

Index

Note: all headings refer to the mandrill unless otherwise stated. Page numbers in *italics* refer to figures and tables.

- Abernethy, K., 36–7, 81–2, 126, 127
- adrenal gland activity, 178
- advantaged daughter hypothesis, 192
- affiliative facial displays, 54–5
- aggressive displays, 50–2, 51
 - and male testosterone levels, 178–9
 - during mate-guarding, 102–4, 105
- alarm calls, 48
- aliphatic acid, vaginal, 159, 160
- allogrooming, 58–9
 - and mate-guarding, 100
 - post-copulatory, 64
 - see also* grooming
- alternative mating tactics, 61, 64, 102, 109–10, 126–7, 139
 - and sperm competition, 167
 - female influences, 106, 107
 - flanged and non-flanged orang-utans, 180–2, 181
 - see also* fatted and non-fatted males
- amenorrhoea, 86
 - post-partum, 113, 115
 - see also* lactational amenorrhoea
- anovulatory cycles, 115
- apocrine glands, 17
 - see also* sternal gland
- aromatase activity, sexual skin, 182
- Astaras, C., 44
- autogrooming, 58
 - see also* grooming
- avoidance tactics, females, 100
- baboons (*Papio* spp.)
 - chacma baboon (*P. ursinus*), female
 - sexual skin swelling, effect on males, 158, 186
 - comparison with mandrill, 6, 8
 - hamadryas baboon (*P. hamadryas*), 35
 - female sexual skin swelling, 164
 - notifying displays, 66
 - social organization, 146–7
 - yellow baboon (*P. cynocephalus*), female sexual skin swelling, 162
- bachelor groups, 37
- baculum, 29, 30
- badges of status
 - drill, 156–7, 183
 - gelada, 153
 - human beard, 153–4
 - mandrill, 153, 156–7, 183
 - orang-utan, 157
 - vervet monkey, 153
- Bartholin, T., 3
- Barton, R., 172–3
- beard, 16
 - human, 153–4, 187
- behaviour
 - see* sexual behaviour; socio-sexual behaviour
- behavioural observations, 90
- Bernstein, I., 68
- bimaturism, 142, 144
- Bioko Island, drill populations, 10–11, 196–8
- birth season, 77, 176–7
 - determining factors, 78–9
 - drill, 87
- birth sex ratio bias, 192
 - advantaged daughter hypothesis, 192
 - local resources competition hypothesis, 192–3
 - sample size effects, 193, 193
 - Trivers–Willard hypothesis, 192
- black face mask, drill, 135
- black-handed spider monkey, seminal fluid coagulum, 170–1
- blood parasites, 72
- blue skin colouration
 - convergent evolution, 23, 152
 - physical basis, 22–3, 135, 152
 - see also* sexual skin
- body size sexual dimorphism, xiv, 16, 17, 134, 142, 143, 144
 - and sexual segregation, 147

body size sexual dimorphism (cont.)
 relationship to mating system, 145–6
 relationship to socioeconomic ratio, 146
 relationship to visual traits sexual dimorphism, 154
 role of predation risk, 144–5
body weight, males
 fatted and non-fatted, 122
 relationship to group association frequencies, 125
Bossi, T., 89
bowerbirds, female mate choice, 186–7
branch-shaking displays, 52
breakdown (BD) of sexual skin, 32
 and mate-guarding, 101–2
Brown, G., 193, 193
Buffon, G.L., 4
bulbocavernosus muscles, 30, 165, 172
bulbourethral glands, 30
bushmeat, 197–8, 205, 206

Cameroon
 drill populations, 11, 200
 conservation status, 200–3
 National Parks, 208
canines
 dimorphism
 relationship to mating system, 145–6
 role of predation risk, 145
 sexual selection, 145
 growth, 24
 size, relationship to body size, 152
Cercopithecoidea, 6
cervix, 32
chacma baboons (*P. ursinus*), female sexual skin
 swelling, effect on males, 158, 186
challenge hypothesis, 179
Chambers, K.C. and Phoenix, C.H., 161
Charpentier, M.J.E., 62
chimpanzee (*Pan troglodytes*)
 female sexual skin swelling, 164
 vaginal length, 163
CIRMF, xvi, 204
 semi-free ranging mandrill groups, 89, 128–30
 behavioural observations, 90
 fatted and non-fatted males, 120–3
 female rank and reproductive success, 111–16
 female reproductive careers, 117
 female sexual skin observations, 91
 founder member weights, 118
 male rank and mating success, 93–5
 male reproductive careers, 117–20
 mating system, 126–7
 menstrual cycle and behaviour, 95–8
 paternity studies, 110, 110
 webs of sexual encounters, 91–3
Clarke, I., 85–6
classification, 7

climate change, role in speciation, 13, 133
clitoris, 33
co-evolution, male and female genitalia, 31, 162–3
comparative studies, 133
competition, 139
 for food, 136
 inter-female, 161, 185
 inter-male, 126, 139, 147, 156–7, 183
 and testosterone levels, 178–9
 drivers of, 184–5
 suppression of secondary sexual adornments, 180, 180–2
conservation
 Bioko Island drill population, 196–8
 Cameroon drill populations, 200–3
 Cross River State drill populations, 198–9
 extinction risks, 208
 Gabon mandrill populations, 206–7, 207, 208
 National Parks, 198–9, 204, 206–7, 207
convergent evolution, 133
 blue colouration, 23, 152
Coolidge effect, 172
copulatory frequency
 see ejaculatory frequency
copulatory pattern, 138
copulatory posture
 see mounting behaviour
copulin, 159
cotton-top tamarin (*Saguinus oedipus*), 191
covert mating, 104–6, 167
crest, 16
 piloerection of, 55, 57
Crook, J.H., xvi
Cross River State drill populations, 198–9
crowing vocalizations, 48, 137
cryptic female choice, 31, 32, 140, 141, 162–3
cycle phase duration, 113–15

Darwin, Charles, 131, 140, 183
 on female mate choice, 185–6
 on sexual selection, xiv, 148, 157, 189
 on the human beard, 153–4
dentition, 24
 phylogenetic studies, 136
 see also canines
diet, 24, 38–42, 136
 drill, 137
disease resistance, white blood cell (WBC)
 counts, 72
diseases, 72
Disotell, T., 6
distribution ranges
 drill, 9–11
 mandrill, 9–11, 134
Domb, L. and Pagel, M., 162
drill (*Mandrillus leucophaeus*)
 Bioko Island population, 196–8

- black face mask, 135
- Cameroon populations, 200
 - conservation status, 200–3
- diet, 137
- distribution ranges, 9–11
- endangered status, 208
- feeding behaviour, 44
- gestation period, 87
- male secondary sexual adornments, 152, 153
- Nigerian populations, 198–9
- ranging behaviour, 44–5
- seasonal breeding, 87–8, 137
- sexual skin, effect of dominance rank, 153
- social organization, 38, 44, 137
- subspecies, 11
- vocalizations, 48
- ‘drill bell’, 202, 203
- Dubuc, C., 149–50
- ‘duck-face’, 53–4, 54

- eagle attacks, 71
- Eberhard, W.G., 162
- Ebo National Park, 208
- ecology
 - see* feeding ecology; ranging behaviour
- ejaculatory frequency, 95
 - and sperm competition, 171–2
- emperor tamarin (*Saguinus imperator*), 191
- environmental stress, relationship to fluctuating asymmetry, 163–4, 165
- epididymis, 30
- Equatorial Guinea
 - see* Bioko Island
- eumelanin, 152
- evolutionary history, 133–4
 - role of climate change, 134
 - role of rainforest contraction and expansion, 134
 - study approaches, 133
- extinction, 196
- extinction risks, mandrill and drill, 208

- facial adornments
 - female, 18–19
 - male, 17, 18, 135
 - drill, 135, 152, 153
 - female mate choice for, 149
 - see also* male secondary sexual adornments
 - purpose of, 152–3
 - rhinus macaques, 149–50
- facial expressions, 49–50, 50, 54–5, 137–8
 - and male rank, 55–7
 - and mate-guarding, 100
 - fear grimace, 53
 - see also* grinning
- fat reserves, 155–6
- fatted and non-fatted males, 120–3, 144, 179
 - developmental differences, 179
 - differences in fluctuating asymmetry, 165
 - metabolic differences, 179–80
 - morphology, 18
 - physical differences
 - adults, 120–1, 122
 - developmental changes, 120, 121
 - secondary sexual adornments, 122–3
 - physiological differences, 181–2
 - relationship to group association frequencies, 123
- fatting, squirrel monkeys, 154–5
- fear grimace, 53
- feeding competition, 136
- feeding ecology, 38–42, 136
 - drill, 44
 - relationship to reproductive success, 174
 - solitary foraging, 142–4
- Feistner, A., 60
- female
 - growth and development, 19, 21
 - proceptive behaviour, 61, 61–2
 - difference from socio-sexual displays, 65, 65
 - during mate-guarding, 100
 - relationship to male rank, 91
 - reproductive anatomy, 29, 31–3
 - skin specializations, 18–19, 20
- female attractiveness, 186
 - and fluctuating asymmetry, 164
 - and inter-male competition, 184–5
 - hormonal influences, 160–1
 - human, 190
 - male neuroendocrine responses, 178
 - olfactory cues, 159–60
 - sexual skin swelling, 158–9
- female mate choice, 106, 107, 148–9, 184, 185–6
 - benefits of preferred attributes, 186
 - bowerbirds, 186–7
 - effects on mate-guarding and mating success, 107
 - for red facial colouration, 149
 - king penguins, 190–1
 - orang-utan, 157
 - pilot study of, 150–1, 151
 - rhinus macaques, 149–50
 - runaway sexual selection, 186
 - Temminck’s tragopan, 149
 - Tungara frog, 183
 - zebra finch, 186
- female refusals, relationship to male rank, 93–4
- female sexual skin swelling, 32, 157–8, 164
 - and cryptic female choice, 162–3
 - and mate-guarding, 101–2
 - and penile elongation, 31
 - as a marker of fertility, 189–90
 - attractiveness to males, 158, 159
 - effects of colour, 158–9
 - studies in chacma baboons, 158
 - evolutionary considerations, 135
 - graded signal hypothesis, 162

- female sexual skin swelling (cont.)
 - individual differences, 82
 - observation and recording of, 91
 - pathological, 162
 - phylogeny, 163, 184, 185
 - relationship to the menstrual cycle, 90, 90–1
 - seasonality, 79, 80
 - timing of, 104
 - variations in, 82
- female–female mounting, 67
- fertility, influencing factors
 - emotion and temperament, 175
 - nutrition, 174–5
- field studies, xv–xvi
- first birth, age at, 111, 117, 142
- Fisher, R., 186
- flehmen, 62, 138
- fluctuating asymmetry, 163–4
 - and female attractiveness, 164
 - and female rank, 165
 - and male development, 165
- follicle-stimulating hormone (FSH), 85
- follicular phase duration, 115, 128, 161–2, 165, 175–6
 - relationship to social rank, 116
- follicular phase interruption, 103, 176
- food availability, relationship to seasonal breeding, 78–9, 84
- foraging behaviour, 38, 41–2
 - see also feeding ecology
- fossil records, lack of, 133
- Frei, E., 68, 89
- fruit consumption, 39–40, 41–2
- functional anatomy
 - reproductive, 27–8
 - female genitalia, 31–3
 - male genitalia, 28–31
 - skeleton, 23–6
- Gabon, 204
 - drill sightings, 11
 - economy of, 204
 - National Parks, 206–7, 207, 208
 - transport systems, 204–5, 205
- Gartlan, J.S., 34
- gelada
 - chest-patch colour, 153
 - social behaviour, 35
- gene flow, 128
- genital manipulation, notifying displays, 66
- Gesner, C., 3
- gestation period
 - drill, 87
 - mandrill, 77, 111, 113
- gibbons (*Hylobates* spp.)
 - white-cheeked gibbon (*H. leucogenys*), 191
 - white-handed gibbon (*H. lar*), 191
- golden snub-nosed monkey (*Rhinopithecus roxellana*), 35
- gonadotrophin inhibitory hormones (GnIH), 86
- gonadotrophin releasing hormone (GnRH) pulse generator, 84–6
 - emotional and temperamental influences, 175
 - nutritional influences, 174–5
- graded signal hypothesis, 162, 176
- greater galago (*Otolemur crassicaudatus*), birth sex ratio bias, 192
- grinning, 55, 56, 137–8, 149
 - and male rank, 55–7, 58
 - and mate-guarding, 100
 - sexual interactions, 57, 62
- grooming, 58–9, 59
 - and mate-guarding, 100
 - ectoparasite removal, 72, 73
 - in matriline, 59
- group association frequencies, males, 125
- group sizes, 35–7
 - drill, 38, 44
 - relationship to feeding ecology, 42
 - see also supergroups
- group-associated males, 119
- growth and development, 19–23
 - canines, 24
 - social constraints, 26
- growth hormone levels, orang-utans, 181
- Grubb, P., 9, 11, 66
- guenon (*Cercopithecus* spp.), seasonal breeding, 77
- hamadryas baboon (*P. hamadryas*)
 - female sexual skin swelling, 164
 - social behaviour, 35
- Hamilton–Zuk hypothesis, 71–2
- handicap hypothesis, 187–8
 - immunocompetence-handicap hypothesis, 188
- Hanuman langur (*Simnopithecus entellus*), male infanticides, 194
- Harcourt, A.H., 166
- Harrison, M.J.S., 42
- head-bobbing, 50–2
- head-shaking, 55, 57, 138
- Hill, W.C.O., 16
- home range sizes, 42–4, 43, 44, 136–7
- Hongo, S., 37
- Hoshino, J., 39–40, 41–2
- hybridization, drill–mandrill, 11
- immunocompetence-handicap hypothesis, 188
- infanticides
 - evidence in the mandrill and the drill, 195
 - inferred infanticide data, 194
 - measures of infanticide risk, 194–5
 - sexual selection hypothesis, 193–4
- infants
 - effects of mother’s rank, 110–12

- facial colouration, 152
- grinning, 55
- maternal grooming of, 72
- play mounting, 66
- vocalizations, 48
- interbirth intervals (IBIs)
 - effect of female rank, 111–14, 114
 - three components of, 114
- inter-sexual selection, 140, 148, 153, 186
- intra-sexual selection, 140, 142, 145, 156–7, 183
- ischiocavernosus muscles, 30
- isolation, role in speciation, 13

- Japanese macaque (*Macaca fuscata*), same-sex mounting, 67
- Jolly, C., 152
- Jouventin, P., 34, 42, 66, 150

- K-alarm, 48
- king penguin, mate choice, 190–1
- kipunji (*Rungwecebus kipunji*), 6
- kisspeptins, 86
- Klopp, E., 152
- Korup National Park, 208
- Kudo, H., 46–7

- lactational amenorrhoea, 86, 175
 - duration of, 86
 - link to infanticide risk, 194–5
- Lahm, S., 39
- Lande–Kirkpatrick models, 186
- leopard attacks, 70–1
 - male defences, 145
- leptin, 175
- lip movements, 49
- lip-smacking, 54–5, 57
- loa loa, 72
- local resources competition hypothesis, 192–3
- lone males, 37–8
 - see also male emigration
- long-distance vocalizations, 46–8
- longevity, 70
 - sex differences, 70, 137
 - effects of parasites and disease, 71–3
 - effects of predation, 70–1
 - in the wild, 70
- long-tailed macaque (*M. fascicularis*), 142
- Lopé National Park, 204, 208
- luteal phase duration, 115
- luteinising hormone (LH), 32, 85, 181

- macaques (*Macaca*)
 - crested black macaque (*M. nigra*), 164
 - Japanese macaque (*M. fuscata*), 67
 - long-tailed macaque (*M. fascicularis*), 142
 - rhesus macaque (*M. mulatta*)
 - female attractiveness, 159–61
 - sexual skin colouration, hormonal effects, 182
 - spermatogenesis, seasonality of, 80
- Main, M.B. and Du Toit, J.T., 147
- major histocompatibility complex (MHC), 128–30
- malaria, 72
- male
 - growth and development, 19–20, 21, 22
 - reproductive anatomy, 28, 28–31
 - skin specializations
 - facial adornments, 17
 - rump and external genitalia, 17–18
- male advertisement, Tungara frog, 183
- male emigration, 36, 37, 67, 82, 103–4, 119, 119, 136, 139, 142–4, 179–80
 - dangers of, 126
 - predation risk, 70–1
 - relationship to fattenedness, 123
- male infanticides
 - evidence in the mandrill and the drill, 195
 - inferred infanticide data, 194
 - measures of infanticide risk, 194–5
 - sexual selection hypothesis, 193–4
- male secondary sexual adornments
 - and predation risk, 183–4
 - handicap hypothesis, 187–8
 - in fattened and non-fattened males, 122–3
 - in the drill, 152
 - purpose of, 152–3
 - relationship to rank, 123
 - role of sexual selection, 148–9, 150
 - suppression in lower-ranking males, 180, 180–2
- Mandrillus* genus, 4–5
 - classification, 7
 - historic distribution ranges, 9–11
 - subspecies, 11–13
- mangabey, arboreal (*Lophocebus* spp.), 6
 - head-shaking, 138
 - phylogeny, 135–6
 - sexual skin, 19, 20
- mangabey, semi-terrestrial (*Cercocebus* spp.), 6
 - head-shaking, 138
 - mate-guarding, 64, 138
 - phylogeny, 135–6
 - relationship to *Mandrillus* genus, xv
- Marmosa mexicana*, 135
- Marty, J.S., 153
- mate choice, 128–30
 - see also cryptic female choice; female mate choice
- mate-guarding, 35, 61, 64, 91–3, 126
 - aggressive episodes, 102–4, 105
 - and female sexual skin swelling, 101–2
 - dynamics of, 98–102
 - female responses, 100
- mangabeys, 64

- mate-guarding (cont.)
 - partitioning of, 102, 104–6, 105
 - phylogenetic perspective, 138
 - relationship to menstrual cycle, 97
 - vocalizations, 47
- mating season
 - inter-sexual coordination, 177–8
 - menstrual synchrony, 176–7
- mating success, relationship to male rank, 91, 93–5, 94
- mating systems
 - ancestral cercopithecines, 172–3, 173
 - and bulbocavernosus muscles, 172
 - and ejaculatory frequency, 95
 - and mate choice, 190–1
 - and seminal fluid coagulation, 168–9, 170
 - and white blood cell counts, 72
 - multiple partner matings, 127
 - phylogenetic perspective, 139
 - relationship to ejaculatory frequency, 171, 171, 172
 - relationship to relative testes size, 166, 166–7
 - relationship to seminal vesicles size, 168, 169
 - relationship to sexual dimorphism, 154, 155
 - relationship to sexual dimorphisms, 145–6
 - wild mandrills, 128
 - see also* alternative mating tactics; monogamy; multimale–multifemale mating system; polygyny
- matrilineal social organization, 37, 67, 110–12, 127–8, 129, 139
 - and birth synchrony, 79
 - and rank order, 68–9
- Mediterranean salinity crisis, 13
- melanin, 19
- menstrual cycle, 32
 - changes in facial colouration, 18–19
 - changes in female activity, 99–100
 - changes in sexual skin, 19, 22
 - effect of social disruption, 177
 - effects on behaviour, 95–6
 - influence of male rank, 96, 96–7
 - female sexual skin swelling, 90, 90–1
 - follicular phase duration, 115, 128, 161–2, 165, 175–6
 - follicular phase interruption, 176
 - luteal phase duration, 115
 - neuroendocrine control, 84–6, 85
- menstrual synchrony, 176–7
- Merino sheep
 - LH pulses, nutritional effects, 174–5
 - temperamental differences, 175
- Michael, R.P., 159–60
- microfilaria, 72
- Minkébé National Park, Gabon, 206–7
- Miopithecus talapoin*, female sexual skin swelling, 164
- mitochondrial DNA, 6, 11
- molecular clock evidence, 133–4
- monogamy
 - and mate choice, 190–1
 - and relative testes size, 167
 - association with monomorphism, 191
- morphology
 - external features, 16–19
 - facial musculature, 49
 - growth and development, 19–23
 - males, 134–5
 - reproductive anatomy, 27–8
 - female, 29, 31–3
 - male, 28–31
 - skeleton, 23–6
- mounting behaviour, 62, 63
 - same-sex mounting, 66–7
- multimale–multifemale mating system, 93, 127, 139
 - ancestral cercopithecines, 172–3, 173
 - and bulbocavernosus muscles, 172
 - and ejaculatory frequency, 171, 171, 172
 - relationship to relative testes size, 166, 166–7
- multiple partner matings, 127, 139
 - females, 107
- National Parks, 208
 - conflicts of interest, 206–7
 - in Gabon, 206–7, 207
 - Lopé National Park, 204
 - Nigeria, 198–9
- Nigeria, drill populations, 198–9
- notifying displays, hamadryas baboons, 66
- nutrition, effects on GnRH pulse generator, 174–5
- oestrogen
 - effect on female attractiveness, 159–61
 - effect on sexual skin, 22
 - vaginal effects, 159
- olfactory cues, 159–60
 - role in menstrual synchrony, 177
- one-male units, 34–5
- orang-utan, 157
 - flanged and non-flanged strategies, 180–2, 181
- orgasm
 - female, 63–4, 138
 - male, 63
- ovaries, anatomy, 32
- oviducts, anatomy, 32
- ovulation, 32, 101
 - resumption after birth, 86
 - seasonality, 77
 - timing of, 97, 101
- owl monkey (*Aotus* genus), 191
- oxidative stress, 188–9

- Pandrillus, 199
- Papionini tribe, 7
- parading behaviour, 100
- paranasal swellings, 17, 24–6, 27, 121–2
 - fatted and non-fatted males, 121, 122
 - size of, relationship to body size, 152
- parasites, 71, 72–3
 - Hamilton–Zuk hypothesis, 71–2
- partner switching, males, 102, 172
- paternity confusion tactics, 194
- paternity studies, 89, 110, 110
 - in gibbons, 191
 - in owl monkeys, 191
- pelage, 16–17
 - developmental changes, 19
- penis, 29, 30–1
 - as an internal courtship device, 162
 - length of, 162–3
- Pennant, T., 3–4
- peripheral males, 119
- pheromones, 159–60
- phylogeny, 7–8, 9
 - and social communication, 57–8
 - molecular studies, 6–7
 - of dentition, 136
 - of facial colouration, 135, 152
 - of female sexual skin, 135, 184, 185
 - of limbs and limb girdles, 135–6
 - skeletal features, 23–4
- play face, 54
- polygyny
 - and relative testes size, 167
 - relationship to sexual dimorphism, 154, 155
- postpartum amenorrhoea (PPA), 113, 115
- pout face, 54
- predation risk, 70–1, 137
 - and secondary sexual adornments, 183–4
 - role in body size dimorphism, 144–5
 - role in canine dimorphism, 145
 - Tungara frog, 183
- pregnancy
 - changes in facial colouration, 18
 - changes in sexual skin, 19
- presentation behaviour, relationship to social rank, 68
- proceptive behaviour, 61, 61–2
 - difference from socio-sexual displays, 65, 65
 - during mate-guarding, 100
 - relationship to male rank, 91
- progesterone, effect on female attractiveness, 160
- prostate gland, 30
 - size of, 168
- prudent allocation of sperm, 172
- Prum, R., 22–3
- puberty
 - bimaturism, 142
 - males, 19–20, 22, 118, 179
 - effects of sexual selection, 142
- python attacks, 71
- rainfall patterns, relationship to reproductive strategies, 77, 78–9
- rainforest contraction, 134
 - possible role in speciation, 13
- rainforest destruction, impact of, 208
- ranging behaviour, 42–3
 - advantages of, 45
 - drill, 44–5
- rank disputes, effect on testosterone levels, 178–9
- rank order
 - agonistic behaviour, 68
 - and fluctuating asymmetry, 165
 - and presentation behaviour, 68
 - and scent-marking, 60
 - females, 67, 68, 128, 185
 - and matriline, 68–9
 - and reproductive success, 111, 111–16, 112
 - relationship to reproductive success, 174, 175
 - with respect to males, 69
 - inter-sexual, 69
 - males, 67–8, 120, 139, 147
 - and grinning displays, 55–7, 58
 - and mate-guarding, 97, 99
 - and reproductive success, 106
 - and secondary sexual adornments, 123, 124
 - association with two-phase grunt (2PG), 46, 47
 - effect on sexual skin, 153
 - interaction with cyclical behavioural changes, 96, 96–7
 - relationship to mating success, 91, 93–5, 94
 - relationship to testosterone levels, 178
- reactive oxygen species (ROS) production, 188–9
- recent matings, olfactory cues, 160
- reconciliation behaviour, 65
- red howler monkeys, male infanticides, 194
- red sexual skin
 - physical basis, 22, 135
 - see also* secondary sexual adornments
- Rensch's rule, 144
- reproductive anatomy, 27–8
 - female, 29, 31–3
 - male, 28, 28–31
- reproductive careers
 - females, 117
 - males, 117–20
- reproductive health, and secondary sexual adornments, 189–90
- reproductive strategy hypothesis, 147–8
- reproductive success, 107, 108
 - females, 174
 - relationship to rank, 111–16, 175

- reproductive success (cont.)
 - males, 127
 - relationship to rank, 106, 109
- rhesus macaque (*Macaca mulatta*)
 - female attractiveness
 - effect of vaginal oestrogen, 160–1
 - olfactory cues, 159–60
 - red facial skin, 149–50
 - sexual skin colouration, hormonal effects, 182
- roaring, 47
- Rogers, M.E., 42
- Rowell, T., 115
- runaway sexual selection, 184, 186
- Ryan, M., 182–3
- same-sex mounting, 66–7
 - and rank order, 68
- scent-marking, 59–61, 127, 138, 160, 182
 - monogamous species, 191
- seasonal breeding
 - and rainfall patterns, 77, 78
 - birth season, 78–9
 - in the drill, 87, 87–8, 137
 - influencing factors, 79
 - female reproductive physiology, 79, 81–2
 - male reproductive physiology, 80–1, 81
 - proximate cues, 83
 - social factors, 82, 83, 87
- secondary sexual adornments
 - as markers of reproductive health, 189–90
 - in humans, 190
 - evolutionary considerations, 134–5
 - Hamilton–Zuk hypothesis, 71–2
 - handicap hypothesis, 187–8
 - in monogamous species, 191
 - sexual selection, 107–9
 - see also* male secondary sexual adornments
- seed consumption, 39
- seminal fluid coagulation, 64, 165, 168–9, 170–1
- seminal vesicles, 30, 165
 - size, relationship to mating system, 168, 169
- Setchell, J., 18–19, 69, 71, 83, 111–12, 149, 177
- sexual attractiveness
 - see* female attractiveness
- sexual behaviour, 37, 38
 - CIRMF mandrill group, 91–3, 92
 - copulatory patterns, 62–3
 - effects of social rank, 64, 91, 93–5, 94
 - female copulatory behaviour, 63–4
 - flehmen, 62
 - male assertiveness, 62
 - mate-guarding, 61, 64
 - mounting behaviour, 62, 63
 - phylogenetic perspective, 138
 - post-copulatory, 64
 - proceptive behaviour, 61–2
 - seasonal breeding, 61
- sexual dimorphism, xiv
 - relationship to mating system, 154, 155
 - squirrel monkeys, 154–5
 - visual traits rating scores, 154
 - mandrill and drill, 156, 156
 - orang-utan, 157
 - see also* body size sexual dimorphism; canine dimorphism
- sexual segregation, 147–8
- sexual selection, xiv, 156–7
 - and reproductive success, 189
 - Darwin’s views, 140, 148
 - effects upon females, 140
 - of canine size, 145
 - of male body size, 142–4
 - of male secondary sexual adornments, 148–9, 150
 - traditional and modern views, 141
 - see also* cryptic female choice; sperm competition
- sexual selection hypothesis of male infanticide, 193–4
- sexual skin
 - aromatase activity, 182
 - development of, 19
 - effects of androgens, 153
 - female, 18–19, 20
 - evolution of, 158–63
 - see also* female sexual skin swelling
 - hormonal influences, 22
 - male, 17–18
 - effect of dominance rank, 153
 - evolution of, 148–53
 - facial adornments, 17
 - rump and external genitalia, 17–18
- sexually transmitted infections (STIs), 72
- short-distance vocalizations, 48
- Silk, J., 193, 193
- simian immunodeficiency virus (SIV), 12
 - transmission of, 72
- Singleton, M., 25–6, 121
- skeleton, 23–6
 - evolutionary considerations, 135–6
- skin specializations
 - see* female sexual skin swelling; male secondary sexual adornments; sexual skin
- sleeping sites, mate-guarding, 100–1
- snakebites, 71
- snout length, 152
- social behaviour, xv
- social communication, 46
 - facial expressions, 49–50, 50, 54–5, 137–8
 - and male rank, 55–7, 58
 - grooming, 58–9, 59
 - phylogenetic considerations, 57–8
 - scent-marking, 59–61, 138

- sexual behaviour, 61–4,
 - copulatory patterns, 63
- vocalizations, 47, 137, 150
- social disruption
 - effect on mating season, 83, 87
 - effect on menstrual cycle, 115, 177
- social organization, 34–5, 128, 129
 - drill, 38, 44, 137
 - mandrill, 136–7
 - matrilineal, 127–8, 139
 - sexual interactions, 37
 - supergroups, 35–7
- socionomic sex ratio, 70, 185
 - relationship to sexual dimorphisms, 145–6, 146
- socio-sexual behaviour, 64–5
 - adult males, 66
 - and rank order, 68
 - phylogenetic perspective, 138
 - same-sex mounting, 66–7
- socio-sexual mimicry, 66
- solitary males, 119, 127, 136, 142–4, 182
 - fat deposition, 123
 - predation risk, 137
- speciation, 13–15
 - evolutionary history, 133–4
 - role of climate change, 134
 - role of geographical barriers, 134
 - role of rainforest contraction and expansion, 134
- sperm competition, 95, 107, 140, 141, 165–6, 167
 - and accessory reproductive glands, 168, 169
 - and bulbocavernosus muscles, 172
 - and copulatory frequency, 171–2
 - and seminal fluid coagulation, 168–9, 170, 170–1
 - and sperm morphology, 167–8
 - and spermatogenesis rates, 168
 - and testes size, 166, 166–7
 - prudent allocation of sperm, 172
- sperm counts
 - effect of repeated ejaculations, 171–2
 - prudent allocation of sperm, 172
- sperm midpiece volume, 165, 167–8, 168
- spermatogenesis rates, 168
- spermatogenesis, seasonality, 80
- squirrel monkeys
 - birth season, 176–7
 - fatting, 154–5
- staring display, 50–2
- sternal gland, 59–60, 138, 150, 160
 - analysis of secretions, 61
 - anatomy, 17
 - see also* scent-marking
- submissive displays, 51, 52–4, 64–5
 - difference from proceptive behaviour, 65, 65
 - principle of antithesis, 65–6
- subspecies, 11–13
- supergroups, xv, 35–7, 136
 - age/sex composition, 36
 - feeding behaviour, 42
 - feeding competition, 136
 - home range sizes, 136–7
 - presence of adult males, 125, 126, 127
 - seasonal changes, 37
 - splitting of, 128, 137
- symmetry, 164
 - see also* fluctuating asymmetry
- tamarins (*Sanguinus* spp.), 191
- taxonomic studies, 133
- Telfer, P., 11–12, 14
- Temminck’s tragopan, 149
- temperament
 - effects upon GnRH pulse generator, 175
 - individual differences, 176
- tension yawns, 52–3, 53
- testes size, 28–30, 95, 165
 - fatted and non-fatted males, 120–1, 122
 - relationship to male rank, 123, 124
 - relationship to mating system, 166, 166–7
 - relationship to sperm midpiece volume, 167–8, 168
- testosterone
 - effect on sexual skin, 22, 153
 - immunocompetence-handicap hypothesis, 188
- testosterone levels
 - and rank order, 178
 - effect of rank disputes, 178–9
 - effect of sexually attractive females, 178
 - fatted and non-fatted males, 120–1, 122
 - in fatted and non-fatted males, 179
 - relationship to group association frequencies, 125
 - relationship to male rank, 123, 124
- ticks, 72–3
- tooth-grinding, 145
- trade-offs
 - delayed sexual maturation, 142
 - handicap hypothesis, 187–8
- tree climbing, 41
 - female ‘treeing’ tactic, 100
- Trivers–Willard hypothesis, 192
- tumbu fly infestations, 72
- Tungara frog, 182–3
- two-phase grunt (2PG), 46, 47, 137
 - purpose of, 150, 151
- uterus, anatomy, 32
- vagina
 - anatomy, 32–3
 - length of, 162–3
 - oestrogen application to, 159
- Van Hooft, J.A.R.A.M., 49–50, 50
- vasa deferentia, 30

vertical distribution, 38, 40–1, 41	Wickings, J., 89
vervet monkey (<i>Chlorocebus aethiops</i>), 135	Wickler, W., 66
blue scrotal colouration, 152, 153	Wingfield, J., 179
vocalizations, 46–8, 47, 137, 150	Wood, K., 87
and mate-guarding, 100	
vomeronasal organ, 138, 177	‘yak’ vocalizations, 48
vulva, colour contrast, 19	yawning, 52–3, 53
	yellow baboons (<i>Papio cynocephalus</i>), female sexual
walking away, 98–9, 99	skin swelling, 162
white blood cell (WBC) counts, 72	
White, E.C., 42–4, 44	Zahavi, A., 187–8
white-cheeked gibbon (<i>Hylobates leucogenys</i>), 191	zebra finch (<i>Taeniopygia guttata</i>)
white-handed gibbon (<i>Hylobates lar</i>), 191	female mate choice, 186