

Cambridge University Press

978-0-521-09541-9 - Bird Navigation, Second Edition

G. V. T. Matthews

Index

[More information](#)

INDEX

- accelerometers, 97
- activity, period, 49, 156, 157
 - threshold, 42, 156
- adult, 1, 9, 14, 17, 58, 65
- air sacs, 95
- Albatross, Laysan, 60, 62, 63, 69
- almanac, nautical, 38, 53, 120
- amphibian orientation, 52
- anaesthesia, 98
- ancestral home, 18, 59, 163
- 'angels', 5
- arteries, 104
- arthropod, orientation, 21, 26, 27, 29,
 - 33, 35, 36, 38, 39, 52, 85, 142, 145, 146, 149
- clocks, 33, 159, 160
- artificial horizon, 152
- satellite, 75
- sun, 28–30, 141, 142, 148
- atmospheric conditions, 79, 95, 110
- auditory clues, 5, 24, 27, 138, 155, 156
- automatic registration, 22, 24, 92
- aviary experiments, 21, 59, 87–9, 135–7

- barometric pressure, 27, 111
- bats, orientation of, 156
- bearing-and-distance, 3, 10, 17, 162
- bi-component hypothesis, 39, 155
- Blackbird, 147
 - Red-winged, 60, 62
 - Yellow-headed, 59
- Blackcap, 23, 41, 42, 47, 48, 93, 117
- blind-folded birds, 154
- Bluethroat, 60
- Brambling, 23
- breeding, area, 1–3, 9, 17, 48
 - cycle, 7, 56, 59, 65
- Brownian energy, 104
- Bunting, Indigo, 42, 47, 48
 - Ortolan, 42
 - Reed, 23, 147

- cages, orientation, *see* Kramer
- carry-over orientation, 24
- castration, 56
- ceilometer, 4

- centrifugal force, 102
- cerebellum, 99
- Chaffinch, 4, 8, 13, 23, 27, 93, 147
- chickens, 110, 154, 155
- chilling of eggs, 59
- chronometer, 119, 122, 138, 156, 160, 162
- circular choice apparatus, 23, 28–31, 33, 42
- circumpolar constellations, 44, 48–51
- Cisticola, Chubb's, 156
- clock, biological, 30–32, 156–60, 162
 - annual, 160, 161
 - lunar, 52
 - shifting, 28–33, 38, 44, 45, 52, 53, 84, 85, 138–41, 159–60
- closed room, orientation in, 24, 25, 91, 92
- cloud, *see* overcast
- comparison of stimuli, 101, 102, 120, 122–6, 130, 132
- compensation orientation, 42, 47
- conflict orientation, 38, 42, 48
- conjugate point, 107–9
- Coot, 57
- cosmic rays, 158
- couple, fluid, 103
- courtship signals, 155
- Cowbird, 60
- Crossbill, 23
 - Parrot, 23
- cross-over point, 123, 127
- Crow, Prairie, 10
 - Hooded, 13, 15–17
- Cuckoo, 10
 - Black-billed, 42
 - Bronze, 2
 - Yellow-billed, 42
- culmination, 119, 122, 123, 127, 130, 132, 134, 161
- Curlew, Bristle-thighed, 1
- curvature of earth, 73, 94

- dark adaptation, 150
- day length, 31, 32, 38, 39, 43, 136, 137
- decompression, 99

Cambridge University Press

978-0-521-09541-9 - Bird Navigation, Second Edition

G. V. T. Matthews

Index

[More information](#)

- delay experiments, 10, 15
 detour experiments, 96
 dichotomy in homing, 88, 89
 direction maintenance, 8, 9, 23, 24, 27, 41, 43, 115
 directional bias, innate, 12, 15, 18, 21, 92
 learned, 10, 18, 27, 30, 35, 92
 direct sensory contact, 94–100
 disorientation, 7, 8, 24, 25, 28, 38, 42, 43, 48, 88, 90, 91, 114, 138
 zone of, 82, 83, 86, 90, 94, 101, 111–13, 140, 153
 displacement of migrants, 13–17, 54, 162, 163
 distance, of migration, 15
 of transportation, 82–4, 94, 102, 114, 119, 140, 148, 156
 Double Altitude solution, 122
 Dove, Mourning, 3
 doves, migratory, 99
 drum, rotating, 98
 Duck, Wood, 13, 59
 ducks, 3, 12, 42, 68, 154, 162
 duetting, 155, 156
 Dunnock, 42, 57

 Eagle, Bald, 72
 Golden, 146
 echolocation, 156
 eclipse of sun, 114
 ‘electric, braes’, 152
 electrodes, implanted, 99, 143–4
 electromagnetic field, 25, 105, 106, 110
 electrostatic field, 26, 105
 equator, 32, 36, 37, 49, 129, 145
 equatorial, trans-, experiments, 35, 36, 129
 equinox, 33, 36, 122, 129, 133, 134
 evolution, 35, 36, 50, 56, 67, 152, 158, 163
 experience, role of, 9, 18, 19, 30, 36, 56, 65, 86, 88, 89, 116
 extrapolation, 30, 112, 123–7, 130, 144, 145, 155
 extrasensory perception, 95, 96
 ‘eye-sign’, 144
 eye structure, 143, 144, 146, 147, 150, 152

 feed-back systems, 98, 154
 Fieldfare, 147
 fish, orientation of, 26, 33, 35, 36, 38, 39
 flicker-fusion, 143

 flight, recorder, 68, 69
 speed, 65, 97, 103, 105, 106, 128, 155
 vector, 108, 140, 141, 162
 flocks, behaviour of, 20, 63, 72, 114, 118
 Flycatcher, Collared, 59
 Pied, 3, 59, 93
 Flying Squirrel, 156–8
 ‘flyways’, 58
 fog, 4, 7, 8
 food, training to, 56, 57, 87, 158–9
 foster home, 59
 Frigate Bird, 57

 Gannet, 60, 71, 72, 144
 gastropods, orientation of, 26
 geese, 152, 153, 162
 Goldeneye, 155
 Goldfinch, 28
 Gonolek, Black-headed, 155
 Goose, Barnacle, 3
 Canada, 12, 20, 27, 43, 69
 Goshawk, 57
 gravity, 97, 102, 103, 136, 152–4
 Greenfinch, 23
 grid, navigational, 101–31
 Grosbeak, Rosy, 42
 Scarlet, 23, 42, 93
 Gull, Black-headed, 57, 61, 91, 92
 Common, 59
 Herring, 60, 62, 64, 66, 69, 107
 Lesser Black-backed, 60, 61, 69, 89, 107, 112, 113
 gyroscope, 97

 hand-rearing, 41, 92, 117
 Hawfinch, 23
 Hawk, Sparrow, 13, 17
 head stability, 100, 103, 153
 heart beats, 47
 homing, 17, 54–93, 99, 104, 108, 116, 121, 129, 132–41
 night, 118, 119
 speed, 63–67, 84, 116, 121, 129, 139, 141
 homeward component, 83, 84, 136, 140
 orientation, 67–72, 76–93, 112, 115, 116, 121, 129, 135, 151
 horizon, 89, 124, 135–7, 152
 hormones, 31, 56
 hourglass timing, 52
 human capacities, 123, 142, 143, 147, 149, 150, 152, 153, 156
 humming birds, 155

Cambridge University Press

978-0-521-09541-9 - Bird Navigation, Second Edition

G. V. T. Matthews

Index

[More information](#)

- immediate orientation, 78–82
- imprinting, of locality, 59
- individual, capacities, 43, 114, 151
 - variation, 55, 65, 88, 159
- inertial navigation, 96–100
- infra-red, photography, 23
 - sensitivity, 95
- juveniles, 1, 8, 10–17, 42, 56–9, 85–87, 162, 163
- Kestrel, 153
- kinesis, 117
- Kramer-cage, 22–31, 35, 41, 42, 47, 51, 90–3, 117, 118
- labyrinth, destruction of, 98, 99, 155
- lamps, bird-borne, 43, 118
- landmarks, 9, 18, 20, 23, 27, 55, 57, 65, 73, 82, 84–92, 110, 128, 135, 140, 141
- Lark, Western Meadow, 29
- latitude, 35–9, 48, 97, 112, 117, 119, 125–8, 132
- leading lines, 3, 72
- light, constant, 31, 158, 159
- light/dark cycle, 31, 138, 158
- lighthouses, 4
- Linnet, 23
- loft, mobile, 107
 - situation, 73, 85, 86, 134
- longitude, 32, 47, 48, 112, 117, 119, 122, 125, 127, 138, 140, 141, 156, 159
- magnets, bird-borne, 25, 105–7
- magnetic field, 25–27, 104–9, 158
- Mallard, 12, 13, 18–21, 25, 27, 29, 31, 33, 43, 45, 48, 52, 53, 58, 61, 72, 79, 81, 84, 119, 150
- map-and-compass, 85, 102, 110, 111, 117
- Martin, House, 60
 - Purple, 60, 61, 62, 118
- mass, measurement of, 102, 103
- memory, 87, 130, 132, 137, 160–3
- meridian, 43, 44, 119, 122
- migration, forms of, 1–7, 24, 41
 - restlessness, 17, 22, 23, 25, 117
 - stimulus, 22, 23, 117, 118
- minimum separabile*, 147–149
- mirror experiments, 28, 29, 38, 85
- moon orientation, 8, 41, 49, 51–3, 149
 - watching, 5
- moult, 56, 68
- movement detection, 142–4, 152
- nasal cavities, 95
- non-migratory stock, 12, 13, 65, 85, 94, 99
- 'nonsense orientation', 18–21, 27, 29, 31, 32, 43, 52, 78–82, 84, 85, 88, 89, 127, 140
- noon, 38, 112, 122, 126, 130, 131
- nutration, 49
- obliques, discrimination of, 149
- Oil Bird, 156
- oil droplets, retinal, 146
- one-direction navigation, 22–25
- operant conditioning, 25, 142, 148, 159, 161
- optomotor reaction, 142
- orbit, of earth, 44, 50
- Ortstreue*, 2
- oscillatory systems, 33, 34, 39, 97, 158
- Ostrich, 147
- Ousel, Ring, 15
- overcast, effect of, 4, 7, 8, 27, 29, 42, 43, 46, 74, 84–6, 91, 92, 112–17, 138–41, 150, 159
- owls, 95
- palisade experiments, 88, 89, 135–7
- parallax, 47, 124, 135, 136, 145
- paratympanic organ, 99
- pecten*, 105, 143
- Penguin, Adelie, 21, 27, 32, 60, 68
- Petrel, Fulmar, 150
 - Leach's, 60–63, 66, 98, 106
 - Storm, 60
- phototaxis, 51, 85, 91
- Pigeon, homing, 17, 18, 25, 27, 29–33, 35–8, 54–7, 59, 64–5, 68–72, 77–90, 94, 95, 98, 99, 102, 106–10, 114–16, 118, 127, 128, 133–42, 147–50, 161
- Rock, 65
- pigeon-racing, 17, 54, 56, 71, 108
- pinhole camera, 121
- Pintail, 20, 21, 27, 43, 58, 61, 119
- Pipit, Meadow, 23
 - Tree, 42
- planarians, orientation of, 26
- planetarium, 47–9, 117, 118
- planets, 49, 50
- Plover, Golden, 92, 115
- plumage marking, 10, 13
- polarised light, 29

Cambridge University Press

978-0-521-09541-9 - Bird Navigation, Second Edition

G. V. T. Matthews

Index

[More information](#)

- Pole, geographical, 21, 37, 107, 125
 Star, 44, 45, 47, 49, 119
 position, ambiguity of, 107, 129, 130
 triangle of, 120
 postural sensors, 104, 152–5
 potential difference, 105, 106
 precession, 49, 50
 pressure-pattern flying, 26
 proprioception, 96
 protozoa, orientation of, 26
- Quinine hydrochlorate, 99
- radar, 5–8, 72, 110
 radio-active watcher, 61
 radio-transmissions, 109, 110
 radio-transmitters, bird-borne, 43, 72–5,
 114, 141
 random scatter, 42, 86, 107, 108, 114,
 134, 140
 release site, 76, 108, 110, 135
 re-orientation, 8, 17, 48
 residual orientation, 24
 retina, 143–50, 152, 155
 retracement theories, 96
 retrapping, 59, 70, 71
 rhythms, biological, 31, 155, 160, *see*
also clocks
 ringing recoveries, 2, 10–13, 58, 69, 70,
 108, 109, 135–7
 rings, leg, 2, 10, 60
 Redstart, 93
 Robin, 24, 25, 42, 147
 American, 150
 rotating drum, 98
 rotation of earth, 26, 43, 44, 97, 103,
 104, 119, 129
- sea, release at, 64, 89, 124, 125
 search, random, 67–8, 72, 94, 98, 107
 systematic, 66, 72
 seasonal changes, 36–40, 43–50, 65,
 110, 111, 126, 127, 132–4, 161, 162
 selection, 54, 65
 semi-circular canals, 96, 99, 100, 104,
 106, 152
 sensory summation, 146, 150
 sextant, 123, 135
 Shearwater, Great, 1, 3, 161, 162
 Manx, 59–65, 69, 81, 89, 90, 112, 113,
 116, 118, 138, 150
 Short-tailed, 160–2
 Sooty, 3
 Shelduck, 59
- Shrike, Lesser Gray, 41
 Red-backed, 23, 41, 42, 60, 61
 sightings, en route, 69
 Siskin, 23, 158
 Skua, Great, 2
 sky-glow, 41, 95
 sky-watching, 4
 smell, sense of, 95, 150
 soaring, 63, 72
 solstice, 37, 133, 134
 Sparrow, Eastern Tree, 57
 Fox, 2
 Golden-crowned, 58, 62
 House, 57, 62, 64, 131, 150
 Tree, 57, 59, 62, 64
 White-crowned, 41, 58, 62, 64
 stabilised platform, 97
 standard direction, 3, 9, 17
 star, altitude, 43, 119, 120
 azimuth, 43, 45, 47, 50, 120
 bi-coordinate navigation, 112, 117–
 20
 -compass, 43, 48, 105, 119
 pattern, 8, 41, 42, 43, 47, 112
 Starling, 13–16, 23, 27–31, 35, 36, 60,
 61, 66, 69, 89, 90, 93, 95, 98, 147,
 150, 158, 159
 statistical analysis, 24, 25, 49, 59, 61,
 76, 91, 134
 steeple-chasing, 73, 86
 stock, variations in, 55, 64, 65, 81
 Stork, White, 10–12, 60, 61, 69, 107
 Sumner circles, 118–20, 127, 128
 sun, altitude, 30–9, 112, 122–30, 133,
 148, 149
 instantaneous, 127–9
 rate of change of, 36–9, 125
 arc, 37, 122, 124, 125, 127, 132, 133,
 148, 161
 inclination of, 122, 125, 133, 148,
 161
 azimuth, 36–40, 112, 123, 124, 130,
 145
 rate of change of, 36–9, 125
 bi-coordinate navigation, 117, 122–42
 -compass, fixed angle, 9, 29, 30, 163
 time-compensated, 26–36, 41, 80,
 85, 86, 92, 105, 110, 115, 116,
 132, 138–41
 movement, direction of, 129, 130,
 145, 148
 nocturnal position, 33, 34, 39
 sunrise, 8, 112, 130, 136, 159, 160
 sunset, 41, 112, 130, 136

Cambridge University Press

978-0-521-09541-9 - Bird Navigation, Second Edition

G. V. T. Matthews

Index

[More information](#)

- sunspot activity, 108
- Swallow, 57, 60, 61, 66, 110, 118
 - Bank, 3, 60, 81, 90
 - Cliff, 60
- Swift, 60, 147
 - Alpine, 60, 61
- Swiftlet, 60, 147
- Teal, Blue-winged, 10, 15, 20, 27, 43
 - Green-winged, 13, 14, 20, 58
- television masts, 4
- Tern, Arctic, 2, 60, 61
 - Common, 18, 27, 60, 66
 - Noddy, 60, 62, 95
 - Sooty, 60, 62, 69
- territorial behaviour, 94
- threshold-tracking, 148
- Thrush, Song, 147
 - Grey-cheeked, 74, 75
 - Swainson's, 74
- Thrush-Nightingale, 42
- thunderstorms, 108
- time, 29, 30, 36–8, 40, 44, 119, 124
 - local, 39, 122, 127, 129, 137
- time-interval measurements, 145, 155, 156, 159, 161
- time-shift, 32, 47, 48, 160
- topographical features, 8, 9, 19, 20, 56, 72, 73, 108
- tracking, from ground, 68, 72, 73
 - by aircraft, 18, 43, 71, 73–5, 107, 108, 114, 141
- training, directional, 17, 23, 27, 30, 35, 42, 47, 55, 73, 78, 82, 86, 114, 115, 135, 141, 158
 - non-directional, 55, 82, 135
- transplantation experiments, 10–13
- turbulence, 7, 8, 9, 153, 154
- turntable experiments, 46, 47, 98, 99
- twilight, 42
- ultra-violet light, 27
- unknown senses, 94, 95, 96, 110
- untrained Pigeons, 78, 82, 85, 87, 89, 135–7
- vanishing time, 76–80, 114
- vertical, determination of, 149, 152
- vision, long distance, 94, 95
 - night, 149–51
- visual, acuity, 146–8, 151
 - observation 4, 7
 - reference points, 8, 9, 27, 115, 124, 154
- Wagtail, White, 23
- waiting experiment, 133–6
- Warbler, Barred, 23, 27, 41, 42, 93
 - Garden, 23, 41, 42, 47, 48, 117
 - Grasshopper, 42
 - Wood, 23, 41
- wave patterns, 7, 125
- Whinchat, 93
- Whitethroat, 24, 41, 117
 - Lesser, 41, 47, 48, 117
- wind, effects of, 3, 6, 7–9, 19, 26, 90–2, 108, 109, 112, 128, 154
- winter, effect on homing, 111
- wintering area, 1, 2, 4, 9, 12, 17, 54, 57, 58
- Wryneck, 60, 71
- year length, 50, 160–61
- Yellowhammer, 147
- Zeitgeber*, 31, 138, 160
- zenith, 38, 119, 121, 145