

Index

- acetylcholine (ACh), 24
 - cholinergic drugs and sexual behaviour, 165
 - cholinergic pathways, 20, 251
 - general information on, 17–18
 - influence of estradiol on ACh production, 251
 - influence on dendritic spine density, 250–1
 - influence on hormone release, 82
 - synthesis of, 16
 - Addison's disease, see adrenal glands
 - adenosine triphosphate (ATP), 11, 14
 - adrenal glands, 38–9
 - Addison's disease, 39
 - adrenal cortex, 38–9
 - androstenedione production from the, 102
 - dehydroepiandrosterone production from the, 102
 - estrogen production from the, 96
 - testosterone production from the, 27
 - see also corticoids, steroid hormones
 - adrenal medulla
 - blood pressure, 23
 - release of catecholamines from the, 26
 - release of monoamines from the, 39
 - see also adrenaline/epinephrine, noradrenaline/norepinephrine
 - adrenarche, 102
 - Cushing's disease, 33, 39
 - adrenaline (epinephrine)
 - effect on heartbeat of, 16
 - effects on sexual behaviour of, 127
 - general information on, 18, 26
 - relationship with the thyroid hormones of, 76, 81–2, 83
 - release by the adrenal medulla of, 39
 - adrenocorticotrophic hormone (ACTH)
 - cellular activity in the hippocampus, 80–1
 - in CAH, 109, 258
 - production in the adrenal glands of, 39
 - stimulation by CRH, 31, 33–4
 - synthesis from prohormones, 30
 - aggression, see behaviour
 - alpha-fetoprotein (AFP), role in sex
 - determination of, 92
 - amplexus, 53
 - amygdala
 - androgen receptors in the, 73–4
 - connections with the bed nucleus of the stria terminalis, 141
 - connections with the olfactory system, 160–1, 194
 - effects on maternal behaviours of the, 206
 - estrogen receptors in the, 72
 - general information on, 5, 6
 - glucocorticoid receptors in the, 75
 - oxytocin receptors in the, 189, 206
 - progesterone receptors in the, 73
 - role in social processing of the, 6, 245
 - thyroid hormone receptors in the, 76
- androgens
 - androgen insensitivity syndrome (AIS)
 - effects on cognitive ability, 259
 - effects on gender identity, 114, 120
 - general information on, 113
 - androstenedione, 26–7
 - association with gender identity of, 99
 - castration and replacement of, 67
 - concentration in spotted hyena, 94
 - conversion to estrone, 72
 - conversion to testosterone, 29, 2.2
 - levels during the menopause of, 28, 187
 - levels in transsexuals of, 122
 - production in the testes of, 41
 - relationship with cognitive ability, 256
 - role in homosexuality of, 128
 - salivary sampling problems in the
 - measurement of, 45
 - secretion of during puberty, 102
 - sexual receptivity, 185
 - androsterone, 26
 - castration and replacement, 67
 - dehydroepiandrosterone (DHEA), 26
 - as a neurosteroid, 29
 - measurement issues, 46
 - relationship to dominance of, 243
 - secretion from adrenal cortex of, 102
 - synthesis, 2.2
 - dehydroepiandrosterone sulfate (DHEAS),
 - levels in transsexuals of, 122
 - secretion from adrenal cortex of, 102

- androgens (*cont.*)
 dihydrotestosterone (DHT), 26
 effects on aggressive behaviours of, 232, 236
 effects on sexual behaviours of, 163
 effects on sexual differentiation of, 90, 117
 synthesis of, 27, 30, 117, 159, 2.2
 testosterone
 binding to SHBG of, 25
 diurnal fluctuations in, 41, 46
 effects on EEG pattern of, 78
 effects on skin condition of, 180
 influence of thyroid hormones on, 83
 levels of in females, 27
 levels of in left-handers, 47
 measurements of circulating levels of, 43–7
 production of, 27, 41, 62, 89–90
 relationship with cognitive ability
 in animals, 25153
 in humans
 evidence from clinical syndromes, 257–61
 evidence from digit ratio studies, 253–6
 evidence from foetal sampling, 256–7
 evidence from reduction studies, 281–2
 evidence from supplementation studies, 272–5, 279–80
 relationship with circulating levels, 261–5
 relationship with dermatoglyphic characteristics, 58
 relationship with finger length ratios, 59–60
 role of in aggression
 in animals, 65, 218, 225–33
 in humans, 201, 233–47
 role of in AIS, 113
 role of in amplexus, 53
 role of in attachment behaviours, 201
 role of in CAH, 109–11
 role of in cerebral lateralisation, 143, 144–5, 147–9, 150–3
 role of in competitive behaviours, 53,
 role of in IHH, 115
 role of in Klinefelter syndrome, 114–15
 role of in maternal behaviours, 213–14
 role of in paternal behaviours,
 in animals, 213, 217–20
 in humans, 220–3
 role of in pheromones, 51
 role of in relationship status, 201–4
 role of in sexual behaviours
 in birds, 67
 in humans, 170–9, 184–8, 201–4
 in primates, 167,
 in rodents, 63, 77, 91, 158–63,
 role of in sexual differentiation, 43, 51, 90–1, 97
 in avian song centres, 57, 136
 in gender role, 99–102, 111–15, 120–1
 in homosexuals, 126, 127, 129, 131, 133, 142
 in human brain regions, 74, 150–3
 in hyenas, 94
 at puberty, 102–8
 in rodents, 56, 137–8, 144
 in transsexuals, 122, 123
 role of in social behaviours, 197–9,
 seasonal variations in, 47
 synthesis and conversion of, 26–7, 29, 30, 72–4, 89, 92, 117, 144, 217, 2.2
 antidiuretic hormone, *see* vasopressin
 arginine vasopressin, *see* vasopressin
 aromatase, 27, 92
 aromatase regulation, 72
 in bone tissue, 104–5
 in homosexuality, 138
 in transsexuals, 123
 aromatisation,
 in the activation of sexual behaviours, 159–60, 161–2
 in avian parental behaviours, 217
 catecholamine action on, 72
 cerebral asymmetry and, 144
 estrogen receptors, 73, 92
 in homosexuality, 134
 hypothalamus and sex differences, 144
 process of, 27, 72, 92, 2.2
 attachment bonds, *see* behaviour
 basal ganglia, 5, 7
 behaviour
 aggressive behaviours
 anabolic androgenic steroids (AAS), 229–30, 243
 ARKO animals and aggression, 233
 challenge hypothesis in animals, 225–33
 challenge hypothesis in humans, 234–45
 characteristics of aggression, 224–5
 castration as aggression reduction, 225
 competitive aggression, 241–3
 definition in animals, 224
 definition in humans, 233–4
 dominance, 243–5
 ERKO animals and aggression, 233
 finger length ratio and, 246–7
 home advantage in sport, 240–1
 loser effect in animals, 232
 loser effect in humans, 237–9
 personality factors in, 245
 puberty in animals, 230
 puberty in humans, 234–7
 reproductive effort, 218
 role of estradiol/aromatase, 232
 role of vasopressin, 230, 232
 seasonal variations in, 226, 229
 territorial aggression, 55, 65, 224, 229
 testosterone supplementation, 229–30, 242–3

- winner effect in animals, 230–2
- winner effect in humans, 237–41
- amygdala and social behaviours, 6
- attachment behaviours
 - definition, 192–3
 - in monkeys, 65
 - offspring–parent attachment, 204–6
 - role of oxytocin in, 205–6
 - role of stress in, 205
 - parent–offspring attachment in animals
 - maternal behaviours in birds, 207–8
 - prolactin and broodiness, 208
 - maternal behaviour in mammals, 208–17
 - mPOA alterations in, 211
 - role of endogenous opioids in, 213
 - role of lactation in, 210
 - role of oxytocin in, 209–10, 213
 - role of prolactin in, 207–8
 - role of steroid hormones in, 211–13
- parental bonds in humans,
 - evidence from CAH females, 214
 - relationship with steroid hormones, 214–16
 - role of endogenous opioids in, 216
- paternal behaviour in birds, 217
 - role of steroid hormones in, 217
- paternal behaviours in humans, 220–222
 - role of prolactin in, 222
 - role of steroid hormones in, 221–2
- paternal behaviour in primates, 219–20
 - role of prolactin in, 219
 - role of steroid hormones in, 219–20
- paternal behaviour in rodents, 217–19
 - role of steroid hormones in, 217–18
 - role of prolactin in, 217
- social bonds in animals, 193–96
 - role of oxytocin in, 193–6
 - role of pheromones in, 192, 194
 - role of progesterone in, 192–3
 - role of vasopression in, 194–6
- social bonds in humans, 196–204
 - individuals with social deficits, 196–7
 - role of oxytocin in, 197
 - role of testosterone in, 197–8
 - role of vasopressin in, 197
- heterosexual attraction
 - emotion of love, 200–1
 - hormone profiles during love, 201
 - oxytocin and trustworthiness, 199–200
 - role of empathy in, 198–9
 - testosterone and relationship commitment, 202–4, 229
 - testosterone and smiling, 199
- reproductive/sexual behaviours, 154–90
- brain regions associated with sexual behaviours, 137–9, 160
- categorising sexual behaviours in humans, 124, 168–70, 179–80
- categorising sexual behaviours in primates, 166–8
- categorising sexual behaviours in rodents, 155–8,
 - individual difference in sexual behaviours, 161–3
 - in ERKO mice, 162, 164–5
 - role of neurotransmitters in, 160, 165–6
 - role of the olfactory system in, 157, 158, 160
 - role of oxytocin in, 189–90
 - steroid hormones and sexual behaviours, 23, 27, 28, 33, 71, 158–61, 162–8
 - associations with fluctuating hormone levels,
 - in human females, 183–4
 - in human males, 176–7
 - in primates, 166–8
 - attractivity in human females, 180–1
 - castration and replacement studies, 63, 66–7, 86, 91, 158–9, 161, 167–8, 228
 - chemical castration in human males, 174–5
 - effect of social context, 51
 - evidence from digit ratio studies, 177
 - HRT studies, 188–9
 - proceptivity in human females, 181–4
 - receptivity in human females, 184–7
 - role of steroid hormone receptors, 73–4, 162, 165
 - testosterone administration studies, 170–5
 - in elderly males, 175
 - in hypogonadal males, 170–2
 - in normal males, 172–5
 - sexual behaviour and hormone levels, 177–9
 - sexual behaviour in the menopause, 187–9
- behavioural endocrinology,
 - background and history, 48–51
 - comparative studies, 64–6
 - definitions of behaviour, 53–5
 - establishing relationships between hormones and behaviour, 66–8
 - hormone–behaviour interactions, 51–2,
- measuring hormone levels,
 - bioassay, 24, 43, 207–8
 - circulating hormone measurement, 43–7
 - dermotoglyphic patterns, 58
 - finger length ratio, 59–61
 - historical background, 59
 - in aggression, 246–7
 - in attractiveness, 177
 - in autism, 198
 - in CAH, 110–11
 - in cognitive ability, 253–6
 - in dominance, 246
 - in hand skill, 151
 - in homosexuals, 131, 134
 - measurement issues of, 61
 - and number of sex partners, 177

- behavioural endocrinology (*cont.*)
 as a proxy marker for hormone exposure, 59–61
 in relation to body morphology, 103, 106
 in relation to gender role, 101–2
 in transsexuals, 123
 organisational versus activational hypothesis, 56–63
 radioimmunoassay (RIA), 44, 46
- castration
 castrati, 22, 86–7
 chemical castration, 174
 hormone replacement and aggressive behaviours following, 225–8
 hormone replacement and cognition following, 252–3
 hormone replacement and parental behaviours following, 218
 hormone replacement and sexual behaviours following, 63, 66, 67, 91, 96, 159, 161
 organisational versus activational debate, 62
 physical effects of, 22, 86, 105
 sexual dimorphism following, 136, 141
 Skoptsy sect, 87
- catecholamines, 18, 25–6, 72
 relationship with adrenal hormones, 82
 relationship with thyroid hormones, 81
- cerebral cortex, *see* nervous system
- cerebral lateralisation,
 callosal hypothesis, 151–3
 cerebral asymmetry in humans, 142–4
 changes during the menstrual cycle in, 146–7, 272
 changes during puberty in, 145–6
 cortical asymmetry in rats, 144
 dichotic listening in DES-exposed individuals, 145, 261
 dichotic listening method, 143
 GBG model, 147–53
 hormones and cerebral asymmetry, 144–53
 lateralisation in CAH, 145, 258
 lateralisation in Turner's syndrome, 145
 sex differences in cortical activation, 143
 testosterone and lateralisation,
 circulating testosterone and handedness, 150
 prenatal testosterone and degree of lateralisation for subitising, 256
 prenatal testosterone and lateralisation, 150–1
- choline acetyltransferase (ChAT), 251
- chromosomes
 autosomal chromosomes, 10
 sex chromosomes, 10
 sex chromosomes and sexual differentiation, 88, 90, 118, 120
 Turner's syndrome, 259–60
- cognition
 definition of, 248–9, 266
 effects of hormone reduction on, 281–2
 human sex differences in, 249
 maze learning tasks
 Morris maze, 250, 251, 253
 radial-arm maze, 250–1, 253
 T-maze, 252
 mental rotation test (MRT), 254, 255, 257, 259, 261–5, 270–1, 274, 277
 numerical, 255–6
 rodent sex differences in, 249–53
 role of steroid hormones,
 animal evidence, 249–53
 circulating hormones and cognition,
 DHT, 261–3
 estrogens/progestins, 265–72
 gonadotropins, 262, 271
 testosterone, 261–5
 correlations with foetal blood samples, 256–7
 evidence from clinical samples,
 AIS, 259
 CAH, 258–9
 DES exposed individuals, 260–1
 IHH, 272–3
 Turner's syndrome, 259–60
 evidence from digit ratio, 253–6
 supplementation evidence,
 HRT in the elderly,
 females, 275–9
 males, 279–80
 phytoestrogens, 280–1
 hypogonadal males, 272–4
 in transsexuals, 274–5
- communication systems, 8
- congenital adrenal hyperplasia (CAH)
 autism, 198
 cerebral lateralisation, 145, 258
 cognitive performance, 258
 gender identity, 111–13, 120
 general information on, 109–10
 parental behaviours, 214
 2D:4D ratio in, 60, 110–11
- corpus callosum, 3, 6
 racial differences in size and shape in, 152
 role in cerebral lateralisation, 152
 sex differences in size and shape in, 152–3
- corpus luteum, 28, 35, 40, 275
- corticoids
 definition of, 28
 glucocorticoids
 corticosterone, 28, 74–5, 80, 158, 205
 cortisol, 28
 adrenal hormone receptors and, 75
 calculation of free cortisol, 45
 diurnal pattern of, 28, 34, 46–7
 measurement by RIA, 44

- production by the adrenal cortex, 38
 relationships with aggressive behaviours, 235, 238, 239, 242, 244–5, 247
 relationships with attachment behaviours, 201, 205–6
 relationships with parental behaviours, 212, 215–17, 219–21
 relationships with sexual behaviours, 170
 role of in CAH, 109
 role of in Cushing's disease, 33, 39
 mineralocorticoids, 29
 functions of aldosterone, 29
 influence of ACTH on, 33–4
 receptors for, 70, 74–5
 treatment in CAH, 110
 corticotropin-releasing hormone (CRH), 31, 33–34
 couvade, see parental behaviours in humans
 cretinism, see thyroid gland
 crop sac, 49, 68, 207–8
 Cushing's disease, see adrenal glands
- daidzein, see phytoestrogens
 deoxyribonucleic acid (DNA)
 chemical bases, 10–11
 hormone receptors, 70, 74, 123
 dermatoglyphic measures, 58
 in transsexuals, 132
 diabetes, see pancreas
 dopamine (DA)
 in aggressive behaviours, 232
 aromatase regulation, 72
 effect on vasopressin release of, 82
 in the formation of pair bonds, 195, 201, 208, 222, 223
 general information on, 18, 21
 influence of the glucocorticoids on, 82
 influence of thyroid hormones on, 81
 influence on sexual behaviours of, 160–1, 165–6
 production in adrenal medulla, 39
 regulation of hypothalamic hormones, 35
 relationship with estrogen receptors, 81
 synthesis of adrenaline/noradrenaline, 26
- eicosanoids, 25
 electroencephalogram (EEG), 78
 recordings during the menstrual cycle, 78
 endogenous opioids,
 in parental behaviours, 209, 213, 216–17, 223
 epinephrine, see adrenaline
 estrogens
 effects on bone formation of, 104–5
 effects in transsexuals of, 103,
 effects on hypothalamic–pituitary–gonadal axis of, 128–9
 effects on nervous system of, 77, 250–1
 effects on other hormones of, 35, 250–1
 effects on oxytocin receptors of, 193
 effects on vocal characteristics, 108
 estrogen synthase, see aromatase
 diethylstilbestrol (DES), 138, 145, 260–1
 estradiol
 effects of thyroid hormones on, 83
 effects on cerebral lateralisation of, 144, 146,
 effects on the GABAergic system of, 81
 effects on the nervous system of, 79–81, 250–1
 measurement of, 44–7
 production and synthesis of, 27–30, 41, 72–3, 2.2
 receptors for, 73–4
 role in aggressive behaviour of, 227, 232, 247
 role in cognitive ability,
 in animals, 251–3
 in humans
 evidence from supplementation studies, 275, 277–8, 280
 relationship with circulating levels, 257, 263, 267, 270–1, 279–80
 role in digit ratio of, 60
 role in parental behaviours of
 in animals, 211–12, 218–20
 in humans, 215, 217, 221
 role in sexual behaviours of
 in animals, 52, 67, 92, 158–61, 164–8
 in humans, 172–4, 179, 184, 186, 188
 role in sexual differentiation of, 95, 115, 133–4, 144
 role in social behaviours of, 192
 estrone, 28, 41, 72, 128, 278
 general information on, 28
 in Turner's syndrome, 116, 145
 production and synthesis and of, 28, 34, 39–40, 62, 2.2
 receptors for, 70–4, 81, 92, 141
 role at puberty, 102, 104
 role in aggressive behaviours, 227, 229, 232–3
 role in cognitive ability
 in animals, 252
 in humans
 evidence from digit ratios, 254
 evidence from supplementation studies, 275–9, 280–1
 evidence from Turner's syndrome, 259–61
 relationship with circulating levels, 263, 265–73
 role in digit ratios, 59–60
 role in parental behaviours
 in animals, 207–9, 212, 218
 role in sexual behaviours
 in animals, 67, 77, 92, 159–65, 167–8
 in humans, 180–1, 184, 187–9
 role in sexual differentiation, 56–7, 90–2, 94–8, 104–5, 120, 134, 138, 141–2, 144
 role in transsexualism, 123

- estrus
 anestrus state, 157, 163
 effects of dopamine on, 165
 hormones and estrus, 77, 79, 163, 164, 211, 252
 neuronal activation during, 77
 parental behaviour and, 218
 sexual behaviours during, 163–5, 167, 168–9, 172, 180, 185, 193, 228
 synaptic density during, 79
- free hormone hypothesis, 45
- gamma-aminobutyric acid (GABA), 19
- estradiol and the GABAergic system, 81
- GABA receptors, 19
 neurosteroids, 29
 influence of progesterone, 73
- GABAergic projections, 251
- influence on pituitary hormones, 35
- genistein, *see* phytoestrogens
- glia, 9
- glutamate, 19
 hippocampal function and, 79–80
 receptors for, 19
- goitre, *see* thyroid gland
- gonadotropins
 effects on vocal parameters, 108
 follicle stimulating hormone (FSH)
 associations with cognitive performance, 262, 271
 control by GnRH, 31
 levels during menopause of, 275
 levels during romantic attraction of, 201
 regulation of gonadal hormone production of, 34–5, 40–1, 42
 role in human menstrual cycle of, 40
 role in puberty of, 62–3, 102
 role in rodent estrus cycle of, 163
 influences of clasping behaviours in amphibians, 53
- luteinising hormone (LH)
 associations with cognitive performance, 262, 271
 control by GnRH, 31
 levels in males viewing pornography, 178
 pheromonal influences on, 158, 192
 regulation of gonadal hormone production of, 34–5, 42
 role in broodiness of, 208
 role in human menstrual cycle of, 40, 44
 role in puberty of, 62–3, 102
 role in rodent estrus cycle of, 163
 role in testosterone fluctuation on, 41
 role of steroids in LH release, 35
 surge in response to estrogen in homosexual males, 129
- see also* idiopathic hypogonadotropic hypogonadism
- gonadotropin-releasing hormone (GnRH)
 agonist and antagonist effects on testosterone of, 172–3
 agonists and ovulation prevention, 167
 effects during puberty of, 62, 102
 effects of urinary pheromones on, 158
 negative feedback loop of, 42
 synthesis and actions of, 31, 35, 163
- Graves' disease, 37
- growth hormone (GH), 31
 actions of, 32, 34, 102
 effects on bone tissue of, 104
 inhibitory action of eicosanoids on release of, 30
 peptide hormones, 26
 treatment in Turner's syndrome, 116
- growth hormone-inhibiting hormone (GH-IH), *see* somatostatin
- growth hormone-releasing hormone (GH-RH), 31
- hermaphrodite, *see* intersex
- hippocampus
 adrenal hormone receptors in, 75
 alterations during puberty of, 62, 63
 androgen hormone receptors in, 73
 aromatisation within, 72
 description and location of, 5, 6
 hormonal effects in, 77, 78–82, 97, 251, 253, 269, 281
 role in learning and memory, 5, 6, 250, 253, 269
 thyroid hormone receptors in, 76
- homosexuality
 abdominal adiposity in, 104
 androgen receptor expression in, 74
 animal models of, 127–8
 in CAH females, 113
 cognitive performance in, 254
 confusion with transsexuality, 122
 developmental instability in, 132
 dimorphism in CNS structures in, 141–2
 finger length ratios in, 131–2
 gender nonconformity in, 124–5
 genetic factors in, 124–5
 hormonal theories of, 125–34
 incidence in the population, 123–4
 role of aromatisation, 138
 steroid hormone levels in, 126, 203
- hormone replacement therapy (HRT), cognitive effects of, 275–81
- hormones
 amino acid hormones, 25–6
 definition of, 24–5, 2.1
 glycoproteins, 34–5

- historical background of research on, 22–4
- hormone receptor complex, 41, 70,
- hormone regulation, 42–3, 2.4
- lipids, 30
- measurement of, 43–7, 71–2
- neurological effects of, 70–1, 76–84
- peptide hormones, 26
- pheromones, 25, 51, 158, 160, 192
- prohormones, 25
- releasing hormones, 31–3, 2.3
- tropic hormones, 33–4
- see also steroid hormones; thyroid hormones
- human chorionic gonadotropin, 44
- hydrocortisone, see cortisol
- hypothalamus
 - aggressive behaviours and, 230, 232
 - androgen receptors in, 73
 - aromatisation in, 72, 74, 134
 - connectivity of, 5, 6, 7
 - estradiol effects on GAD in, 81
 - estrogen receptors in, 72
 - estrus cycle relationships, 77, 81
 - glucocorticoid receptors in, 75
 - hormones secreted by, 31–3, 35, 2.3
 - IHH, see idiopathic hypergonadotropic hypogonadism
 - influence on menstrual cycle by, 40
 - influence on puberty of, 63, 102
 - influence on steroid production of, 41
 - medial preoptic area (mPOA)
 - estrogenic effects on, 77
 - interstitial nuclei of, 142
 - oxytocin receptors in, 206
 - role in sexual behaviours of, 71, 126, 160, 165, 190, 211
 - steroid receptors in, 72, 73, 74, 162, 210
 - neurotransmitter pathways, 20
 - paraventricular nuclei, 31–3
 - adrenal hormone receptors in, 76
 - maternal care and, 206
 - oxytocin production in, 189, 193
 - vasopressin production in, 193
 - progesterone receptors, 73
 - relationships with the pituitary gland, 31–5, 40, 42, 52, 62–3, 2.3
 - serotonergic effects in, 82
 - sex differences in, 97, 137–9, 142
 - sexual behaviours and, 134, 160
 - sexual determination and, 87, 89
 - suprachiasmatic nucleus (SCN), 36
 - thyroid hormone receptors in, 76
- idiopathic hypogonadotropic hypogonadism (IHH)
 - cognitive performance in, 272–3
 - gender identity in, 115
 - general information on, 115
 - role of gonadotropins in, 115, 272
 - vocal characteristics, 108
- indoleamines, 18–19
 - amino acid hormones and, 25
 - see also melatonin; serotonin
- intersex, 89, 118, 120–1
- ionotropic receptors
 - for acetylcholine, 18
 - characteristics of, 17
 - for GABA, 19
 - for glutamate, 19, 79
- Kallmann's syndrome
 - general information on, 115
 - gender identity in, 115, 120
- Klinefelter's syndrome (46XXY)
 - general information on, 114–15
 - gender identity, 115, 120
- lignans, see phytoestrogens
- limbic system
 - attachment bond formation and, 223
 - components and functions of, 5
 - connectivity of, 5, 20
 - glucocorticoid inhibition of steroid hormone activity within, 71
 - links with neuropeptides, 35
 - role in motivation and reward, 195
- lipids, 17, 30
- long-term potentiation (LTP), 79–80
- lordosis
 - definition of, 91, 156
 - effects of androgens on, 91, 92
 - effects of cholinergic antagonists on, 165
 - effects of estradiol/estrogen on, 164–5
 - effects of maternal stress on offspring lordosis, 127
 - effects of oxytocin on, 190
 - effects of progesterone on, 164
 - effects of serotonin on, 166
 - as a measurement of sexual receptivity, 158
 - pheromone effects on, 51
- luteinising hormone releasing hormone (LH-RH)
 - effects on broodiness of, 208
 - effects of pheromones on, 192
- luteotropin, see prolactin
- maternal behaviour, see behaviour
- medial preoptic area, see hypothalamus
- melatonin
 - effects on LH and FSH, 44
 - production and synthesis of, 26, 35–6
- menopause
 - alteration in sexual behaviours during, 187–8
 - alteration in steroid hormone levels during, 28, 108, 187, 275
 - cognitive effects of, 276–7, 281

- menstrual cycle
 - body scent during, 181
 - cerebral lateralisation during, 146
 - EEG recordings during, 78
 - fluctuations in cognitive processing during, 265–72
 - fluctuations in oxytocin levels during, 190
 - fluctuations in steroid hormone levels during, 27–8, 34, 40, 47
 - perceptual changes during, 57
 - premenstrual syndrome/tension (PMS/T), 268
 - sexual behaviours during, 168, 179, 182–3, 185–7
 - skin colour changes during, 180
 - vocal characteristics during, 108
- metabotropic receptors
 - acetylcholine, 18
 - adrenergic system, 83
 - characteristics of, 18
 - GABA, 19
 - glutamate, 19
 - similarity with hormonal effects, 69
- monoamine oxidase (MAO), 269
- monoamines, 18–19
 - adrenal medulla release of, 39
- neuroanatomical directions, 1
- neurohypophysis, see pituitary gland
- neurons
 - action potential within, 14–15
 - chemical events within, 13–14
 - electrical events within, 12–13
 - communication between, 16–17
 - structure of, 9–12
- neurosteroids, 29, 73, 77, 96, 158
- neurotransmitters, 17–20
- nervous system
 - autonomic nervous system (ANS), 2, *1.1*
 - basal ganglia, 7
 - brain organization, 2–8, *1.2*, *1.3*
 - central nervous system (CNS), 1–2, *1.1*
 - cerebral cortex, 3–6
 - definition of, 1–2
 - diencephalon, 7, *1.3*
 - forebrain, 3–7
 - functions of the lobes, 4–6
 - hindbrain, 9
 - limbic system, 7
 - midbrain, 8
 - organization of the nervous system, 1–2, *1.1*, *1.2*
 - peripheral nervous system (PNS), 1–2, *1.1*
 - somatic nervous system (SNS), 1, *1.1*
 - telencephalon, 3–7, *1.3*
- nonapeptide, see oxytocin
- noradrenaline,
 - effects on aromatisation of, 72
 - effects on cognition of, 269
 - effects on oxytocin and vasopressin of, 82
 - effects on sexual behaviour of, 158, 165, 179
 - effects on social bond formation of, 192
 - general information on, 18, 26
 - relationship with the thyroid hormones, 76, 81–3
 - release by the adrenal medulla of, 39
- norepinephrine, see noradrenaline
- orchidectomy, orchiectomy, see castration
- organizational versus activation hypothesis
 - re-evaluation of the theory, 61–3
 - standard assumption, 56–61
- organotherapy, 22–4, 275–6
- orgasm, 169–70
 - oxytocin levels during, 189–90, 194
 - prolactin levels during, 179
 - testosterone levels during, 176
- ovariectomy
 - effect on cognitive performance of, 252–3, 281
 - effect on cortical thickness of, 144
 - effect on dendritic spine density of, 79, 97
 - effect on GABA of, 81
 - effect on neuronal activation of, 77
 - effect on parental behaviours of, 207, 211
 - effect on sexual behaviours of, 67, 97, 158–9, 163–4, 165, 167, 168
 - effect on sexual differentiation of, 96
 - effect on social behaviours of, 194
 - use in estrogen-binding studies of, 72
- oxytocin
 - definition of, 26, 189
 - effects of, 189
 - influence of acetylcholine on, 82
 - influence of soy isoflavones on, 280
 - levels during orgasm, 189–90, 194
 - receptor binding in the CNS, 193–4
 - role in sexual behaviours of, 189–90
 - role in social bonding in animals of, 193–6, 205–6, 209–10, 213, 222–3
 - role in social bonding in humans of, 197, 199–200, 206, 216, 222–3
- pancreas, 37–8
 - diabetes, 37–8
 - insulin and down regulation, 42
 - insulin and glucose, 38
 - insulin-like growth factor (IGF-1), 34
 - insulin secretion and function, 23, 25, 26, 32, 37
- Pap test, 50, 163
- Papez circuit, see limbic system
- parental behaviour, see behaviour
- paternal behaviour, see behaviour
- peptides, 20, 25
 - corticotrophin-related peptides, 33–4

- neuropeptides, 25, 35
- pancreatic polypeptides, 37–8
- peptide hormones, 26; see also oxytocin and vasopressin
- polypeptide hormones, 26, 41
- phytoestrogens, soy isoflavones and cognition, 280–1
- pituitary gland, 7, 33
 - androgen receptors within, 73
 - effects of tumours within, 39
 - estrogen receptors within, 75
 - glucocorticoid receptors within, 75
 - hormones produced within, 30, 33–5, 82, 189, 193, 207
 - progesterone receptors within, 73
 - relationship with the adrenal glands, 66
 - relationship with the gonads, 39–41, 173
 - relationship with the hypothalamus, 30–5, 42, 52, 223
 - relationship with the pineal gland, 36
 - relationship with the thyroid gland, 36, 48, 83
 - response to estrogens, 128–9
 - role during puberty, 62–3, 102
 - role during the menopause, 275
 - sexual dimorphism within the, 139
- progestins, 28
 - progesterone, 28
 - and cognition, 252–3, 267, 269–72, 275, 278
 - and dendritic spine density, 79–80, 97
 - effects on hypothalamic nuclei of, 97
 - effects on mPOA neurons of, 210
 - effects on parental behaviours of, 192–3, 207, 209, 211–12, 215
 - effects on sexual behaviours of, 28, 73, 77, 158, 162–8, 174, 179, 183–6, 188–9
 - effects on vocal characteristics of, 108
 - and facial preferences, 183
 - influence of genistein on, 280
 - measurement in saliva of, 46
 - menstrual cycle fluctuations in, 34–5, 146
 - neurosteroids effects on, 29
 - production by the corpus luteum of, 28, 35, 40, 275
 - receptor action of, 70, 71
 - receptor localisation of, 73
 - role in sexual differentiation, 98
 - role in the menopause, 187
 - ovarian production of, 39–40
 - and skin colour, 180
 - testicular production of, 40
 - and waist-to-hip ratio, 180
- polycystic ovary syndrome (PCOS), see transsexuality
- prolactin
 - association with broodiness, 208
 - association with parental behaviours, 217, 219–21
 - association with orgasm, 179
 - effects of gonadal steroids on, 34
 - effects of serotonin on, 208
 - effects of TRH on, 35
 - functions of, 34, 49, 68, 207–8
 - influence of lactation on, 210, 216
 - up-regulation and, 42
- pseudohermaphroditism, 117
 - gender identity in, 117–18
- puberty
 - aggression during, 230, 231–7, 246, 265
 - androgen surge in males at, 27
 - breast development in males at, 114
 - castration studies and, 66, 86, 97, 159, 225, 251
 - changes in the male larynx during, 57
 - CNS changes in, 62–3
 - delay of, 63, 105–6, 114–16, 171, 172, 176–7, 259, 272–3
 - endocrine activity during, 63, 89, 98, 102–3
 - female menstrual cycle at, 40
 - secondary sexual characteristics in animals at, 49
 - sex differences in maturation at, 146
 - sexual behaviours during, 170, 176–7,
 - sexual differentiation at, 102–8, 261
 - body morphology, 103–4
 - bone metabolism, 104–6
 - vocal characteristics, 106–8
 - Tanner stages of, 103, 107
 - virilisation at puberty in
 - pseudohermaphroditism, 117, 120
- ribonucleic acid (RNA), 10
 - messenger RNA (mRNA), 34, 74, 76, 138
- salivary sampling, see hormones
- second to fourth finger length ratio (2D:4D), see behavioural endocrinology
- serotonin
 - effects on lordosis, 166
 - influence of glucocorticoids on, 82
 - general information on, 19, 26
 - melatonin synthesis, 35
 - relationship with estrogen receptors, 81
 - role in aggression of, 228, 232
 - role in broodiness and maternal behaviours, 208, 223
- sex determination
 - in AIS, 113
 - animal models of, 90–5
 - in CAH, 109–11
 - in enzyme deficiency syndromes, 117
 - genetic basis of, 88–9, 95–6
 - historical background, 86–7
 - in homosexuals, 123–5
 - hormonal effects on, 89–99
 - hormonal models of, 98

- sex determination (*cont.*)
 - in IHH, 115
 - in Klinefelter's syndrome, 114–15
 - role of AFP in, 92
 - in transsexuals, 121–3
 - in Turner's syndrome, 116
 - types of, 87–8
- sex differentiation
 - during puberty, 102–8
 - in body shape, 103–4
 - in bone metabolism, 104–6
 - in the voice, 106–8
 - in avian song centres, 135–6
 - in cognition, 248–9
 - evidence from animal studies, 249–51
 - spatial ability in humans, 254–5
 - from AIS individuals, 258
 - from CAH girls, 258
 - from DES-exposed children, 260–1
 - from Turner girls, 259–60
 - in gender role, 99–102
 - androgens and gender role, 102–3
 - definition, 85, 99
 - gender identity in AIS, 114, 120, 259
 - gender identity in CAH, 111–13, 120
 - gender identity in enzyme deficiency syndromes, 117–18
 - gender identity in homosexuals, 123–5, 133–4
 - gender identity in Klinefelter's syndrome, 114–15, 120
 - gender identity in John/Joan case, 118–19, 120–1
 - gender identity in transsexuals, 121
 - gender role identity in IHH, 115
 - gender role identity in Turner's syndrome, 117
 - maternal stress and gender role, 99–101
 - 2D:4D ratio and gender role, 102
 - gender role reassignment, 110
- in human brain,
 - brain size, 139–41
 - cerebral asymmetry, 142–53
 - evidence from dichotic task, 143
 - evidence from menstrual cycle studies, 146–7
 - evidence from MRI, 143
 - evidence from prenatal studies, 144–5
 - evidence from pubertal maturation, 146
 - in CAH females, 145
 - the callosal theory, 151–3
 - the GBG model, 147–53
 - hypothalamus, 141–2
 - in rodent cortex, 144
 - in rodent hypothalamus, 137–8
 - in rodent tail bias, 144
 - in sheep hypothalamus, 138
- sex hormone binding globulin (SHBG), 26, 100, 185, 187
- sexual behaviours, see behaviour
- social bonds, see attachment behaviours
- somatomammotropins, 34
- somatostatin (SOM), 32–3
- somatotropin, see growth hormone
- steroid hormones, 26–9, 2.2
 - detection by autoradiography, 71–2
 - neurosteroids, 29–30, 79–80, 99, 163
 - receptor binding, 72–4
 - see also androgens; estrogens; glucocorticoids; mineralocorticoids; neurosteroids; progestins
- suprachiasmatic nucleus, see hypothalamus
- synapse
 - chemical events at the, 16
 - general information on, 12–13
 - long-term potentiation at the, 79
- thalamus
 - androgen receptors within the, 73
 - location of the, 6, 31
 - projections to the, 20
 - relationship to the hypothalamus, 30
 - structure of the, 7
 - thyroid hormone action in the, 76
- thyroid hormones
 - functions of, 27, 36–7
 - role in brain development of, 80, 82–3
 - role in goitre of, 36, 48
 - manufacture, release and transport of, 36–7
 - receptor binding of, 76
 - regulation of, 42–3, 2.4
 - relationships with adrenergic system, 76
 - role in cretinism, 37, 48
 - thyroxine (T₄), 26, 36–7, 76
 - triiodothyronine (T₃), 26, 34, 36–7
- thyroid stimulating hormone (TSH), 32, 34–5, 42, 43, 48
- thyrotropin, see thyroid stimulating hormone
- thyrotropin-releasing hormone (TRH), 32, 34–5, 42
- transsexuality
 - alterations in brain volume in, 141
 - androgen receptors in, 74
 - body fat distribution in, 103
 - definition of, 121–2
 - dermotoglyphic characteristics in, 123
 - digit ratio in, 123
 - estrogen treatment in male–female transsexuals, 103
 - gender dysphoria in, 113, 121
 - hormone administration and cognition in, 274–5
 - incidence of PCOS in, 122
 - LH response in, 129
 - receptor polymorphisms in, 123

Index		355
Turner's syndrome, cerebral lateralisation, 145 cognitive performance in, 259–60 gender identity in, 116, 120 general information on, 116	association with sexual behaviours, 193 association with social memory, 194 chemical similarity with oxytocin, 189 effect on lactation on production of, 210 functions of, 32 influence of neurotransmitters on, 82 location of receptors for, 193, 195, 201	
vasopressin (arginine vasopressin), 25–6 association with aggressive behaviours, 230, 232 association with attachment behaviours, 194–6, 206, 218, 222 association with autism, 197	ventral tegmental area (VTA) brain activation during romantic attraction, 201 dopaminergic projections, 20	