

Index

References to figures appear in *italics* and those to tables appear in **bold**

- Aar massif
 deep crustal features 49, 308, 313, 316, 425
 palaeomagnetic features 404, 408
 shear features 344–5
- Abruzzi–Hornli unit 178, **179**, 181
- Acceglio zone 138, 142
- Adamello massif 402
- Adria microplate 150, 154, 219, 288
- Adriatic promontory 10, 305, 402
- Adriatic subplate 113, 130, 244
- Adula nappe 115, 126, 315, 354, 425
- Aegean microplate 305
- Aegean rift basin, 285, 286
- African–Adriatic promontary *see* Adriatic promontary
- African plate motions 148–50, 221–4, 265–70, 340–1, 438–9
- Aiguilles Rouges massif 13, 23, 49
 basement features 34, 38, 40, 57, 308, 331
- Allalin gabbro 184, 354
- Alpes Maritimes 406–7, 411, 414
- Alpine–Dinaric Line 311
- Alpine sole thrust (AST) 345, 348, 349
- Alpine structure, principle areas of 1–4, 23
- Ambin massif
 composition 136, 137, 138, 139
 deformation 140, 144, 147, 341
- Anatolian microplate 305
- Antigorio granite 126
- Anzio–Ancona Line 276
- Anzola shear zone 203, 206, 207
- Apennines
 rotations 289, 324
 structure 278–9
 thrusting 218, 276–7
- Apuane nappe 278, 279
- Apulian microcontinent
 basement 10, 173, 272
 motion 176, 270–1, 337, 341, 349
 see also Adriatic promontary
- Ardon tectonic sliver 55
- Argentera massif 3, 102, 308
 palaeomagnetic features 334, 406
 rotation 331, 336
- Arlberg line 229
- Arosa mélange 231, 233, 238
- Arosa Schuppen zone 425
- Arpont schist 138, 145, 146
- Austro–Alpine nappes
 deformation 247–51, 252–60
 geological setting 2, 3, 244
 metamorphism 251
 orogen element 424
 palaeomagnetism 404
 tectonic history 230–9, 243–4, 309, 310–11
 thrust geometry 244–7, 268
- Autapie helminthoid flysch 88, 91, 92, 93
- Ayas unit 178, **179**, 181–2
- Bakony unit 168
- Balaton Line 168
- Belledonne massif 3
 alignment 334, 336
 palaeomagnetism 406
 rotation 331
 thrusting 76–7, 78, 308
- Bellino thrust 216
- Bergell massif
 age 127, 373, 431–2
 cooling history 159, 160
 deformation 158, 343
 palaeomagnetism 404, 408, 412, 413
- Bernhard nappe 115, 308, 354, 379, 425
- Bersezio fault 148
- Bettaforca unit 177, 178, **179**, 181
- Biella syenite 160
- Blegi oolites 404–5
- Bosco–Gurin unit and thrust 116, 126
- Bourg d’Oisan half graben 343
- Breccia nappe 425
- Breithorn unit and thrust 177, 178, **179**, 183
- Brenner fault 167
- Briançonnais defined 425
- Briançonnais domain (Internal Pennine Zone) 135
 basement 136
 cover 136–7
 metamorphism, 138, 362
 palaeomagnetism 406
 structure 139–47
 subsidence 14, 308
 tectonic history 137–8, 147–50
 interpretations of 434
 thrusting 97, 98–103
- Brignano anticline 215
- Bündnerschiefer 425
- Calabrian Arc 277, 287, 288, 296
- Campagna window 270
- Canavese Line 113, 155, 156
 deformation history 159–64
- Canavese Zone 424
- Capo d’Orlando Formation 276
- Carnian mélange 231, 237
- Carrara marble 258
- Centovalli Line 156, 157
- Central Alps
 displacements 343–9
 metamorphism 356
 palaeomagnetism 404–5, 407–9
- Central European Rift System 306–8, 324
- Cetraro 278–9
- Chablais klippe 34
- Châines Subalpine (Subalpine chains) 3
 deformation 20–1, 38, 42–3
 horizontal strain changes 65–71
 tectonic history 71–8

- thrusting 343
- vertical elevation changes 79–80
- Chartreuse massif 343
- Chavière fault 145, 148
- Col de Larche 101, 103
- collision model for Alps 18–24, 424–5
- Como Formation 160, 431
- Conrad discontinuity 313, 314
- Corno del Camoscio–Breithorn, Zona 174
- Corsica, rotation of 276, 437
- Cremona Line 160
- crustal thickness studies 219–21, 306–8

- Dauphiné tectonic domain 308, 309
- Dauphinois Zone (External Pennine Zone)
 - deformation 343
 - palaeomagnetism 406, 411, 415
 - subsidence 14
- Deckenbau model 424
- Deferegggen–Anteselva–Valles (DAV) Line 153, 167
- deformation studies
 - Austro–Alpine nappes 247–51, 252–60
 - Canavese Line 156–64
 - Lepontine dome
 - high temperature 118–22
 - retrograde 122–8
 - Sesio–Lanzo 196–9
- delamination studies 285, 288, 290–8
- Dent Blanche
 - fission track age 379
 - nappe system 311, 363, 424
- Diablerets nappe 34
 - folding 39, 40, 50, 57
 - illite crystallinity 55
 - metamorphism 56
 - strain state 54
 - tectonic model 58–61
- Digne nappe and thrust 84–8, 331
- Dinaric Line 311
- Dioritica–Kinzigitica, seconda zona (IIDK) 189, 190–3
 - deformation 196–9
 - metamorphism 194–6
 - see also* Second Dioritic Kinzigitic Complex
- Dogger Slates illite crystallinity 55
- Doldenhorn nappe 34, 38, 40, 48, 344
- Dôme de Barrot 406, 411
- Dora–Maira massif
 - deformation 136, 308, 341
 - metamorphism 354, 361, 362
- Drauzug unit 168
- Drugsbergschichten 38

- Eastern Alps
 - palaeomagnetism 403–4, 409–11
 - see also* Austro–Alpine nappes
- eclogite mica schist unit (EMS) 189, 190–3
 - deformation 196–9
 - metamorphism 194–6
- Elba Granite 277
- Embrunais–Ubaye nappes 88–95, 331

- Engadine Line 114, 116, 130
- Engadine window 236, 308
- Eoalpine phase
 - deformation 12–17, 430, 432
 - metamorphism 354–9
 - timing 353
- Esterel massif 407
- European plate motions 148–50, 221–4, 265–70, 340–1, 438–9
- extensional phase model for Alps 7–12
- External Crystalline Massifs
 - displacement 330–3
 - structural interpretation 333–7
 - tectonic history 329, 330
- External Pennine Zone *see* Dauphinois Zone

- Falknis nappe 233, 239
- faults
 - dating of 205–9
 - lateral transfer 106
- fission track ages
 - concepts 370–1
 - interpretation 372–4
 - metamorphic studies 391–3
 - tectonic studies
 - Lepontine dome 386–8
 - Sesia–Lanzo 374–80
 - Silvretta 380–6
 - Suretta 388–91
- Flaine depression 34, 38, 49
- flysch, significance of 434–5
 - nappes 425, 431
 - shales and slates illite crystallinity 55
- fold geometry, use of 35–40
- foliation studies
 - Austro–Alpine nappes 250, 257
 - Lepontine dome 118
- Franciscan-type orogenesis 432
- Frontal Pennine Thrust 3, 23, 336, 345, 348
- Fundelkopf syncline 233
- Furgg zone 175, 182

- Gailtal Line 153, 167, 168, 311
- Gampadels fault 236, 238
- Gargano basin 271, 272
- Garvera thrust 165
- Gauertal fault 238
- Gebroulaz fault 145, 148
- Geissspitze unit 236, 237–8
- Gellihorn nappe 34
- Giudicaria Line 167, 311
- Glarus nappe and thrust 165, 408, 410, 431
- Globigerina* ooze 277
- Gneiss Minuti (GM) Complex
 - metamorphism 197–8, 199, 360
 - tectonic history 189, 374–7
- Golm unit 236, 237
- Gornergrat unit 178, 179, 180–1
- Gosau Formation 247, 403, 404
- Gotthard massif 57–8, 115, 308, 425
- Gran Paradiso massif
 - age 379, 380

- deformation 308, 341
- metamorphism 354, 362
- Gran Tournalin 177, 178, **179**, 181–2
- Grand St Bernard nappe 136, 138
- Grande Motte nappes 145, 146
- Grandes Rousses massif 406
- gravity anomaly studies 320–3
- gravity sliding models
 - Helvetic nappes 47–8
 - Western Alps 105–6
- Graywacke zone 245, 310
 - deformation 252–9
 - detachment and thrusting 244, 247, 248, 249
- Grès Nummulitique illite crystallinity **55**
- Gressoney–Gran–Tournalin unit 174
- Grigna segment 230
- Guil ignimbrite 406
- Gurktal thrust 244, 245, 246, 247
- Gurnigel flysch and nappe 407, 434–5

- Habkern Arc 435
- Hauptdolomit 233, 235
- Hauterivien limestone illite crystallinity **55**
- Helminthoid flysch nappe 308
- Helvetic nappes 3, 14, 23, 33
 - deformation 20–1, 425, 431
 - displacements 343–4
 - fold geometry 35–40
 - gravity slide theories 47–8
 - metamorphism 54–7
 - palaeomagnetism 405
 - profile shape 48–52
 - strain state 52–4
 - structure 33–5
 - tectonic synthesis 41–4, 58–61, 308, 309
 - thrusting 40–1, 268
- hinge point, use of 35–8
- Hohgant shales illite crystallinity **55**
- Houillère, Zone 138

- Iblean block 271
- Imerese basin 270, 272
- Inntal nappe 403
- Insubric fault 343, **348**, 349
- Insubric Line 2, 3, 23, 113, 213, 311
 - movements along 130, 156, 159, 164, 217
 - see also* Peradriatic Line
- Insubric mylonites 122, 156, 164
- Insubric phase 122, 130, 156, 163, 164–7
- Internal Pennine zone *see* Briançonnais zone
 - see also* Piémont zone
- inversion *versus* thrusting 86–7
- Ionian Sea 287, 288, 294
- Isère fault 334
- Italian Alps *see* Southern Alps
- Ivrea Body 104, 155
- Ivrea zone
 - ages 205–9, 379
 - deformation 158
 - geological setting 157, 159–60, 203–4
 - metamorphism 164, 204–5
 - palaeomagnetism 161–3, 406

- Jura mountains 3, 425
 - deformation 268, 430–1

- Kabylie–Calabria thrust belt 276
- Kieselkalk 39, 50, 51
- kinematic studies
 - Austro–Alpine nappes 252–9
 - Briançonnais domain 140–1
 - Canavese Line 163–4
 - Lechtal nappe 237–9
 - Leptontine dome 128–31
 - Sesia–Lanzo 196–7
 - Southern Alps 216
 - Western Alps 345–9
 - Western Mediterranean 265–80

- Lagonegro basin 270, 272, 276
- Lavanttal Line 167, 168
- Lechtal nappe 230–2
 - kinematic studies 237–9
 - palaeomagnetism 403
 - tectonics 233–5, 236–7
- Leptontine dome
 - age studies 379, 386–8, 391–3, 394
 - crustal studies 313
 - deformation 118–28, 164–7
 - geological setting 113–14
 - kinematics 128–31
 - metamorphism 116–17, 155, 392–3, 394
 - palaeomagnetism 404–5, 409
 - structure 114–16, 308
 - uplift 156–9
- Les Annes klippe 34
- Leventina granite gneiss (orthogneiss) 115, 119, 126
- Lias Slates illite crystallinity **55**
- Liguria 136, 276
- Ligurian Sea 285, 286
- Lindose graben 280
- lineaments, significance of 104, 113, 167–8, 311
- lineations, stretching
 - Apennines 278
 - Austro–Alpine nappes 250
 - Briançonnais domain 144
 - Leptontine dome 118, 126, 127
 - Pennine Alps 176–82, 341–3
- lithosphere–asthenosphere modelling 301–2
- lithospheric root 307, 316–20
- Lucomagno granite gneiss 115
- Lugano Line 158

- Macugnana unit 177, 178, **179**, 180–1
- Madrisa zone 236, 237
- Maggia steep zone 116, 118, 160
- magnetic studies
 - anisotropy 78
 - anomalies 266
 - fabric analysis
 - Central Alps 407–9
 - Eastern Alps 409–11
 - pre-Alps 407
 - Western Alps 411–15
 - lineations 333

- Malm limestone 38, 50, 51, 55, 137
 Malossa anticline 215
 Margna nappe 425, 433
 Martigny–Chamonix syncline 38, 41
 Médian nappe 425
 Mediterranean Plate model 436–41
 Mediterranean Sea
 evolution 285–90
 kinematic history 270–8
 Mesoalpine phase 430
 metamorphism 359–61
 timing 353
 Mesocco zone 356
 Mesogea 287, 289–90
 Messinian salinity crisis 277
 metamorphism
 collision phase 20
 compression phase 12, 15, 17
 regional studies
 Austro–Alpine nappes 251
 Briançonnais domain 138
 Helvetic nappes 54–7
 Ivrea zone 204–5
 Leontine dome 116–17
 Pennine Alps 175–6
 Sesia–Lanzo 193–7, 354, 356, 359, 360, 362
 Western Alps: Eoalpine 354–9; Tertiary 359–61
 temperature studies
 Gran Paradiso 380
 Leontine dome 379, 386–8, 391–3
 Sesia–Lanzo 374–80
 Silvretta 380–6
 Suretta 388–91
 mica dating 369–70
 Leontine dome 386–8
 Sesia–Lanzo 374–80
 Silvretta 380–6
 Mischabel unit and thrust 176
 Misox zone 425
 Mittagshorn synform 182–3
 Mittagsspitze zone 235, 236, 238
 Molise Basin 270, 272
 Mölltal Line 167, 168
 Moncucco unit 116
 Mont Blanc massif 3, 23
 rotation 331, 334, 336
 tectonic studies 34, 38, 41, 308
 Mont Chétif massif 308
 Mont Oserot imbricate stack 101
 Monte Alpi window 270
 Monte Rosa unit 115, 116, 174
 metamorphism 175–6, 354, 362
 tectonic studies 158, 184, 177, 178, 179, 180–1,
 308, 341, 425
 Montgenèvre massif 104, 415
 Montmaur thrust 86
 Monviso ophiolite 97
 Morcles nappe
 folding 34, 38
 illite crystallinity 55
 lineations 344
 metamorphism 56
 tectonic history 40, 41, 48, 50, 54, 57
 thrusting 40
 Neopalpine phase 430–1
 metamorphism 359–61
 orogenesis 428–9, 430–1
 timing 353
 Niesen flysch and nappe 407, 432, 434
 Northern steep belt 128
 Noric nappe 247
 Numidian flysch 272, 276, 289
 Nummulitic flysch 343
 Nummulitic limestone 39

 Obere Zermatter Schuppenzone 174
 Oetzal nappe 167, 310
 ophiolites 3, 425, 433
 Orobic basement 213, 229
 Ossola–Ticino area 360

 palaeogeography
 Cretaceous 357
 Palaeocene 436
 Triassic, Upper 7
 palaeomagnetism 163
 Central Alps 404–5
 Eastern Alps 403–4
 Southern Alps 401–2
 Western Alps 406–7
 Palaeozoic of Graz thrust system 244, 245
 Pandino anticline 215
 Pannonian rift basin 285, 286
 Panormide platform 271, 272, 276
 Pantellaria graben 280
 Parpaillon flysch and nappe 88, 97–8, 98–103
 Pelve thrust 145, 146, 148
 Pelvoux massif 3, 12, 13, 19
 rotation 331, 334, 336
 tectonic history 308
 thrusting 21, 77–8, 95–6
 Pennine Alps 308, 309
 geological setting 23, 173
 metamorphism 175–6
 structural interpretation 173–5, 176–83
 tectonic history 20, 184–5, 268, 431
 zones
 External *see* Dauphinois zone
 Internal *see* Briançonnais zone
 see also Piémont zone
 Periadriatic Line (fault system or lineament)
 palaeomagnetism 409–11
 significance 113, 153–6, 167–8, 311
 Peyrouard thrust array 86
 Piancavallo–Barcis thrust 215–16
 Piémont Ocean and Trough 425, 433
 Piémont zone 308, 354, 361
 Pilloner–Becca di Nana unit 174
 Plan-de-Lardier thrust 86
 plate motions
 Africa and Europe compared 148–50, 221–4,
 265–70, 304–8, 340–1, 438–9
 role in orogenesis 425, 430, 435–41
 Platta Decke (nappe) 356, 425
 Plattengneis shear zone 245
 Pogallo fault 203

- Polat–Trois Eveches 90, 91, 92
 Ponte Brolla 373
 Portjengrat unit and thrust 176, 178, 179, 180–1, 182
 Prätigau preflysch 425
 Prätigau half-window 233
 Pre-Alps 3, 34
 deformation 431
 palaeomagnetism 407
 Provençal fold 3
 Punt-la-Drossa beds 233
 Pusteria Line 153, 167
 Pustertal Line 167, 311
 Pyrenean event 17–18
 Pyreno-Provençal displacement 75
- Querzone 116
 see also Maggia steep belt
 Queyras 354
- radial thrusting 105
 Radstätter Tauern unit 311
 Rätikon 230–3, 238, 239
 Rechnitz–Bernstein window 308
 Remollon dome 86–7
 Rhenodanubic flysch zone 308
 Rhine Line 239
 Riesenerferner massif 411
 ring shear model 333–4
 Roburent Line 101
 Romande klippe 34
 root zone concept 155
 rotational displacements
 Mediterranean 269, 276, 289, 324, 437
 Western Alps 105, 329–37
 Rouchoze unit 101
 Ruitor massif
 geological setting 136, 143
 metamorphism 138
 tectonic history 139, 140, 144, 145, 147
- Saas–Zermatt zone 174, 178, 179, 180, 181, 183, 184, 425
 Salanfe synform 40
 salinity crisis, Messinian 277
 Samoëns thrust sheet 40
 San Donato unit 278
 Sardinia, rotation of 276, 437
 Sardinia/Calabria arc 287, 288, 296
 Saula shear zone 237
 Saulce thrust 86
 Schams nappe 239, 433
 Schistes Austrés 425
 Schistes Lustrés 138, 145, 341, 363
 Schlieren flysch 434–5
 Schling thrust 244–5
 Schrattekalk *see* Urganian limestone
 Second Dioritic Kinzigitic Complex 374–7
 see also Dioritica–Kinzigitica
 Seewerschiefer 38
 seismic sections 6, 18
 reflection and refraction 311–16
 tomography 323–4
- Semmering–Wechsel unit 310
 Sesia Eclogitic Mica Schist 374–7
 Sesia–Lanzo zone 3
 age 374–80
 geological setting 189–93
 metamorphism 116, 193–7, 354, 356, 359, 360, 362, 392
 palaeomagnetism 161–3, 406
 tectonic history 198–9
 thrusting 156, 157, 160, 164, 424
 shear studies
 Diablerets nappe 58–9
 External Alpine zone 333–4
 Leptontine dome 118–22, 126, 127
 Sigoyer thrust 86
 Silvretta nappe
 tectonic history 230, 231, 235–7, 310
 timing of events 380–6, 394
 Simano sheet 115, 126
 Simmen flysch and nappe 425, 432, 434
 Simplon Line 114, 115, 116, 164, 360
 Simplon subdome 116, 118, 127–8, 130
 Sion–Courmayeur Line 357, 358, 359
 South Alpine foothills 214–15
 South Alpine thrust belt 211–13, 221
 Southern Alps
 crustal thickness 219–21, 313
 geology, outline of 211–13
 imbrications 215–16
 kinematics 216
 palaeomagnetism 401–2
 plate motions 221–4
 structure 213–14
 tectonic history 217–19, 230, 239, 309, 311
 thrusting 216
 Southern steep belt 122–6, 155, 158–9
 Staufen–Höllengebirge 403
 Stelli zone 175
 strain measurements
 Austro–Alpine nappes 250, 251
 Chaînes Subalpine 65–80
 Helvetic nappes 52–4
 stretching lineation measurements
 Austro–Alpine nappes 250
 Briançonnais domain 144
 Leptontine dome 118, 126, 127
 Pennine Alps 176–82
 Western Alps 341–3
 strike-slip movements 21–2
 Strona–Ceneri zone 203
 Subalpine Chains *see* Chaînes Subalpine
 Sub-Brenta lineament 216
 Sub-Briançonnais defined 425
 Sub-Briançonnais zone 88, 92, 135, 308
 Sub-Orobic lineament 213, 216
 Sulzfluh nappe 238, 239
 Suretta nappe
 tectonic history 115, 315, 425
 timing of events 379, 388–91, 433
- Tambo sheet 115, 315, 425
 Tauern window 155, 308
 Taveyannez sandstone 40, 362, 435

- tectonic features 4–6, 426–7
 Austro–Alpine nappes 243–4
 Briançonnais domain 137–8, 147–50
 Chaînes Subalpine 72–8
 Helvetic nappes 41–4, 58–61
 Pennine Alps 184–5
 Rätikon 230–9
 Sesia–Lanzo 197–9
 Southern Alps 212, 217–19, 230, 239
 Western Alps 103–7
 Tellian basin 271
 Tête d'Aussois thrust 146
 Tethys domain 1, 19–20
 Theodul–Mischabel unit and thrust 177, 178, **179**,
 181, 182, 183
 Theodul–Rothorn zone 174
 thrust history
 Austro–Alpine nappes 244–7
 Briançonnais domain 139–47
 Digne system 84–8
 Embrunais–Ubaye 88–95
 Helvetic nappes 40–1
 Pennine Alps 176–83
 Southern Alps 216
 Ticino subdome 116, 118, 126–7, 130, 425
 Tithonian limestone 66, 68, 70, 73, 77, 79
 Tonale Line 113, 130, 155, 156, 157, 158, 167
 tram-lining 104
 transform belt 8, 10
 Traversella massif 406
 Triazza Formation 385
 Tuscan nappe 278
 Tyrrhenian rift basin 285, 286, 290–8
 Tyrrhenian Sea 277, 280, 285–7

 Ubaye nappe 88–95, 138, 139, 143, 147
 Udine embayment 213, 215
 Ultrahelvetic nappes 34, 308
 deformation 431
 illite crystallinity **55**, 57
 tectonic history 41, 51
 uniformitarianism and orogenesis 421–2
 Urgonian limestone (Schrattenkalk)
 deformation 38, 39, 50, 51, 58
 illite crystallinity **55**
 strain measurements 66, 70, 77

 Val d'Isère 145
 Valais trench 135, 357, 433, 434, 435
 Valais zone 14, 308, 425
 Valanginian Calcaire 38, 39, 51, **55**
 Valanginian Schisteux 38, 39
 Valresia thrust 216
 Valsugana lineament 213, 216
 Valtrompia lineament 213, 216
 Vanoise massif
 metamorphism 138
 stratigraphy 136, 137
 structure 139, 140, 141, 142, 144, 145, 147, 341
 Vanzone antiform 116, 183
 Veitsch nappe 247
 Verampio window 127, 160
 Verbicaro unit 278
 Verona–Trento high 213, 215
 Viu–Locano suture 334

 Wandfluhhorn fold 126
 Werfen nappe 403
 Western Alps
 basement 13
 deformation **348**
 metamorphism
 Eoalpine 354–9
 Tertiary 359–61
 palaeomagnetism 406–7, 411–15
 rotational movements 329–37
 thrusting 103–7
 Digne 84–8
 Embrunais–Ubaye 88–95
 External zones 341–3
 Internal zones 97–103, 341
 Pelvoux 95–103
 Wildflysch nappes 425, 431
 Wildhorn nappe
 deformation 34, 38, 39, 40, 50–1, 57
 illite crystallinity **55**
 metamorphism 56
 Wildstrübel depression 34, 49

 Zaluanda fault 235, 237, 238
 Zermatt–Saas Fee ophiolites 174, 178, **179**, 180, 181,
 183, 184, 425