97, 98
 peramorphic processes, 111, 112, 112, 114, 115, 116, 117, 118, 312
 ‘perched faunas’, extinction, 161
 percoids, experimental morphology, 308
 percussive techniques, preparation, 499–500, 500
Pericosmus, 115
 periodicity, extinction, 167, 171–8, 172, 173, 174, 175, 194, 197, 553
 periodontal disease, palaeopathology, 383, 384
 periostracum, molluscs, 25
Peripatus, 65
 Periscoechinoidea, paraphyletic groups, 433
Perisphinctes, 287
 Perissodactyla, evolution rate, 153
 ‘permanent varieties’, 128
 Permian
 biogeography, 458
 dietary evidence, 363
 diversification, 40, 47, 132
 extinction, 160, 161, 162, 164, 167, 187–93, 187, 188, 189, 190, 373, 400
 macroevolution processes, 131, 132, 133
 Vendian, compared, 33
 plant preservation, 264, 265
 parasites, 378
 predation, 373
 size, 151
 stratigraphy, 487–8, 488
 stromatolites, 340
 terrestrialization, 65
 permineralizations
 plants, 245, 263, 264–6, 264, 265, 352, 353, 354
 skeletons, 224
 see also mineralization
Persimedusites, 18
 Peru Upwelling, 222
Petalonamae, Precambrian, 18, 21
 petioles, hydrodynamic properties of leaves, 230, 231, 232
 petrifactions, plants, 263, 264
 petroleum
 Lagerstätten, 289
 molecular composition, 219, 220
 petroleum source rocks, 408
 petroporphyrins, chemical fossil, 96, 97
Peytoia nathorstii, 215
 pH
 decay processes, 213
 diagenesis, 251, 252
 obrution deposits, 241
 ocean, 163, 165
Phacops, 242, 278
 phalanges, flight, 76
 phalanx colonies, 334
 phalanx strategy, encrusters, 347
 ‘pharetronid’ calcareous sponges, biomimicry, 26
 phenetic biogeography, 437, 453–4, 453
 phenolic compounds, decay, 214
 phenotype
 evolution rate, 153, 495, 497
 origin of life, 6–7
Philippia krebsii, 455
Pholidophorus, 284, 366
 phoronids, trace fossils of, 360
Phosphaenus, 378, 379
 phosphate
 ocean chemistry, 35–6
 origin of life, 8
 soil, 57, 59
 see also phosphatization
 phosphatization
 parasites, 378
 skeletons, 27, 28, 29, 44, 317, 379, 407
 destruction of, 225
 diagenesis, 245, 256–7, 256
 extraction techniques, 503–4
 Lagerstätten, 267, 268, 273, 288, 291
 ‘Orsten’ deposits, 274, 275–6, 277
 phosphorite, stratigraphy, 476
 photic zone, indicators of, 411
 photo-oxidation, organic compounds, 217
 photoautotrophs, Precambrian, 12, 14
 photography, 505–8, 506
 Photomicroscop, photography, 505
 photosynthesis
 bacteria, Cambrian, 27
 grasses, 84
 pigment, chemical fossil, 96, 97
 Precambrian, 7, 12, 22, 50
 stromatolites, evidence from, 336, 338–9
 phragmocone, ammonites, 244, 244, 245
Phragmoteuthis, 284
 phycocyanin, blue green algae, 49
Phycosiphon, 359
 ‘phylectic rate’, 154
 phyletic transformation, 106, 107
 phyllocarids, arthropods, 370
Phylloceratina, Triassic, 194
 Phyllopod bed, British Columbia, 271–4, 272, 274
 phylogenetics, analysis, 299, 425–6, 428–30, 434
 see also cladistics; stratophenetic classification
 phylogeny, definition of, 434
 physical environment, evolution effect on, 119, 121, 122
 Stationary Model, 121–2, 121
Physoderoceras, 364
 phytane, oxygen indicator, 219
 phytoliths, grasslands, 84, 85
 phytoplankton
 chemical composition, 96
 extinction, 180, 185
 Palaeozoic, 50, 51, 52
 phytosaurs
 extinction, 194, 195
 predators, 373
Picea pungens, 232
 Piltdown fraud, 544–5
 pinnacle reefs, Palaeozoic, 56
Pinus succinifera, 294
Piptochaetium, 84
Pithecanthropus erectus, 88–90, 89, 382, 544, 545
Pithonotus marginatum, 377
Placenticeras, 369
 placer deposits, 269
 placoderm fish
 extinction, 185, 194
 Lagerstätten, 279
 predation, 370
 size, 148

- placodonts
 predation, 368, 370
 teeth, 363
Placodus, 363
'Planet X', extinction, 178
plankton
 diversification, 49–52, 51
 extinction, 121, 160, 163, 166, 183, 185, 199, 200
Red Queen Hypothesis, 136
 see also nannoplankton
planktotrophy, biogeography, 455, 455, 456, 456, 460
Planolites, 359
plants
 biomechanics, 319
 coevolution, 137–8
 communities, reconstruction of, 351
 decay, 214
 diagenesis, 254, 254
 extinction, 163, 166, 187, 190, 190, 191, 197, 197, 203–4, 204, 209
 flattening, 245
 galls, 378
 preservation, 215, 263–6, 264, 265
 Lagerstätten, 279, 281, 283, 288, 292
 size constraints, 147–9, 148, 151
 source rocks, 220
 terrestrialization, 60–4, 61
 thermal maturity, 514
 transport-hydrodynamics, 230–2, 231
 see also angiosperms
plastrons, biomechanics, 320
platanoid flowers, angiosperms, 80, 82
plate tectonics
 biostratigraphy, 484–6, 487
 Cambrian, 36
 development of, 547–50
 diversification, effect on, 133–4
 eustasy, effect on, 162
 habitat diversity, 42
Plateosaurus, 150
plattenkalks, 250, 252–3, 285
Platygonus, 208
platyhelminthes
 parasites, 377, 377, 378–9
 Precambrian, 21
Platypholina, 21
Platysuchus, 284
Plectospathodus flexuosus, 421
Pleistocene
 dietary evidence, 365, 367
 extinction, 206–9, 208
 grasslands, 84, 86, 87
 Lagerstätten, 268
 molecular palaeontology, 98
 palaeopathology, 382
 parasites, 377
 predation, 375–6
 reefs, 344
 size, 151
 stratigraphy, 468
pleopods, terrestrialization, 67
Plesiadapidae, stratophenetics, 439, 439
Plesiadapis, 440, 441
Plesiadapoidea, stratophenetics, 441
plesiomorphic state, 431–2, 435, 448
plesiosaurs
 biomechanics, 321–2, 322
 extinction, 202
 Lagerstätten, 284
 predation, 363, 370
 skeleton, 382
Plesiosaurus, 284
Plethodontidae, morphology, 312, 313
Pliensbachian extinction, 173, 174, 175
Pliocene
 grasslands, 85, 86, 87
 molecular palaeontology, 98
 predation, 376
 size, 151
 stratigraphy, 468
Pliohippus, 86
piosaurs, feeding, 363
Podolia, Ukraine, U.S.S.R., 481, 482
podomere, arthropod, 319, 320
pogonophores
 feeding, 389–90
 habitat, 64
 Precambrian, 18
 trace fossils, 360
poikilohydry, terrestrialization, 60, 64, 65
Poisson time series, 171, 172, 172, 173, 174, 175, 176, 177
Polecat Beach, Wyoming, 439, 439
Polinices aratus, 389, 389
Polinices duplexatus, 369
pollen
 biology, 82–3
 evidence 79, 80, 80, 81, 84, 88
 diet, 354, 365, 367, 509
 preservation, 264
 thermal maturity, 511, 512–13, 513, 515
pollination
 coevolution, 138
 hydrodynamics, 325
polyanionic constituents, origin of life, 8
polybutyl-methacrylate, sample
 preparation, 501–2
polychaete worms
 biofacies, 397, 400
 encrusters, 346, 348, 358
 feeding, 389
 Lagerstätten, 271, 272, 279, 280, 281
 polymeric agglutinations, fossil
 molecules, 96
 Vendian, 44
polymerization, origin of life, 7
polymethyl methacrylate, sample
 preparation, 501, 502
polymorphism
 colonies, 332, 333
 population, 327–8, 328
Polynices, 370
polypeptides, origin of life, 8, 31
polyphyletic group, taxonomy, 427, 432
polyploidy, reproductive isolation, 102, 102
polypyrimidines, origin of life, 6
polytypic species, 100
polyvinyl butyral resin, sample
 preparation, 501
Pomoria, 18
populations, 326–29, 327, 328, 329, 329
 genetic analysis, morphology, 313
 structure, 23, 116, 151, 156
Porites, 343
porolepiforms, terrestrialization, 69
Poromya granulata, 390
porosity, sediments, effect on nodules, 250, 251
porphyrin, oxygen indicator, 218, 219
Posidonia, 284
Posidonia Shales, Holzmaden, West Germany, 244, 270, 282–4, 283, 284, 285, 364, 365, 395, 408
Posidonienschiefer, see Posidonia Shales
post-displacement, heterochrony, 111, 112, 112, 114, 117
postcranial skeletons, grazers, 86
postzygotic barriers, speciation, 101, 103
potassium hydroxide, sample preparation, 504
Pound Subgroup, South Australia, 17
Praecambridium, 21
Prague Basin, Czechoslovakia, 481, 482
prairie, North America, 85
prasinophyte algae, Precambrian, 15, 50, 51
pre-displacement, heterochrony, 111, 113, 113, 114
preadaptive hypothesis, adaption, 144, 145, 145, 146
Precambrian, 548
 encrusters, 349
 metazoans, 17–23, 19, 20
 problematic fossils, 443, 444
 prokaryotes and protists, 9–16, 14
 reefs, 53, 53
 soils, 57
 stratigraphy, 470, 471, 474, 475–8, 477
 terrestrialization, 57, 58
 see also Archaean; Proterozoic
precocious maturation, heterochrony, 112, 116
precoprolite, dietary evidence, 364
predation
 biomineralization, 29
 bone transport, 233
 Cambrian, 33, 34, 52
 colonies, 334
 computer analysis, 496
 dietary evidence, 362
 encrusters, 350
 evolution, 119, 122, 136–7
 heterochrony, 115
 Lagerstätten, evidence, 288
 marine, 368–72, 369, 371
 Mesozoic, 48
 Precambrian, 18, 22, 23, 45, 50
 size advantage, 151
 skeletal damage, 223
 terrestrial, 68, 373–6, 374
 trace fossils, 357
 trophic structure, 42, 385, 385, 386, 386, 386, 387, 388, 389, 390
premolars, hominids, 88
preparation
 chemical methods of, 500–1, 501
 macrofossils, 499–502, 500, 501
 photography, 505
preservation processes, 268
preservational classification, trace fossils, 425
pressure force, hydrodynamics, 323
pressure, fossil molecules, 96
prey, coevolution, 136–7
prezygotic barriers, speciation, 101, 103
priapulids
 diversity, 426
 habitat, 64
 Lagerstätten, 271, 272
 trace fossils, 360
Přídolí Series, 480, 481, 482
primates
 evolutionary diversification, 440, 441
 speciation, 109
 stratophenetics, 439, 439, 441
primitive ocean scenario, 3–7

- Prins Karls Forland, Svalbard, 11
Prioniodus bicurvatus, 421
Priority, Principle of, 417, 418, 420, 422, 424
pristane, oxygen indicators, 219
Proarticulata, Precambrian, 21
probability, fossil record, 301
problematic fossil taxa, 442–4
 Lagerstätten, 271, 276, 280
 Precambrian, 13
proboscideans
 extinction, 208, 208
 Tertiary, 87, 208, 208
procopionids, extinction, 194, 195
productid brachiopods
 biofacies, 400
 extinction, 160, 189
Proeryon, 283, 284
progenesis, heterochrony, 111, 112, 112, 114, 117, 117, 118
‘progress’, evolution, 120–1
progymnosperms
 concept of, 422
 Palaeozoic, 40, 63
prokaryotes, Precambrian, 7, 10–14, 11, 15, 16, 30, 49
prolaceriforms, extinction, 194, 195
promotor region, heterochrony, 118
prosauropods, size, 150
Protaster stellifer, 240
Protechiurus, 21
protein based life, 5, 6
proteins
 decay, 217
 molecular palaeontology, 95
 skeletons, effect on, 317
Protenaster, 115, 116
protoechampsids, predators, 373
Proterozoic, 11, 13–16, 14
 problematic fossils, 442, 447
 stratigraphy, 461, 470, 471–2, 474
 stromatolites, 336, 337, 339, 339
proteutherian mammals, extinction, 204, 204
protists
 biomineralization, 24, 27
 Precambrian, 10, 14, 15–16, 50, 51
 problematic taxa, 443
Protoarenicola, 30
proto-Atlantic, biostratigraphy, 485, 486
protoceratids
 dentition, 86
 extinction, 205, 207
protoconodonts, Cambrian, 25, 28, 29, 34
protostarians, Precambrian, 30
Protohertzina, 44, 45
Protohippus, 86
‘protokerogen’, sediments, 217
protomammals, 373, 374
protopterygote insects, flight, 72, 74
Protostegidae, extinction, 205
Prototaxites, 61, 63
proto-wings, flight, 72–5, 73, 78
protozoans
 parasitic, 380
 terrestrialization, 65
provinces, diversity, 133, 134
provincialism, Precambrian, 18
prymnesiophyte algae, molecular
 composition, 220
pseudoextinction, 448
pseudo-lebensspuren, trace fossils, 335
Pseudohippurites, 86
pseudomorphic textures, diagenesis, 255
Pseudomytiloides, 283
pseudopathology, 384
pseudopleochroism, diagenesis, 249
Pseudorotalia yabei, 510
pseudoscorpions, terrestrialization, 65
pseudotracheae, terrestrialization, 67
Psilonichnus ichnofacies, 356–7, 358, 360
psilophytes, Lagerstätten, 279
Psilophyton, 63
Pscooptera, amber, 297
Pteranodon, 76
Pteridinium, 20, 21, 33
pteridophytes
 Cretaceous, 81, 83
 Palaeozoic, 39, 40, 62, 64, 191
pteridosperms
 extinction, 191
 permineralization, 265
Pterocomia, 287
Pterodactyloidea, flight, 76
Pterodactylus, 287
Pterophyllum, 283
pteropods, environmental indicators, 412
pterosaurs
 biomechanics, 319
 evolutionary faunas, 39, 41
 flight, 75, 76, 77, 78
 Lagerstätten, 284, 288, 289
 predators, 375
 size, 148
 Triassic, 194, 195
pterygote insects
 biomechanics, 321
 terrestrialization, 65
Ptychodus, 363
Ptycholepis, 284, 364
ptyctodonts, predators, 368, 370
Pulchrilamina, 54
pulmonates, terrestrialization, 65, 66, 67, 68
punctuated anagenesis, 108
punctuated equilibrium theory, 105, 107, 108, 109, 110, 127, 550, 552
 computer analysis, 498
punctually derived species, 427, 428
Purbeck fossil forest, southern England, 264, 352
Purella, 34
purple bacteria, Precambrian, 16, 49
pycnoxylic wood, climate indicator, 402
pygostyle, birds, 78
pyrite
 decay product, 216
 diagenesis, 245, 252, 253–5, 254, 257
 Lagerstätten, 241, 268, 269, 274, 282, 286, 291
 Burgess Shale, 273, 273
 Holzmaden, 282, 283
 Hunsrück Slate, 277, 278–9, 278
 plant preservation, 263, 264, 264, 266
 specimens, storage, 515–6
 surfaces, origin of life, 8
 taphofacies, 259, 259, 260, 261
Pyrrophytes, Precambrian, 50, 51

Qasimia schysmae, 510
QB virus, origin of life, 6
‘quantum evolution’, Simpson, 125, 127
quartz, extinction evidence, 163, 169, 169, 170
‘quartz equivalents’
bones, 233, 234
shells, 228
quaternary
 diversification, 133
 environmental indicators, 404
 molecular palaeontology, 97
 palaeopathology, 383, 384
 reefs, 341
 sea-level changes, 16
 see also Holocene; Pleistocene
quaternary o, extraction techniques, 503
Quenstedtoceras lamberti Biozone, 466
Quetzalcoatlus, 76, 319

r-selection
 brackish environment, 407
 heterochrony, 115, 117
Radiata, Precambrian, 18–20, 19, 20, 21, 23
radiation
 angiosperms, 83
 biomineralization, 26, 28, 29
 community groups, 393
 diversity analysis, 447–8
 encrusters, 347
 Miocene, 376
 Palaeozoic, 34, 36, 40, 46, 47
 Precambrian, 23
 see also evolutionary faunas
radiolarians
 biomineralization, 25, 28
 diagenesis, 256
 environmental indicators, 412
 geochronology, 483
 Lagerstätten, 283
 Palaeozoic, 50, 51, 52
 preservation, 264
 radiation, 185
 Red Queen Hypothesis, 121, 123, 136
 sample preparation, 502, 503, 504
 speciation, 108
radiometric dating, use of, 438, 461, 465
radula, gastropods, 362
Radulichnus, 351
Ramellina, 21
ramets, colonies, 331, 332, 333, 334, 335
random processes, 109, 393
 computer analysis, 495–7
 time series, 171, 172, 173, 174, 175, 175, 176, 177
Rangea, 21
rank, determination of, 511–5, 512, 513, 513, 514
Ranunculidae, Cretaceous, 81
Rassenkreis, speciation, 100
Rastrites maximus, 479
‘rate hypomorphosis’, heterochrony, 113
rates, evolution, 152–9, 156, 157, 158
Rawtheyan extinction see Ordovician
Ray, J., (1627–1705), 539, 542
Raymond Quarry, British Columbia, 271
rays, feeding, 366, 368
recapitulation theory, 111, 117, 545, 546
Recent see Holocene
Receptaculita, 55
receptaculitid algae, Palaeozoic, 25, 54, 443
reciprocal overgrowth, encrusters, 348, 350
recruitment strategy
 encrusters, 346
 populations, 326
recursion techniques, computer analysis, 495
red algae

- environmental indicators, 411
 Ordovician, 54–5
 stromatolites, 336, 340
Red Queen Hypothesis, 119–24, 120, 122, 123, 129, 136, 550, 553, 554
Redkinia spinosa, 22
 redox potential discontinuity (RPD), 241
 redox process, 8, 42
 reefs, 52–6, 53, 55
 biofacies, 398, 400
 carbonate build-ups, 341–5, 342, 343, 344, 393–4
 colonies, 330
 communities, 393–4
 encrusters, 349
 extinction, 160, 167, 184, 185, 189
 heterochrony, 117
 Solnhofen Limestones, 286
 stromatolites, 340
 see also Burgess Shale
 reflectivity, vitrinite, 511–2, 512, 513, 513, 514, 515
 refractories, decay process 214, 254
 ‘regulatory genes’, heterochrony, 118
 regurgitates, dietary evidence, 364
Rehbachiella kinnekullensis, 276
 reinforcement, microevolution, 103
Renalcis, 54, 56
 repichnia, trace fossils, 355
 replacement ratio, extinction events, 189–90
 replicator, selection, 127
 reproduction
 angiosperms, 81
 barriers, 198
 biogeography, 455
 colonies, 331–2, 335
 heterochrony, 115
 hierarchy theory, 126
 isolation, 100–6, 102, 132
 Radiata, 18
 size advantage, 151
 terrestrialization, 68, 70
 reptiles
 biomechanics, 321–2, 322
 classification, 433, 435–6, 436
 dentition, 363, 363
 evolutionary faunas, 38, 39, 41
 extinction, 190, 190, 194, 195, 195, 196, 204–5, 205, 206, 207, 207
 Lagerstätten, 284, 288
 paraphyletic group, 432, 433
 predators, 370, 373, 374, 374, 375, 363, 370
 skeleton, 382
 size, 148
 terrestrialization, 68, 70
 see also dinosaurs; plesiosaurs;
 pterosaurs; synapsid reptiles;
 therapsid reptiles
 resins
 Baltic amber, 294–7, 294, 295, 296, 297
 preservation, 268
 resource
 specialization, 156, 157
 tracking, 138
 respiration
 mineralized skeletons, 29
 size constraints, 149
 terrestrialization, 67, 69
 resting traces, trace fossils, 355
Retusa kellogii, 389
 reversal, evolution, 109–10, 435
 Reynolds number, 320, 321, 323–4, 325
 rhabdosomal stabilisers, graptolites, 52
 Rhaetian extinction, 173, 174, 175
 Rhamphorhynchoidea, 76
 ‘Rhinean’, sediments, West Germany, 277
 rhinoceros
 dentition, 86
 Lagerstätten, 268
 size advantage, 151
 Rhipidistia, paraphyletic groups, 433
Rhipidomella, 369
Rhizocorallium, 359, 365
 rhizomes, grasses, 84
 rhizopods, modern fauna, 38, 48
 rhizosphere, terrestrialization, 59, 64
Rhizostomites, 287
 Rhodesian Man, 383
Rhododendron, 231
 rhodoliths, environmental indicators, 411
 rhyncholites, cephalopods, 370
 rhynchosaurus, extinction, 194, 195, 195
 Rhynchota, Baltic amber, 297, 297
Rhynia, 62, 137
 Rhynie Chert, Aberdeen
 coevolution, 137
 plant preservation, 264
 permineralization, 352
 terrestrialization evidence, 58, 59, 63, 64, 65, 68
 rhyniophytoid, terrestrialization, 61, 62
 rhynchonellid brachiopods, biofacies, 400
Riftia pachyptila, 389
 rifting
 Cambrian, 35
 Grube Messel, 290
 Riphean, plankton, 50, 51
 RNA
 genetic analysis, 327
 metazoan evolution, 31
 origin of life, 6, 7
 respiration evidence, 14
 robust patterns, stratophenetics, 438, 439, 440
Rochdalia parkeri, 73
 rodents
 caviomorph, 208
 evolution rate, 153
 feeding, 367
 prey, 376
 size, 151
Rogerella, 360
 Ronner, F., 469
 ‘roof shale’ floras, 353
 root-traces, grassland soils, 84, 85
 rooted soils, terrestrialization, 58, 59
 rosid dicotyledons, Cretaceous, 81
Rosselia, 359
 rotifers
 and acanthocephalans, 377
 terrestrialization, 65
 rudist bivalves
 extinction, 201, 400
 preadaptive hypothesis, 144, 145
 reefs, 342
 size, 151
Rugoconites, 18
 rugophilic behaviour, encrusters, 349
 rugose corals
 encrusters, 347
 extinction, 160, 184–5, 187, 189
 Ordovician, 54, 55
 ruminants, Tertiary, 87
 runner form, encrusters, 347, 347, 350
 running/jumping theory, flight, 74, 78
Rusichnites grenvillensis, 424
 Russian Platform, 17, 180, 182, 187
 rhyncholites, cephalopods, 370
 sabelliditids, Cambrian, 22, 54
 sabre toothed cats
 extinction, 207, 208, 208
 palaeopathology, 381
 predators, 151, 375–6
Saccocoma, 287, 288, 364
 safety factor analysis, experimental morphology, 309
Sagenella, 348
 salamanders
 heterochrony, 116, 118
 Lagerstätten, 292
 morphology, 312, 313
 terrestrialization, 69
 saleniid echinoids, heterochrony, 114
 salinity
 biofacies, 398
 diagenesis, 247, 255
 extinction cause, 191, 199
 fossil concentrations, 237, 241, 242, 286, 287, 288
 indicators, 406–8, 407
 molecular evidence, 219, 221, 222
 stromatolites, 337
 trace fossils, 356, 357, 361
Salopella, 62
Salopella-like sporangia, 60, 62
Salpingoteuthis, 284
 salps, colonies, 330, 334
 saltation theory, macroevolution, 124
Salvinia, 367
 Samland Promontory, U.S.S.R., Baltic amber, 294–7, 294, 295, 296, 297
 sample size, fossil record, 301
 sampling model, 446, 447
 San Andreas Fault, North America, 486
 sandstones, extraction techniques, 503
 sanidine, extinction evidence, 169
 Santana Formation, Brazil, Cretaceous, 277
 sapropel, Vendian, 180
 satellite taxa, nomenclature, 423
 saurischian dinosaurs, predation, 374–5
 sauropods
 feeding, 363, 364, 375
 size, 151
 sauropsids
 terrestrialization, 68
 see also birds; mammals
Saurorhynchus, 284
 savanna, spread of, 85, 86, 138
 scaffolds, skeletons, 314
 scallops
 diagenesis, 247
 molecular remnants, 97, 98
 scanning electron microscopy (SEM), 505, 510, 509–11
 scanstore, electron microscopy, 511
 scavengers
 Cambrian, 33
 definition of, 213
 destructive processes, 223
 Lagerstätten, 288
 Precambrian, 18, 22, 23
 shell hydrodynamics, 229, 233
 trace fossils, 357, 359
 trophic structure, 385, 386, 388

- Scelidosaurus harrisoni*, 501
Scheuchzer, J., (1672–1733), 539
Schizaster, 115
 schizogenic mode, resin production, 295
Schizoporella, 348
 'schlauben', resin, 295–6, 296
Schuchert, C., 547
 sciotaxon, definition of, 421
 scleractinian corals
 biomineralization, 26
 encrusters, 347
 Triassic, 189
 sclerites
 Precambrian–Cambrian, 22, 24, 27, 34, 44, 45, 443
 sclerocytes, biomineralization, 26
 sclerosponges
 biomineralization, 26
 problematica, 443
 scolecodonts, sample preparation, 502
 scorpions
 Lagerstätten, 279
 terrestrialization, 65, 66, 67
Scyenia ichnofacies, 356, 358, 412
 scrapers, effect on reefs, 56
Scrobicularia, 389
Scyliorhinus, 366
Scyphozoa
 Lagerstätten, 282, 286, 287, 288
 Precambrian, 18, 21, 32, 44
 sea-level
 biases in fossil record, 130
 biostratigraphy, 488–90, 489
 changes, reefs, 344–5
 extinction process, 160–2, 161, 163, 164, 166
 events, 182–3, 183, 184, 187, 188, 192, 193, 199, 197
 source rocks, 220
 variations, Palaeozoic, 35, 35, 42, 478, 479
 sea-lions
 biomechanics, 321–2
 predation, 370
 seals, predation, 370
 seasonality, extinction, 187, 188, 193, 203–4
 seaweeds *see* algae
 'secondary adaption', 145
 sediment grain size, trace fossils, 361
 sedimentary record
 completeness of, 298–9, 298
 extinction evidence, 169
 sedimentation rate
 completeness of fossil record, 298, 298, 299, 301, 302
 fossil concentrations, 236, 236, 237
 Lagerstätten, 240, 243, 267, 277, 281, 282, 291
 source rocks, 221, 221
 taphofacies, 258, 258, 259, 259, 260, 260, 261, 261, 262, 263
 trace fossils, 356, 362
 seeds
 angiosperms, 79, 83
 hydrodynamics, 231
 segmentation, Coelenterata, 21, 23
Seirocrinus, 284
 seismic stratigraphy, 471, 472
 selectivity, extinction, 167
 semicircular canals, terrestrialization, 70
 sense organs
 skeleton, 314
 terrestrialization, 65, 68, 70
 septaria, nodules, 251, 251
 sequence stratigraphy, 302, 302, 359, 472
 sequestrants, sample preparation, 500
Sequoia, 151
 serpulids, encrusters, 347, 350
 settling, shells, 227–8, 228
 sexual dimorphism, hominids, 88, 89
 sexual selection, macroevolution, 126, 127
 sharks
 feeding, 363, 364, 365, 366
 Lagerstätten, 284, 288
 predation, 368, 369, 370, 371
 shear force, hydrodynamics, 323
 sheep, teeth, 234
 sheet form, encrusters, 347, 347, 350
 shells
 Cambrian, 24–9, 25, 28
 composition, 314
 diagenesis, 254
 flattening, 244
 hydrodynamics, 227–9, 228, 229
 morphology, 311
 predation, 368, 369, 369, 370, 371, 372
 taphofacies, 258, 259
 shock-metamorphosed minerals,
 extinction evidence, 163, 169, 169, 170, 177, 198
 shrimp, Lagerstätten, 282, 292
 Siberian traps, associated, extinction, 178
 sibling species, speciation, 100
 Sichuan, China, 169
 siderite
 coprolites, 366
 Lagerstätten, 241, 291, 292
 concretions Mazon Creek, 279, 281–2, 282
 nodules, 250, 251, 252
Sidneyia, 362, 364
 Signor–Lipps effect, 166
 silica
 coprolites, 366
 fossils, Cambrian, 27–8, 28, 34
 plants, 84, 138, 263, 264, 264
 stability, 225
 Silurian
 biocenoses, 395, 397, 397, 398–400
 biomineralization, 26
 communities, 391, 392
 completeness of record, 299
 diversification, 46–7
 evolutionary flora, 40
 environmental indicators, 411, 412
 Lagerstätten, 26/
 parasites, 378–9, 380
 plankton, 51, 52
 predation, 371, 372, 373
 reefs, 53, 55–6, 345
 stratigraphy, 461, 463, 465, 466, 468, 475, 478–82, 479, 481, 483, 488, 489
 terrestrialization, 58, 59, 60, 61, 62, 63, 64, 65, 67, 68
 similarity coefficients, phenetic
 biogeography, 453–4, 453
 Simpson, G.G., 546, 547
 Simpson similarity coefficient, 453, 454, 454
 'Simpsonian systematics', 434
 simulation modelling, 493–4, 494, 496
Sinanthropus, 545
 Sinian, 17
 see also Vendian
Sinosabellidites, 30
 siphonogonuchitids, Cambrian, 34
 siphonophores
 colonies, 330, 332, 333, 334
 Lagerstätten, 279
 sipunculids
 habitat, 64
 trace fossils, 360
 sister-groups, 430, 433, 435, 437, 448
 size
 destructive processes, 224, 226
 evolution, 108, 137, 147–52, 148, 149, 150, 151
 extinction, 161
 flight, 76
 heterochrony, 112, 113, 115, 116, 117
 leaves, transport, 230, 231
 Palaeozoic, 45, 47
 Precambrian, 18, 22, 23
 terrestrialization, 76
Skara, 275, 276
 skeletons
 biases in fossil record, 130
 Skaracarida, Lagerstätten, 276
 composition and growth, 314–18, 315, 316
 encrusters, 346
 experimental morphology, 307
 palaeopathology, 381–4, 382, 384, 385
 Precambrian–Cambrian, 22, 24–9, 25, 28, 33, 34, 36, 45
 vertebrates, heterogeneity, 118
Skiagia, 180
 skins, Tertiary, 205
Skinneria, 18
 skolithid reefs, 54
Skolithos, 45
 ichnofacies, 356, 357, 358, 359, 360, 361, 412, 412
 skull
 hominids, 88, 89, 90, 91
 mammals, 145
 Slave Province, Canada, reef formation, 53
 sloths
 extinction, 208, 208
 feeding, 367
 preservation, Lagerstätten, 268
 size, 150
 'small shelly faunas', Cambrian, 39
 smectite, Lagerstätten, 291
Smilodon, 207, 208
 Smith, W., (1769–1839), 541, 541, 542
Smittina exsertaviculata, 332
 snails, terrestrialization, 65
 snakes
 Cretaceous, 205
 Lagerstätten, 292
 predators, 376
 Snowdon, 490
 soaring, flight, 75, 76
 societies and organisations, 522–4, 530
 sodium hexametaphosphate, sample
 preparation, 500
 sodium hypochlorite, extraction
 techniques, 503
 sodium polytungstate, concentration
 techniques, 504
 sodium thiosulphate, extraction
 techniques, 503
 soft parts
 decay, 213, 214, 215
 diagenesis, 253, 254, 257
 encrusters, 346, 350
 flattening, 245

- fossil concentrations, 237, 276, 277
Grube Messel, 292, 293
Holzmaden, 283, 284
Solnhofen, 287, 288
fossil record, effect on, 389, 426, 445
parasites, 377, 380
trace fossils, 180, 356, 357, 360
soils, terrestrialization, 57–9
solar heat output, extinction, 164
Solar System *see* extra-terrestrial cause
Solemya, 283
solemyid bivalves, trophic structure, 390
Solenopora, 54
solitary encrusters, 346, 347, 347, 350
Solnhofen Limestone, West Germany, 239,
 240, 244, 268, 269, 270, 285–9, 286,
 287, 289
Archaeopteryx, 78, 288, 289, 543
diagenesis, 253
 dietary evidence, 364
soot, extinction evidence, 169
Sørenson similarity coefficient, 453, 454
source rocks, 220–2, 221
South China block, 187, 188
Southern Uplands, Scotland, 483
space competition, benthic habitat, 42, 43
spatangoid echinoids, heterochrony, 115
Spathodus primus, 421
spatial refuges
 colonies, 334
 encrusters, 347
speciation, 100–6, 102, 107
 angiosperms, 82
 heterochrony, 114
 hierarchies, 125–6
 rate, 156–7, 158, 159, 198
 study of, 299, 548, 552, 553
 Vendian, 22
species
 definition, 100, 107
 diversity, 134, 445–7, 446
 extinction, 185, 186, 186
immunological techniques, 99
selection, 127, 552–3
 species-area effect, 192
'specific mate recognition system (SMRS)',
 126
Sphaerirhynchia (Wilsonia) wilsoni, 395
sphalerite, Lagerstätten, 281
Sphenacodontidae, predators, 373
Sphenodon, 157
sphenodontid, Lagerstätten, 284
sphenopsids, Palaeozoic, 40, 63
spheroids, Precambrian, 10, 11, 12, 14
spherules, extinction evidence, 169, 170
spherulites, skeletons, 315, 315, 316–17,
 316
sphinctozoans, biomineralization, 26
spicular skeleton, Precambrian–
 Cambrian, 24, 26, 27, 28, 33
spicules, problematic taxa, 443
spiders
 Lagerstätten, 279, 292
 predators, 373
 terrestrialization, 59, 65
spinosity, prey, 371, 372
spirorbids, symbiotic, 138
Spirophyton, 359
Spirorbis, 348
Spirorhaphe, 359
Spitsbergen, Triassic, 277
Spongionionmorpha, 360
sponges
- clinoid, 224, 225
coloniality, 330, 333
coralline, 443
durability, 224, 225
encrusters, 346, 347, 348, 350
extinction, 184, 185, 194
hexactinellid, 26, 28
Lagerstätten, 271, 272, 273, 273, 292
lithistid, 54
modern, 38, 48
Palaeozoic, 45, 46, 52, 53, 54
 Cambrian, 23, 26, 34, 45
problematic taxa, 443
reefs, 342, 343
skeleton, 26, 27, 28, 314, 315
trace fossils, 360
Spore Colour Index (SCI), 512, 513
spores
 biostratigraphy, 461, 467
 electron microscopy, 509
 preservation, 264
 terrestrialization, 60, 62, 63
 thermal maturity, 511, 512–13, 513, 513,
 514, 515
sporomorphs, terrestrialization, 60–2, 61
sporopollenin, terrestrialization, 60
Spriggina, 21
Sprigginidae, Precambrian, 21–2
springtails, terrestrialization, 58, 59
Squamata
 classification, 435, 436
 extinction, 205, 206
squids, 287
stable isotopes, use of, 35, 35, 251, 252
stagnation deposits, 239, 268–70, 269, 283
 see also Burgess Shale; Grube Messel;
 Hunsrück Slate; Solnhofen
 Limestone
stamen, angiosperms, 80
stand-off, encrusters, 350
standard mean ocean water (SMOW), 403
stapes, terrestrial vertebrates, 70
starch grains, preservation, 264
starfish *see* asteroids
stasis, 107, 108, 109, 110, 124, 125, 552
Stationary Model, evolution, 121–2, 121
status material, storage, 516–7
Staurinidia, 18
stearate, diagenesis, 252
Steganotheca, 62
Stegoceros, 205, 207
stegosaurs
 defence, 375
 feeding, 363, 364
Steinheim, West Germany, 90
steinkern pyrite, taphofacies, 259, 259, 261
Steinmannia, 284
stellate microfossils, Precambrian, 13
stelleroids, Palaeozoic, 38, 46
stem-group, classification, 433, 437
Steinmannia, 284
Stenodictya, 73
stenohaline taxa, environmental
 indicators, 406
stenolaemate bryozoans, diversification,
 38, 46, 347
Stenomyelon tuedianum, 265
Stenopterygius, 284, 285, 285
stenotopic species, speciation and
 extinction, 128, 158, 162
Stensen, N., (1638–1686), 538
Stephen Formation, British Columbia, *see*
 Burgess Shale
- stereological techniques, 301
stereom, echinoderms, 26, 62, 315–16, 318
stereophotography, 508
sterile axes, Devonian, 62
sterility, reproductive isolation, 102
sterna, flight, 77, 78
steroids, information from, 218
Stevns Klint, Denmark, 201
Stigmaria, 423
Stipa, 84
Stipidium, 84
stomach contents, evidence of diet, 363
stomata, leaves, 60, 62, 231, 402
stomatopods, predators and prey, 368, 370,
 372
Stone City Formation, southeast Texas,
 389
storage, specimens, 515–7
storms
 extinction, 188
 fossil concentrations, 236, 237, 240, 267,
 283
 Solnhofen Limestone, 286, 288, 289
taphofacies, 258, 261
stratiform conservation deposits, 268
stratiform stromatolites, 336, 338, 339, 340
stratigraphy
 analysis, 30, 155–6, 429, 430, 437
 biofacies, 395–6, 395
 range, completeness of record, 301–2,
 302
 stratigraphy and stratogenetics, 437,
 438, 439, 439
 stratogenetic classification, 427, 429, 435,
 437–41, 439, 440, 551
 computer modelling, 497
 strength, biomechanical study, 318–20,
 319
Stricklandian Code, 417, 418
stridulatory organs, terrestrialization, 68
Striispirifer, 240
stroma, biomechanics, 318
stromatactis, reefs, 54, 55, 56
stromatolites, 336–40, 336, 337, 338, 339,
 340, 548
 Cambrian, 35, 54
 columnar, 336, 336, 337, 337, 338, 339,
 399, 340
 domical, 336, 337, 337, 338, 338, 339, 340
IGCP project, 470
Lagerstätten, 286
metazoans and, 179, 339, 340
origin of life, 7
Precambrian, 10, 11, 12, 13, 14, 15, 17, 31,
 49, 51
 reefs, 53, 53, 54, 55, 56
 stratiform, 336, 338, 339, 340
 stratigraphy, 476
stromatoporoids, 346
 encrusters, substrate for, 349
 environmental indicators, 411
 extinction, 168, 179, 182, 184, 185
 hydrodynamics, 325
 problematic taxa, 443
 reefs, 341, 342, 344
 symbiotic, 138
strontium
 aragonite, 247, 249
 salinity indicator, 407
stromphenid brachiopods
 biofacies, 399
 extinction, 194
'structural genes', heterochrony, 118

- Styginoloch*, 205, 207
 subduction zones, Cambrian, 36
 subholosteans, Lagerstätten, 284
 subjugation, predation, 368
 substrate
 biofacies, 398
 trace fossils, 357, 359–60, 361
 sulphate
 diagenesis, 251, 252, 252, 253, 254, 254, 255
 extinction, 178
 Precambrian–Cambrian, 12, 13, 15, 35, 35
 reduction
 decay process, 213, 216
 Lagerstätten, 240, 240, 281, 282
 sulphide oxidizing bacteria, 390, 390, 409
 sulphidic environments, pyrite formation, 261
 ‘superorganisms’, colonies, 335
 support, terrestrialization, 65, 70
 surface tension, biomechanics, 320
 survivorship curves, 389, 389
 suspension feeding, 18, 22, 23, 38
 bivalves, 399, 400
 encrusters, 346
 Lagerstätten, 276
 tiering structure, 41, 42, 43–4, 44, 45, 45, 46, 46, 47, 48
 trace fossils, 356, 357, 360
 trophic structure, 385, 385, 386, 386, 386, 387, 388, 389
 Swanscombe, England, 90
 Swartkrans, South Africa, 88
 Swedish Caledonides, biostratigraphy, 484
 swimming, biomechanics, 321
 symbiosis, 376, 377, 380, 389–90, 390
 taxa, coevolution, 136, 138
 terrestrialization, 59, 63
 symmetry
 anabaritids, 24
 Coelenterata, 23
 shells, 227
Symmorium, 371
 sympatric speciation, 104
 symplesiomorphies, 430–1, 431, 432
 synapomorphies, 126, 430, 431, 431, 432, 433
 synapsid reptiles
 classification, 436
 evolutionary faunas, 39, 41
 predators, 373
 syneresis, Lagerstätten, 282, 287
 syntaxial cement precipitation, diagenesis, 250
 syringoporids, Ordovician, 55
 systematics, 18–22, 549
- Tabulaconus*, 26
 tabulate corals
 Palaeozoic, 25, 54, 55, 182, 187, 189, 347
 problematic taxa, 443
 ‘tachytely’, evolution rate, 153, 158
 taiga, Post-Pleistocene, 84
 talitrids, amphipods, terrestrialization, 67, 68
 talus blocks, reefs, 56, 343–4
 Tamaulipas, Mexico, 367
Tannuolina, 27
 taphocoenosis, 237, 238, 238, 258
 taphofacies, 258–62, 258, 259, 260, 261, 262, 263
 taphonomic facies *see* taphofacies
 taphonomy
 environmental indicators, 412
 processes, 223–6, 224, 225, 226
 obrution deposits, 243
 plants, 352–3
 trace fossils, 360
 tapirs, dentition, 86
 tardigrades, terrestrialization, 65
Tarsiodea, 440, 441
Tasmanites, 50, 51
Tawuaia, 30
 taxonomy
 composition, compared fossil concentration, 235, 236
 diversity, 131–3, 131, 132, 447, 553
 evolution, 153, 154, 155, 156
 journals, 524
 teaching, exhibit strategies, 519–22, 521
 tectonics, 482–90, 486, 487, 488, 489
 biogeography, 454–5, 457, 458, 458
 extinction, 162, 191, 192, 193
 preservation, 274
 teeth
 hominids, 88, 89, 90, 91
 shells, 227
 palaeopathology, 381, 383
 predators, 373
 transport, 233, 234
 vertebrates, 362–3, 363, 364
Tegularhynchia, 115, 116
Teichichnus, 359
 teids, Tertiary, 205, 206
 teleology, adaption, 139, 140, 144, 145
 teleostean fishes
 biogeography, 449, 450, 450, 451
 Lagerstätten, 284, 287
Tellina, 389
 Tellinacea
 Mesozoic, 400
 trophic structure, 389
 temnospondyl amphibians, terrestrialization, 70
 temperature
 biogeography, 457
 decay processes, 213, 214
 dependent organisms, 412
 diagenesis, 247
 extinction events, 183, 183, 184, 185, 198, 199
 Permian, 187, 188, 188, 191, 192
 extinction process, 161, 162, 163, 165, 166, 167
 heterochrony, 116
 hydrodynamics, 323
 obrution deposits, 241, 242
 oceans, molecular evidence, 96
 oxygen isotope ratios, use of, 403–5, 404, 405
 plant indicators, 401, 401, 402, 402, 403
 Precambrian, 12
 specimen storage, 515, 516
 source rocks, 219, 220, 221
 stromatolites, 337
 trace fossils, 357, 360
 see also thermal maturity
 templating, origin of life, 5, 6
 tentaculites
 biomineralization, 25
 problematic taxa, 442, 443
 shells, 229
 terratratulid brachiopods, biofacies, 400
Teredolites, 425
 ichnofacies, 356, 358, 359, 360
 terrestrial (earth-bound) cause, extinction, 171, 172, 177, 178
 Cretaceous–Tertiary, 203–5, 204, 205, 206, 207
 terrestrial environment, diversity of species, 130, 132, 132, 133, 134
 predators, 373–6, 374
 terrestrialization
 invertebrates, 64–8, 65
 plants, 40, 60–4, 61
 soils, 57–9, 58
 vertebrates, 40–1, 68–72, 69, 71
 Tertiary
 angiosperms, 82–3
 biofacies, 400
 biogeography, 455, 456, 456
 diagenesis, 257
 diversification, 132, 132, 134
 environmental indicators, 404, 412
 grasslands, 84–5, 86, 87
 heterochrony, 115, 117, 118
 Lagerstätten, 268
 microevolution, 109
 nomenclature, 422
 plant
 communities, 352, 354
 preservation, 266
 predation, 370, 375, 376
 reefs, 344
 size, 151
 stratigraphy, 461, 484
 see also Baltic amber; Grube Messel
 Testudinata, classification, 435, 436
 Tethys Ocean, 286
 tetrabromoethane, concentration techniques, 504
 Tetradium, 55
 tetrads, Palaeozoic cryptospores, 60, 61
Tetragonolepis, 284
Tetramatosaurus, 284
 tetraploidy, reproductive isolation, 102, 102
 tetrapods, 68–71, 69, 71
 choana, 69
 diphyletic, 69
 experimental morphology, 307, 308
 extinction, 190–1, 190, 192, 194, 195, 196, 197, 197, 198
 Lagerstätten, 279
 Palaeozoic, 39, 40–1, 68–71, 69, 71
 predators, 373–6, 374
Teudopsis, 284
Thalassinoides, 47, 359, 366
Thallophyta, Palaeozoic, 60, 64
 thanatocoenosis, 237, 238, 258, 268, 276
Tharsis dubius, 287
Thaumatosaurus, 284
 thecidieidine brachiopods, heterochrony, 114
 thecodontians
 classification, 436
 extinction, 194, 195, 195
 predators, 373, 374
Thecodontosaurus, 197
 theoretical morphology, 310, 311
 theoretical palaeobiology, 551, 552
 Therapoda, classification, 436, 436
 therapsid reptiles
 classification, 443, 436, 436
 cynodont, 151, 373, 374
 extinction, 190, 190
 predators, 373, 374, 374, 375

- terrestrialization, 68
see also mammals
- Thermal Alteration Index (TAI), 513
- thermal maturity, determination of, 511–5, 512, 513, 513, 514
- thermophilic conditions, Precambrian, 7, 12
- thermoregulation, pro-wings, 72
- theropod dinosaurs
- bird ancestors, 114
 - predators, 374
- Thescelosaurus*, 205, 207
- Theta-rho analysis, 311–12
- Thoracosphaera*, 201
- thrombolites, stromatolites, 336, 339, 340
- thyasirid bivalves, trophic structure, 390
- Thylacoleonidae, extinction, 208
- tiarechinid echinoids, heterochrony, 114
- tiering, 38, 42, 43–4, 44, 45–8, 45, 46, 47, 133
- marine habitat, 46–8
- Tilestones, South Wales, 480
- time averaging, fossil concentrations, 237–8, 238
- 'time hypomorphosis', heterochrony, 113
- Tirasiana*, 18
- Tithonian extinction, 173, 174, 175
- Tomaculum*, coprolites, 366
- Tommotian Fauna, 39, 40, 44–5
- tommotiids, Cambrian, 25, 27, 34
- tools, hominids, 88, 89–90, 89, 91
- Tornquist's Sea, biostratigraphy, 485, 486
- Torosaurus*, 205, 207
- total-range biozone, 461
- trabeculae, coral skeletons, 26
- trace elements
- extinction cause, 165, 191
 - shells, salinity indicators, 407
- trace fossils, 355–62, 355, 357, 358, 359, 360, 549
- diet evidence, 362
 - diversity, 134, 180
 - durability, 224
 - environmental indicators, 409–10, 410, 411, 412, 412
- Lagerstätten, 277, 282
- modern, 48
 - nomenclature, 423–5
 - Palaeozoic, 34–5, 44, 45, 47
 - parasites, 378
 - Precambrian, 10, 33, 49
 - predation, 368
 - stratigraphy, 476, 477, 478
 - see also* oncolites; stromatolites
- tracheae, terrestrialization, 67, 72, 73, 142
- tracheophytes
- diversity of species, 130, 132–3, 132, 134
 - Palaeozoic, 39, 40, 58, 59, 60, 61, 62, 63, 64
- Trachymetopon*, 284
- Trachysphaeridium laufeldi*, 179
- transformation approach to morphology, 309–10, 310
- transformation cladistics, 429–30, 431–2, 435
- transmission electron microscopy, 508–9, 511
- transport
- hydrodynamics
 - bones, 232–5, 234
 - plant material, 230–2, 231, 351, 352, 354
 - shells, 226, 227–9, 228, 229
- obrution deposits, 239, 240
- preservation, effect on, 214–5, 216, 223
- tree ferns, Carboniferous, 354
- tree rings, climate indicator, 402
- trematodes, parasites, 377, 378
- trepastome bryozoans, extinction, 160, 189
- Triarthrus*, 240
- Trilobite Bed, New York, 253–4
- Triassic
- angiosperms, 79, 81
 - biofacies, 400
 - biogeography, 457, 458
 - coevolution rate, 137
 - dietary evidence, 366
 - diversification, 132
 - evolution rate, 157
 - evolutionary fauna, 40, 41
 - extinction, 194–8, 195, 196, 197
 - causes, 160, 161, 167, 189
 - flight, 76
 - Lagerstätten, 269
 - plant preservation, 264
 - predation 372, 373–4, 374
 - size, 150
 - stratigraphy, 488
- Trirachidium*, 18
- Triceratops*, 205, 207, 375
- trichobothria, terrestrialization, 68
- Trichodesmium*, 49, 50
- Trichognathus symmetrica*, 421
- Trichoptera, Baltic amber, 297, 297
- tricolporate pollen, Cretaceous, 80, 81
- tricolporate pollen, Cretaceous, 81
- tridactyl feet, horses, 86
- trigonotarbid arachnids, terrestrialization, 59, 65
- trilobites
- biofacies, 396, 398, 399
 - biostratigraphy, 461, 462, 475, 477, 485, 486
 - completeness of fossil record, 302
 - diagenesis, 250, 253–4
 - extinction, 160, 181, 181, 182, 183, 189
 - feeding, 362
 - flattening, 245, 246
 - galls, 379–80
 - heterochrony, 114, 115, 117, 118
 - Lagerstätten, 239, 240–1, 240, 242, 243, 267, 269
 - Burgess Shale, 271, 272, 273, 273
 - 'Orsten' deposits, 274, 276
- lineages, 428
- Palaeozoic, 26, 34, 38, 44, 45, 52, 54, 480
- parasites of, 379–80
- photography, 506
- Precambrian, 21
- speciation, 107, 108, 109
- taphofacies, 259, 260
- terrestrialization, 65, 67
- Trilobozoa, Precambrian, 18, 21
- trimerophytes, Palaeozoic, 63, 64
- Tritynx messelianus*, 290
- trophic structure, 191, 193, 385–90, 385, 386, 386, 387, 388, 389, 390
- tropical ecosystems
- extinction, 189
 - forests, Tertiary, 203–4, 204
- Trypanites ichnofacies*, 356, 358, 359–60, 359, 360
- tube-worm, feeding, 389
- tubular fossils, 24–5, 27, 29, 34, 443
- Tullimonstrum gregarium*, 281
- tunicate-like invertebrate, vertebrate ancestor 114
- tunicates
- coloniality, 330, 334
 - encrusters, 346
- Tupaioidea, evolution, 440, 441
- turbellarians
- parasites, 377
 - Precambrian, 30, 31
- turbidity currents
- Lagerstätten, 240, 241, 243, 286
 - Hunsrück Slate, 278
- Turboella*, 38
- turnover rate, species, 185, 186, 186
- turrids, predators, 389
- Turritella*, 228
- turtles
- extinction, 202
 - evolutionary faunas, 39, 41
 - Lagerstätten, 292
 - Triassic, 194
- type series, concept of, 524
- type specimen, concept of, 524
- Tyrannosaurus*, 205, 207, 374–5
- uintatheres, size, 150
- Ulakhan-Sulugur, Aldan River, Siberia, 476, 477
- ultraviolet radiation
- origin of life, 5
 - Palaeozoic, 60, 62
 - photography, 508
- unconformities, geochronology, 483
- Undina*, 284
- UNESCO, 522
- ungulates, evolution, 86–7, 87, 137
- uniramians, 65, 68
- unitary organisms, coloniality, 333
- United Nations Educational, Scientific and Cultural Organization (UNESCO), 469
- univalved, skeletal type, 225, 226
- Upper Hartfell Shale, Dob's Linn, Scotland, 479, 480
- Upper Mississippi Valley, U.S.A., 396
- uraninite, Precambrian, 13
- ureotelic nitrogenous excretion, terrestrialization, 69
- urodeles, terrestrialization, 69
- Urohelminthoida*, 359
- Vaizitsinia*, 21
- Valdai Series, Podolia, Ukraine, 17
- vampyromorphids, Lagerstätten, 284
- Van Valen's Law, 119–20, 120
- vanadyl porphyrin, geochemical fossil, 96, 97
- Varangian glaciation, 17, 180
- varanids, Tertiary, 205, 206
- variability, populations, 156
- Variscan Orogeny, 277
- vascular plants *see* tracheophytes
- vegetarianism, hominids, 89, 367
- velocity profile, benthic habitat, 43, 43
- Vendia*, 21
- Vendian
- diversification, 44, 48, 49–50, 51
 - evolutionary faunas, 40
 - extinction, 17, 22–3, 33, 44, 179–80, 180
 - metazoans, 17–23, 19, 20, 29, 30, 31–3, 32, 44
- problematic taxa, 444

- Vendomia*, 21
Vendomiidae, Precambrian 21
 vendotaenian algae, Precambrian, 17, 180
Veneracea, biofacies, 400
 'Venice System', salinity, 406
 Venn diagram, 431, 433
 Venus, compared primitive earth, 8
 verbeekinid fusulines, 487–8
Vertebalaria, 265
 vertebrates
 biomechanics, 321
 coevolution, 138
 coprolites, 366–7, 366
 developmental patterns, 309, 310
 diagenesis, 257
 diversity, 131, 132, 132, 133, 134
 evolutionary tree, 428
 extinctions, 161, 191, 192, 193, 196, 202
 feeding, 362, 368, 370, 372
 flattening, 239
 flight, 75–8, 77
 genetic variability, 328, 328
 grasslands, evidence of, 85–7, 87
 heterochrony, 114, 118
 Lagerstätten, 29, 239, 267, 286
 Grube Messel, 291, 292–3
 Holzmaden, 283, 284
 Hunsrück Slate, 277, 279
 paedomorphosis, 111
 size, 147
 skeletons, 27, 28, 314, 317
 speciation, 108–9
 transport, 232–5, 234
 vesicomyiid bivalve, trophic structure, 389–90
Vestrogothia spinata, 275
 vicariance biogeography, 448–51, 450, 451, 454–5, 457
 viscosity, hydrodynamics, 323
 vision systems, computer analysis, 497–8
 vitrinite reflectance, thermal maturity, 511–2, 512, 513, 513, 514, 515
 viverids, predators, 375
 vivianite, Lagerstätten, 291
Vladimissa, 21
 volatiles, decay process, 214
 volcanicity
 biostratigraphy, 483–4, 490
 extinction process, 160, 162, 163–4, 166, 167, 168, 169, 170
 events, 203
 periodicity, 177, 178
 Grube Messel, 290, 293
 organic debris, 96
Volvox-like green algal colony, 50
Vombatidae, extinction, 208
 'Voorhies Groups', transport, 233
Waeringoscorpio, 67
 Walcott Quarry, British Columbia, 271
 Wales, sea-level curves, 488–90, 489
 walking, biomechanics, 320
 Walther's Law, biofacies, 398
 Wanakah Shale, Lake Erie, New York, 242
 Warrawoona Group, Western Australia, 10, 12, 51, 338
 water supply, terrestrialization, 60, 64, 65
 water transport
 bones, 233
 plants, 231–2, 231
 water column overturn, 220, 221
 waves
 destructive process, 223, 226
 encrusters, 350
 fossil concentrations, 236, 237
 reefs, 345
 shells, hydrodynamics, 228, 229
 weathering, soils, Palaeozoic, 57, 58, 59
 webs, graptolites, 52
 Wegener, A., 547
 weight
 hominids, 88, 89
 leaves, 230, 231
Weischselia, 265
 Welsh basin geochronology, 483
 Welsh borderland, Silurian, 395
 Wenlock Series, Silurian, 463, 464
 West Tethys, biogeography, 457
 Western Interior Basin, North America, 465
 wetland herbaceous communities, 83, 352, 353
 whales
 feeding, 365, 370
 size, 150–1
 whelks, trophic structure, 390
 White River Badlands, 375
 White Sea, northern U.S.S.R., 32, 33
 Whitwell Chronozone, Welsh borderland, 463, 464
Widdringtonites, 283
 Wild-Leitz system, photograph, 508
 wildfires, extinction, 169, 203–4
Wilsonia Shales, 395
 wind transport
 bones, 233
 plants, 230–1
 Winteraceae, Cretaceous, 81
 within-locality organization, 438, 439
 within-sample organization, 438
 within-species evolution, 106–10, 109, 119, 124
 Wolstonian cold period, 383
 wombat, size, 150
 wood
 biomechanics, 318
 climate indicators, 402
 diagenesis, 254, 254
 evidence, 79
 hydrodynamics, 231
 wooded communities, Tertiary, 83
 woodlice, terrestrialization, 65
 Woodward, J., (1665–1728), 539, 542
 woody plants, Cretaceous, 81
 working groups, Precambrian–Cambrian boundary, 476
 worms
 Lagerstätten, 282
 modern, 48
 Precambrian, 30, 33
 symbiotic, 138
 see also annelid worms;
 platyhelminthes; polychaete worms
 Wyoming, Eocene primates, 109
 X-ray photography, 508
 xenosaurids, Tertiary, 205
 xeromorphic habitat, 351
 xiphosurans, 279
Xiphosurida
 biomechanics, 319
 Lagerstätten, 279
 living fossil, 157, 157
 see also horseshoe crabs; *Limulus*
 Yellowstone National Park, U.S.A., 266, 352
Youngibelus, 284
 Yudomski event, Precambrian, 35
 Zilmerdak 'Series', Urals, 31
 zinc bromide, sample preparation, 504
 zone fossils, 466–7, 466, 467
 zoological nomenclature, 417–18, 419
Zoophycos, 260
 ichnofacies, 260, 356, 358–9, 359, 412, 412
 zooplankton
 cholesterol, 217, 218
 diversification, 50, 51, 52
 extinction, 185, 189
Zosterophyllophytina, Devonian, 63
Zosterophyllum, 61, 62, 63
 zuglodonts, predation, 370
 Zumaya, Spain, 201, 202
 zygomorphy, Cretaceous, 83
 zygopleurid gastropods, Triassic, 189