

Index

- 3, 4-methylenedioxyamphetamine (MDMA). *See* MDMA
- 5-hydroxytryptamine (5-HT), 272
- accessory olfactory bulb (AOB), 259
- Acris crepitans*, 98
- activator proteins, 4
- active avoidance, 311
- addiction, 270
 - detoxification, 279
 - drug self-administration, 274
 - drug tolerance, 277
 - drug withdrawal, 279
 - neuroadaptations in oxytocin and, 277
 - overview, 270
 - oxytocin inhibitory effects, 278
 - prosocial effects of drugs, 271
 - rewarding effects of drugs, 273
- ADP-ribosyl cyclase, 50
 - inhibition of oxytocin-induced activation of, 45
 - intracellular calcium and, 48
 - oxytocin effects on, 45
- adrenal steroids
 - in anuran amphibians, 101
 - vasotocin and, 101
- adrenocorticotrophic hormone (ACTH), 196, 301, 314
- adult attachment, 295
- advertisement calling, 100
- African cichlid, 77, 79, 85
- African mole rats, oxytocin and, 140
- aggression. *See also* social behaviors
 - gonadal steroids and, 220
 - in mammals, 130
 - in primates, 297
 - intermale, 30
 - internal factors in, 203

- maternal, 29, 158, 159
oxytocin and, 200
oxytocin regulation of, 159
rodent models, 193
 maternal paradigm, 194
 neutral cage paradigm, 194
 resident-intruder paradigm, 194
vasopressin and, 197
 drug exposure effects, 221
vasotocin and, 88, 98, 119
- agonistic behavior, 193. *See also* social behaviors
external factors in, 194
internal factors in, 203
rodent models, 193
 maternal paradigm, 194
 neutral cage paradigm, 194
 resident-intruder paradigm, 194
serotonin and, 203
testosterone and, 203
- agonists, 186
- alcohol consumption, 272, 275
- alcoholics, 275
- alloparental behavior, 137, 296
- allopregnanolone, 247
- all-trans retinoic acid (ATRA), 356
- altruism, 350
- altruistic helping, 336
- Amatitlania nigrofasciata*, 86
- American toads, 102
- amphibians, 97
adrenal steroids, 101
anuran, 97
courtship behaviors, 103
gonadal steroids, 101
phonotaxis behaviors, 102
social behaviors in, 97
urodele, 103
- amygdala, 31, 317
- Anaxyrus americans*, 102
- androgen receptors, 7
knockout studies, 11
- androgen response element (ARE), 7
- androgens, 7
in AVPR1a regulation, 15
vasotocin and, 102
- Angolan blue waxbill, 114
- antagonists, 168, 186
- anterior hypothalamus (AH), 197
- antidepressants, 273
- antidiuretic hormone, 130
- anuran amphibians, 97. *See also* amphibians
adrenal steroids, 101
gonadal steroids, 101
phonotaxis behaviors, 102
vocal behaviors, 97
vocalization sites and mechanisms, 98
- anxiety, 309. *See also* fear; social behaviors
animal models, 315
assessment of, 310
defensive distance, 311
functions of, 310
indices, 311
OTR-activated neuronal signaling and, 36
oxytocin effects on, 314
 amygdala, 317
 animal research, 314
 human research, 317
 hypothalamic-pituitary-adrenal (HPA) axis, 314
 prosocial behaviors, 314
oxytocin-vasopressin interactions and, 320
postpartum reduction of, 160
regulation by oxytocin and vasopressin, 313
regulation of, 312
stimulus intensity, 311
survival and, 309
threats and, 311
vasopressin effects on, 318
 animal research, 318
 central synthesis and release, 319
 human research, 320
 hypothalamic-pituitary-adrenal (HPA) axis, 318
- anxiolysis, 30
- anxiolytics, 311
- Aotus azarai*, 299
- Apteronotus leptorhynchus*, 86, 88
- arch-back nursing (ABN), 156
- arginine vasopressin. *See* vasopressin
- arginine vasotocin. *See* vasotocin
- Asperger's syndrome, 50
- Astatotilapia burtoni*, 77, 79
- asvatocin, 77
- Autism Genetic Resource Exchange (AGRE), 355
- autism spectrum disorders (ASD), 351, 367
CD38 and, 354
clinical trials, 371
definition of, 367
DSM-IV diagnostic criteria for, 367–368
endophenotypes, 353

- autism spectrum disorders (ASD) (*cont.*)
 etiology of, 369
 experimental research, 374
 genetic research, 371
 oxytocin and, 367, 369
 oxytocin as treatment for repetitive behaviors, 374
 oxytocin as treatment for social deficits, 372
 oxytocin receptor gene, 370
 plasma oxytocin and, 50
 repetitive behaviors, 374
 social deficit disorders, 372
 vasopressin and, 369
- autoregulation, 44
- AVPR1a* gene, 6, 32, 131, 292, 298, 319, 346, 350, 352
- AVPR1b* gene, 6, 32, 318, 319
- bed nucleus of stria terminalis (BNST), 12, 28, 61, 198, 199, 216
- behavior regulation, 379
 anatomy, 379
 comparative approach in studies of, 380
 development, 379
 function, 379
 oxytocin and, 58
 vasopressin and, 58
 vasotocin and, 85
- bicuculline, 202
- birds
 aggression in, 119
 flocking, 114, 118
 gregariousness in, 117, 118
 group sizes, 114
 grouping behavior, 118
 monogamy in, 129
 nonapeptide systems in, 110, 111
 social behaviors in, 110
 song modulation, 113
 territorial, 114
 territorial behavior, 118
 vasotocin system in, 111
- black-tufted ear marmosets, 295
- blood–brain barrier, 184
- bonding behavior, 190
- bonnet macaques, 294
- Brachyhyopomus gauderio*, 86, 87
- brain
 AVPR-mediated intracellular signaling in, 37
 intracellular signaling in, 35
 oxytocin in, 148, 186, 288
 oxytocin receptor in, 289
 vasopressin in, 288
 vasopressin receptors in, 292
- brain-derived neurotrophic factor (BDNF), 247
- brainstem, 321
- Bufo americanus*, 102
- Bufo cognatus*, 102
- Bufo woodhousii*, 102
- bull frogs, 100
- Ca²⁺/calmodulin-dependent kinase (CaMK), 37, 38
- California mouse, 141, 198
- Callicebus cupreus*, 296
- Callicebus donacophilus*, 299
- Callithrix jacchus*, 13, 288, 295
- Callithrix penicillata*, 295
- calphostin C, 45
- cAMP response-element binding (CREB), 38
- Carassius auratus*, 118
- catfish, 83
- caveolins, 33
- Caviaporcellus*, 13
- CD38
 autism spectrum disorders and, 264, 354
 cADPR activation with, 44
 immunohistochemical analysis of, 51
 in human brain, 51
 R140W mutation in, 50
 regulation of oxytocin secretion and, 50
- CD38, 36
- Cd38 knockout mice, 49, 50
- CD8, 264
- cerebellum, 321
- cerebrospinal fluid (CSF), 142, 184, 200, 292, 296
- charitable giving, 336
- chickens, oviposition in, 112
- cingulate cortex, 63
- cocaine, 202
- cognition, OTR-activated neuronal signaling and, 36
- cognitive empathy, 349
- conditioned place preference, 139, 140, 275
- Coolidge effect, 131
- coqui frog, 98
- corticosterone, 102
- corticotrophin-releasing factor (CRF), 280, 313
- corticotrophin-releasing hormone (CRH), 60
- courtship behaviors, 103
- crab-eating macaques, 288
- Cricetus cricetus*, 13

- cricket frog, 98
- crowing, 113
- cyclic adenosine monophosphate (cAMP), 37–38
- cyclic ADP-ribose (cADPR), 36, 44
- oxytocin effects on, 45, 52
- oxytocin effects on $[Ca^{2+}]$ and, 45, 52
- oxytocin release and, 46, 47
- TRPM2 channels and, 47
- cyclic GDP-ribose (cGDPR), 45
- Cynops pyrrhogaster*, 104
- damselfish, 83, 88
- deer mice
- monogamy in, 141
- vasopressin and, 141
- defensive distance, 311
- detoxification, 279
- dexamethasone, 301
- dehydroepiandrosterone (DHEA), 7
- diacylglycerol, 33, 44
- Diagnostic and Statistical Manual of Mental Disorders (DSM-IV), 367–368
- Dictator game, 350
- dihydrotestosterone (DHT), 7, 10, 11, 101
- dishabituation, 234
- Djungarian hamster, 13
- dopamine, 139, 223
- drugs
- addiction, 270
- prosocial effects of, 271
- rewarding effects of, 273
- self-administration, 274
- withdrawal syndromes, 279
- early experience, 297
- early social environment, 59
- Ecstasy, *See* MDMA
- electroencephalographs (EEGs), 344
- Eleutheroedactylus coqui*, 98
- Eliomys quercinus*, 13
- emotional empathy, 349
- empathic concern, 338
- empathic distress, 337
- empathy, 337. *See also* social behaviors
- cognitive, 349
- emotional, 349
- empathic concern, 338
- empathic distress, 337
- in human, 348
- perspective-taking, 338
- vasopressin and, 348
- endophenotypes, 353
- epidermal growth factor receptor (EGFR), 33, 37
- estradiol, 10, 11, 101
- estrogen, 322
- social learning of food preferences and, 246
- social recognition and, 240
- estrogen receptors, 7
- alpha (ER α), 60, 240, 263
- beta (ER β), 240, 246, 263
- knockout studies, 11
- estrogen response element (ERE), 4, 7, 10, 14
- estrogens, 7
- in OTR regulation, 14
- organizational effects and, 60
- estrogen-stimulated neurophysin (ESN), 288
- European starlings, 112
- extracellular signal-regulated kinase (ERK), 33, 36, 37
- familiarity recognition, 233
- fear, 309. *See also* anxiety; social behaviors
- animal models, 315
- assessment of, 310
- defensive distance, 311
- functions of, 310
- indices, 311
- oxytocin effects on, 314
- amygdala, 317
- animal research, 314
- human research, 317
- hypothalamic-pituitary-adrenal (HPA) axis, 314
- prosocial behaviors, 314
- oxytocin-vasopressin interactions and, 320
- regulation by oxytocin and vasopressin, 313
- central actions, 313
- peripheral actions, 313
- regulation of, 312
- stimulus intensity, 311
- survival and, 309
- threats and, 311
- vasopressin effects on, 318
- animal research, 318
- central synthesis and release, 319
- human research, 320
- hypothalamic-pituitary-adrenal (HPA) axis, 318
- finches, 114
- flocking, 114, 118
- gregariousness in, 117, 118

- finches (*cont.*)
- group sizes, 114
 - grouping behavior, 118
 - territorial, 114
 - territorial behavior, 118
- fish, 75
- aggression in, 88
 - behavioral effects of vasotocin in, 85
 - changes in vasotocin neuronal phenotypes, 83
 - in females, 83
 - in males, 83
 - isotocin neuroanatomy in, 77
 - isotocin neuronal phenotypes, 91
 - nonapeptides, 76
 - reproductive strategies, 79
 - steroid sensitivity of vasotocin phenotypes, 84
 - vasotocin neuroanatomy in, 77
- flank marking, 131, 213. *See also* aggression behavior, 214
- gonadal steroids and, 220
 - norepinephrine and, 218
 - onset of, 218
 - seasonal variation, 225
 - serotonin and, 219
 - testosterone and, 220
 - vasopressin and, 213
 - chemical signals, 218
 - neuroanatomy, 216
 - pharmacology, 214
- flocking finches, 114, 118
- G proteins, 36
- Gallus gallus*, 112
- gamma-hydroxybutyrate (GHB), 272, 276, 277
- garden doormouse, 13
- generalized anxiety disorder (GAD), 319
- generosity, 335
- G_iα proteins, 33
- gigantocellular cells, 77, 79
- glucocorticoid receptor interacting protein 1 (GRIP1), 11
- glucocorticoid receptors, 102
- glucocorticoids, 102
- glycopeptide, 4
- golden hamster, 13
- goldfish, 91, 118
- gonadal hormones, social learning of food preferences and, 246
- gonadal steroids, 7
- aggression and, 220
 - flank marking and, 220
 - in anuran amphibians, 101
 - oxytocin and, 7
 - oxytocin regulation and, 9
 - vasopressin and, 7
 - vasopressin regulation and, 10
 - vasotocin and, 101
- GPER, 10
- grass pufferfish, 91
- gray treefrog, 98
- greater Egyptian jerboa, 13
- green treefrog, 99
- gregariousness, 117
- group living, in primates, 294
- guinea pig, 13
- Gymnotus omarorum*, 86, 87
- habituation, 233
- habituation–dishabituation paradigm, 233
- half-spotted gobies, 84
- hamsters, 13
- aggression in, 130, 199
 - territorial behavior in, 130
- high anxiety-related behavior (HAB), 29, 30, 158
- Homo economicus*, 350
- hormonal modulation, 293
- hormone replacement, 11
- hormone response element (HRE), 4
- horseradish peroxidase (HRP), 217
- human parent–infant interactions, 170, 171
- human-specific parasites, 256
- Hyla cinerea*, 99
- Hyla versicolor*, 98
- hypothalamic–pituitary–adrenal (HPA) axis, 160, 313, 314, 318, 320, 347
- immediate early gene (IEG), 37, 115
- immune responses, 264
- infections, 264
- inositol-1, 4, 5-triphosphate (IP3), 33, 44
- intense world theory, 369
- intercellular signaling, 33
- intergenic region (IGR), 3
- interleukin-6, 14
- intermale aggression, 30
- intracellular signaling
- AVPR-mediated, 37
 - in somatic cells, 37
 - pathways, 35

- intracerebroventricular (ICV) injections, 152, 165
 behavioral effects of, 185
 maternal experience and, 185
- isotocin, 77
 distribution in fish, 77
 neuronal phenotypes, 91
- Jaculus orientalis*, 13
- Japanese macaques, 288
- Japanese red-bellied newt, 104
- JNJ-17308616, 319
- killifish, 86
- knockout mouse, 137, 201
- lactating dams, 29
- lactation, 156
- Lasipodomys brandtii* (Brandt's vole), 11
- lateral septum (LS),
 vasotocin circuitry of, 115, 117
- Lincoln's sparrows, 113
- lipopolysaccharide (LPS), 260, 263
- lithium, 273, 279
- Lithobates catesbeianus*, 100
- Lonchura punctulata*, 114
- long-lasting long-term potentiation (L-LTP), 163
- low-anxiety-related behavior (LAB), 30, 158
- Lythrypnus dalli*, 91
- Macaca fasciculata*, 288
- Macaca fuscata*, 288
- Macaca mulatta*, 288
- Macaca nemestrina*, 294
- macaques, 288
 social behavior in, 142
- macroparasites, 256
- magnocellular cells, 79
- major histocompatibility complex (MHC), 258
- major urinary proteins (MUPs), 258
- mammals
 aggression in, 130
 characteristics of, 129
 mate-guarding in, 129
 maternal behavior in, 136
 monogamy in, 141
 non-monogamous mating systems in, 129
 oxytocin in, 136, 195
 African mole-rats, 140
 macaques, 142
 prairie vole, 137
 oxytocin receptor in, 196
 pair bonding in, 131, 137, 138
 partner preference paradigm, 132
 social behavior in, 131
 territoriality in, 130
 vasopressin in, 130, 195
 deer mice, 141
 hamsters, 130
 prairie vole, 135
 primates, 141
 vasopressin receptors in, 196
- Mandarin vole (*Microtus mandarinus*), 59
- marine gobies, 82
- marmoset, 13, 142, 288, 295
- masu salmon, 91
- mate choice copying, 244, 262
- mate guarding, 129
- maternal aggression, 29, 158, 159
- maternal behavior, 149. *See also* social behaviors
 anxiety, postpartum reduction of, 160
 lactation and, 156
 offspring directed, 156
 oxytocin activation of, 155
 in primates, 164
 in sheep, 136, 164
 oxytocin regulation of, 148
 in mouse, 162
 in prairie voles, 165
 in rats, 151, 153
 in rhesus monkeys, 166
 in sheep, 163, 183, 190
 postpartum activation of, 151
 vasopressin and, 29
- maternal defense, 29
- maternal hormone, 136
- maternal memory, 151, 161
- maternal paradigm, in rodent models, 194
- MDMA, 271
 5-hydroxytryptamine (5-HT) and, 272
 oxytocin and, 271
 prosocial action of, 271
 tolerance, 277
- meadow voles, 134
- medial amygdala, 259, 263, 317
- medial bed nucleus of stria terminalis (BSTm), 110, 111,
 119
 AVT cell group of, 112
 vasotocin circuitry of, 114, 115, 117

- medial preoptic-anterior hypothalamic area (MPOA-AH), 197, 220, 225
- melastatin-related transient receptor potential channel 2.
See TRPM2 channels
- melba finch, 114
- Melospiza lincolni*, 113
- Mesocricetus auratus*, 13
- mesotocin, 77, 97, 118
- messenger RNA, 9
- microparasites, 256
- Microtus mandarinus*, 59
- Microtus orchrogaster*, 13, 15
- mirror neurons, 344, 369
- mitogen-activated protein kinase (MAPK), 35
- monogamy, in primates, 142, 295
- mouse. *See also* mammals
knockout, 137, 201
maternal behavior in, 162
oxytocin receptor binding in, 15
- multihost parasites, 256
- Mus musculus*, 15
- negative reciprocity, 333
- Neolamprologus pulcher*, 82, 85
- neurophysin, 4, 288
- neutral cage paradigm, in rodent models, 194
- New World squirrel monkey, 288
- nicotine-stimulated neurophysin (NSN), 288
- nonapeptides, 76, 77
altruistic behaviors and, 350
avian social behavior and, 110
aggression, 119
social group sizes, 114
song modulation, 113
functional organization, 111
receptors, 112
- non-human primates, 288
adult attachment in, 295
aggression in, 297
brain areas containing AVP-ir bodies and AVP-ir fibers, 290
brain areas containing OT-ir bodies and OT-ir fibers, 291
early experience in, 297
genetics and heritability of AVP and OT in, 298
group living, 294
hormonal modulation of OT and AVP in, 293
monogamy in, 295
neuroanatomy of OT and AVP in, 288
brain, 288
pineal gland, 288
spinal cord, 288
OT and AVP in cerebrospinal fluid and plasma in, 292
oxytocin receptor in, 289
parental and alloparental behavior in, 296
sexual behavior in, 298
social behaviors, 294
stress in, 300
vasopressin receptors in, 289
norepinephrine, 218
nucleus accumbens, 273
- odors, 258
parasite and, 259
sexual responses and, 259
social responses and, 259
- off-spring directed behaviors, 156, 157, 183
- ontological effects, 64
- organizational effects,
behavioral effects, 58
categories, 60
early social environment and, 59
estrogen and, 60
historical perspective, 57
neonatal responses, 63
on estrogen receptors, 63
ontological effects, 64
oxytocinergic system and, 64
social deficit disorders and, 66
vasopressinergic system and, 65
ornithine vasotocin (OVA), 118, 168
- other-regarding behaviors, 350
- Otolemur garnettii*, 299
- owl monkey, 299
- oxytocin, 3, 4, 151
addiction and, 270
aggression and, 200
in humans, 202
agonists, 186
and human parental behavior, 170, 171
antagonists, 186
anxiety and, 309, 313, 314, 320
as maternal hormone, 136
autism spectrum disorders and, 367, 369, 372, 374
behavioral effects of, 58
blood-brain barrier and, 184
disruption, 155
effects on maternal behavior activations, 155
empathy and, 331

- fear and, 309
- fibers, 4–5
- gamma-hydroxybutyrate and, 272
- genes, 3
- gonadal steroid regulation of, 9
- immune function and, 264
- immunohistochemical analysis of, 51
- immunoreactivity, 11
- in brain, 148
- in human brain, 51
- in mammals, 136, 195
- African mole-rats, 140
- prairie vole, 137
- social behavior, 142
- in non-human primates, 141, 288
- hormonal modulation, 293
- mate choice copying and, 244
- maternal aggression and, 159
- maternal behavior and, 136, 148, 161
- in mouse, 162
- in primates, 164
- in rats, 151
- in sheep, 163, 164, 183
- off-spring directed behaviors, 157
- postpartum activation, 151
- neuromodulatory effects of, 189
- neuronal responses to, 31
- neurons, 4–5
- organizational effects of, 60
- pair bonding and, 137
- parental behavior and, 170
- pathogen threat and, 261
- pathways and processes controlled by, 34–35
- protein structure, 3
- psychopathology and, 351
- regulation of secretion, 44
- release of
- anxiolytic effect of, 30
- by extracellular application of cyclic ADP-ribose, 47
- during reproductive functions, 28
- from isolated nerve endings, 46
- social stimuli in, 28
- social stressors in females and, 29
- social stressors in males and, 30
- stress regulation and, 28
- TRPM2 channels and, 47
- sexual dimorphisms and, 10
- social behaviors and, 261
- social behaviors in human and, 344
- social learning of food preferences and, 245
- social recognition and, 234
- oxytocin gene knockout (OTKO) mice, 162, 235, 236
- oxytocin receptor (OTR). *See also* vasopressin receptors
- altruistic behaviors and, 351
- anxiety and, 36
- autism spectrum disorders and, 370
- birth experience and, 187
- cognition and, 36
- distribution, 5, 32
- gonadal steroid regulation of, 12
- hormone priming and, 187
- immunohistochemistry of, 169
- in mammals, 196
- in non-human primates, 289
- in primate brain, 289
- in voles, 138
- intercellular signaling in somatic cells and, 33
- intracellular signaling in brain and, 35
- location and overlap with OT release sites, 32
- maternal behavior and, 136
- maternal experience and, 187
- neuronal responses and, 31
- neuronal signaling and, 36
- radioligands for, 168
- selective antagonists for, 168
- sexual dimorphisms and, 14
- signaling properties of, 33
- structure, 5
- oxytocin receptor gene knockout (OTRKO) mice, 162, 235, 263
- oxytocinergic system, 64
- pair bonding, 131, 134, 137, 140
- panicolytics, 311
- parasites, 256
- parasitism, 256
- paraventricular nuclei (PVN), 4, 148, 167, 199, 201
- in birds, 111
- oxytocin release within, 28, 29, 31
- peripheral actions of OT and AVP in, 313
- parental behavior. *See also* social behaviors
- in human, 170
- in primates, 296
- oxytocin and, 170
- parturition, 28, 184
- passive avoidance, 311

- pathogen avoidance, 256
 immune responses, 264
 odor detection, 258
 pathogen threat and, 261
 sexual/social responses and, 259
 social behavior and, 261
 steroidal–neuropeptide interactions and, 263
Peromyscus californicus, 141, 198
Peromyscus leucopus, 198
Peromyscus maniculatus, 15
 perspective taking, 338
 pertussis toxin, 36
Phaseolus vulgaris-leucoagglutinin (PHAL), 217
 phasitocin, 77
Phodopus sungorus, 13
 phonotaxis behaviors, in amphibians, 102
Physalaemus pustulosus, 99
 pigtail macaques, 294
 pineal gland
 oxytocin in, 288
 vasopressin in, 288
Pithecia pithecia, 299
 plainfin midshipman, 81, 87, 91, 118
 plasma oxytocin
 and autism, 50
 in adult mice, 49
 in infant mice, 49
 in primates, 292
 in wild-type and Cd38 knockout mice, 46, 49
 plasma vasopressin, in wild-type and Cd38 knockout mice, 46
 Polyvagal theory, 274
Porichthys notatus, 118
 positive reciprocity, 332
 post-traumatic stress order (PTSD), 271
 prairie vole, 13, 63
 genetic variation in, 134
 maternal behavior in, 165
 oxytocin and, 165
 oxytocin receptor binding in, 15
 pair bond formation in, 131
 pair bonding in, 134, 137, 140
 social behavior in, 131
 social recognition in, 138
 vasopressin and, 135
 neuroanatomy, 131
 pharmacology, 131
 social behavior, 131
 vasopressin receptors and, 136
 wandering, 136
 preoptic area of hypothalamus (POA), 77, 110
 preprohormone, 4
 primates, 288
 adult attachment in, 295
 aggression in, 297
 brain areas containing AVP-ir bodies and AVP-ir fibers, 290
 brain areas containing OT-ir bodies and OT-ir fibers, 291
 early experience in, 297
 genetics and heritability of AVP and OT in, 298
 group living, 294
 hormonal modulation of OT and AVP in, 293
 macaques, 142
 marmoset, 142
 maternal behavior, 164
 monogamy in, 142, 295
 neuroanatomy of OT and AVP in, 288
 brain, 288
 pineal gland, 288
 spinal cord, 288
 OT and AVP in cerebrospinal fluid and plasma in, 292
 oxytocin and, 141
 oxytocin receptor in, 289
 parental and alloparental behavior in, 296
 sexual behavior in, 298
 social behavior in, 142, 294
 stress in, 300
 tamarins, 142
 titi monkeys, 142
 vasopressin and, 141
 vasopressin receptors in, 289
 progesterone, 247
 prosocial behaviors, 314, 331
 altruistic helping, 336
 charitable giving, 336
 empathy, 337
 generosity, 335
 negative reciprocity, 333
 positive reciprocity, 332
 reciprocity, 332
 trust, 334
 protein kinase C (PKC), 14, 33, 37, 44
 psychopathology, 351
 punning, 274
Pytilia melba, 114
 radioligands, 168
 rats, 11. *See also* mammals

- maternal behavior in, 151
- maternal separation in, 199
- oxytocin receptor binding in, 15
- vasopressin-immunoreactivity in, 13
- Reading the Mind in the Eyes (RMET), 339, 349
- reciprocity, 332
- recognition behavior, 190
- release of oxytocin
 - anxiolytic effect of, 30
 - by extracellular application of cyclic ADP-ribose, 47
 - during reproductive functions, 28
 - from isolated nerve-endings, 46
 - social stimuli in, 28
 - social stressors in females and, 29
 - social stressors in males and, 30
 - stress regulation and, 28
 - TRPM2 channels and, 47
- release of vasopressin
 - during intermale aggression, 30
 - during reproductive functions, 29
 - social stimuli in, 28
 - social stressors in males and, 30
- repetitive behaviors, 374
- resident-intruder paradigm, in rodent models, 194
- retinoic acid receptors (RARs), 356
- retinoid X receptors (RXRs), 356
- retinoids, 356
- retinol, 356
- rhesus monkeys. *See also* primates
 - maternal behavior in, 166
 - OT and AVP neurons in, 288
- river pupfish, 88
- rock-pool blenny, 84
- rodents. *See also* mammals
 - aggression in, 193
 - agonistic behavior, 193
 - maternal paradigm in, 194
 - neutral cage paradigm in, 194
 - resident-intruder paradigm in, 194
- rough-skinned newt, 103
- ryanodine receptor (RyR), 52
- Saimiri sciureus*, 288
- saki monkeys, 299
- Scharrer, Ernst, 27
- Scotinomys xerampelimus*, 15
- selective serotonin reuptake inhibitors (SSRI), 273
- serotonin
 - aggression and, 223
 - agonistic behavior and, 203
 - flank marking and, 219
- sex hormones, social recognition and, 240
- sexual behavior, 298
- sexual dimorphisms, 11
 - oxytocin and, 10
 - oxytocin receptor and, 14
 - vasopressin and, 12
 - vasopressin receptors and, 15
- sheep. *See also* mammals
 - birth experience, 187, 188
 - bonding behavior, 190
 - hormone priming in, 187
 - localization of oxytocin and receptors in brain, 186
 - cells and processing ex, 187
 - cells, fibers and terminals, 187
 - overlap between regions, 187
 - maternal behavior, 163, 164, 183, 190
 - maternal experience, 187
 - off-spring directed behaviors, 183
 - oxytocin release in specific brain regions, 188
 - behavioral effects of, 188
 - neuromodulatory effects of, 189
 - parturition, 184
 - recognition behavior, 190
 - social behavior, 183
 - suckling, 184, 188
- singing mouse, 15
- single nucleotide polymorphisms (SNPs), 370
- sneaker phenotype, 81, 91
- social behaviors
 - early social environment and, 59
 - in amphibians, 97
 - courtship behaviors, 103
 - gonadal and adrenal steroids, 101
 - phonotaxis behaviors, 102
 - social stress, 347
 - vasotocin and, 97
 - vocal behaviors, 97
 - vocalization sites and mechanisms, 98
 - in birds, 110
 - in human
 - altruism, 350
 - empathy, 348
 - mirror neurons, 344
 - nonapeptides, 350
 - other-regarding behaviors, 350
 - oxytocin and, 344
 - vasopressin and, 345

- social behaviors (*cont.*)
 in non-human primates, 294
 adult attachment, 295
 group living, 294
 monogamy, 295
 parental and alloparental behavior, 296
 in sheep, 183
 nonapeptides and, 110
 oxytocin and, 261
 vasopressin and, 261
social deficit disorders, 66, 372
social discrimination, 234
social environment, 59
social learning, 242
 oxytocin and, 245
 vasopressin and, 245
social recognition, 138, 232
 habituation–dishabituation paradigm, 233
 oxytocin and, 234
 sex hormones and, 240
 social discrimination paradigm, 234
social stimuli, 28
social stressors, 347
 in females, 29
 in males, 30
 vasopressin and, 347
social transmission of food preferences (STFP), 243
 gonadal hormones and, 246
 oxytocin and, 245
 vasopressin and, 245
social transmission of food preferences (STFP), 243
sociogenomics, 343
sociosexual behavior, 60
somatic cells
 AVPR-mediated intracellular signaling in, 37
 intercellular signaling in, 33
songbirds, 112, 113
spice finch, 114
spinal cord
 oxytocin in, 288
 vasopressin in, 288
staurosporine, 45
steroids, vasotocin phenotypes and, 84
stress, 60
 in non-human primates, 300
 oxytocin release and, 28
 regulation of, 28
Sturnis vulgaris, 112
substance P, 77
suckling, 28, 184
supraoptic nuclei (SON), 4, 148
 in birds, 111
 oxytocin release within, 28
 peripheral actions of OT and AVP in, 313

Taenopygia guttata, 110
tamarins, 142
Taricha granulosa, 103
territorial behavior. *See also* social behaviors
 in hamsters, 130
 in mammals, 130
 vasopressin and, 129
territorial courtship, 82
territorial finches, 114, 118
testosterone
 agonistic behavior and, 203
 flank marking and, 220
 in AVPR1a regulation, 14
 in OTR regulation, 14
tetrahydrocannabinol (THC), 277
theory of mind, 367
three-spined sticklebacks, 84, 91
titi monkeys, 142, 296, 299
tocinoic acid, 152
Trier Social Stress Test (TSST), 347
trimethylthiazoline (TMT), 161
TRPM2 channels, 47, 52
true individual recognition, 232
Tscherskia triton (greater long-tailed hamster), 11
tungara frogs, 99

Uraeginthus angolensis, 114
Uraeginthus granatina, 114
urodele amphibians. *See also* amphibians
 avitocin control of social behavior in, 103
 courtship behaviors, 103

vagal motor nucleus (VMN), 79, 83
vaginocervical stimulation (VCS), 164
vasopressin, 3
 aggression and, 197
 drug exposure effects, 221
 in humans, 200
 anxiety and, 309, 313, 318, 320
 as antidiuretic hormone, 130
 autism spectrum disorders and, 369
 behavioral effects of, 58
 fear and, 309

- fibers, 5
- flank marking and, 213
- genes, 3
- gonadal steroid regulation of, 10
- immune function and, 264
- in mammals, 130, 195
 - deer mice, 141
 - hamsters, 130
 - prairie vole, 135
 - primates, 141
- in non-human primates, 288
 - hormonal modulation, 293
- neuronal responses to, 31
- neurons, 5
- nonapeptides, 77
- pathogen threat and, 263
- pathways and processes controlled by, 34–35
- prairie vole and, 135
- protein structure, 3
- regulation of secretion, 44
- release of
 - during intermale aggression, 30
 - during reproductive functions, 29
 - social stimuli in, 28
 - social stressors in males and, 30
- sexual dimorphisms and, 12
- social behaviors and, 261
 - in human, 344
- social learning of food preferences and, 245
- social recognition and, 237
- territorial behavior and, 129
- vasopressin receptors, 37. *See also* oxytocin receptor (OTR)
 - distribution, 6, 32
 - gonadal steroid regulation of, 14
 - in mammals, 196
 - in meadow voles, 134
 - in non-human primates, 289
 - intracellular signaling in somatic cells and, 37
 - location and overlap with AVP release sites, 32
 - neuronal responses and, 31
 - prairie vole and, 136
 - sexual dimorphisms and, 15
 - signaling properties of, 33
 - social behavior in voles and, 133
 - social recognition and, 238
 - structure, 6
 - subtypes, 5
- vasopressinergic system, 65
- vasotocin, 77, 79
 - aggression and, 98, 119
 - behavioral effects of, 85
 - changes in neuronal phenotypes, 83
 - distribution in fish, 77
 - gigantocellular cells, 79, 80
 - in BSTm, 111
 - in dorsal motor vagus, 77
 - magnocellular cells, 79
 - mRNA expression in, 79
 - neuronal phenotypes, 79
 - receptors, 101
 - social behaviors in amphibians and, 97, 100
 - courtship behaviors, 103
 - gonadal and adrenal steroids, 101
 - phonotaxis behaviors, 102
 - vocal behaviors, 97
 - vocalization sites and mechanisms, 98
 - song modulation and, 113
- ventral tegmental area (VTA), 150, 157
- ventrolateral hypothalamus (VLH), 225
- ventromedial hypothalamus (VMH), 12, 61
- ventromedial nucleus (VMN), 149
- violet-eared waxbill, 114
- virgins, social defeat of, 29
- vocal behaviors, 97
- vocal pattern generator, 98
- vomer nasal organ (VNO), 259
- white-crowned sparrows, 113
- white-footed mouse, 198
- white-throated sparrows, 113–114
- xestospongins C, 45, 46
- zebra finch, 110
 - group sizes, 114
 - social group sizes, 114
- zebrafish, 88
- Zonotrichia albicollis*, 113–114
- Zonotrichia leucophrys*, 113
- zoonotic parasites, 256