

Index

- 5HT_{2A} receptors, *see* neurotransmitters, serotonin, 5HT_{2A} receptors
- Abulia, Abraham, 149
- addiction, divided self and, 161
- afterlife, belief in, 87
- agency. *see also* self
 belief in supernatural agents and, 46–47, 140
 classification of language by encoding of, 211
 concept of, 64–67
 decentering and, 23–24, 30–32, 34–39, 44, 48, 221
 dialogic self and, 63–64
 diminution in sense of, 34–39
 dreaming and loss of, 169, 187
 effects of religious rituals on, 174
 group agency in enterprise associations, 229, 232–233
 as key to religiosity, 63, 72
 PPF and, 19
 religious language and, 209–212
 role of subcortical structures, 55
 schizophrenia and, 61, 71, 93, 198
 supernatural agents as cause of displacement, 178
 surprise events and reduction in, 25–28
 tendency to {see} everywhere, 61, 62, 93, 198
- akrasia, 69
- Amanita muscaria mushrooms, 89
- amygdala
 degeneration in FTD, 105
 hyperreligiosity and, 102–103, 105, 107
 memory and, 83
 religiosity in TLE and, 102–103, 105
 REM sleep and, 50
 salience network and, 112
 sex differences, 12
- anatomically modern humans (AMH)
 advent of behavioral modernity, 90, 209
 evolution of REM and decentering, 48–53, 81
 features of brain evolution, 37–38, 49
 interaction with existing hominin populations, 37, 49, 74, 76, 78, 79, 90
- ancestor worship, 87
- ancestral group formations, 225–226
- ancient Greeks, 125
- animism, 87, 225
- anterior cingulate cortex (ACC)
 FTD and, 108
 group doctrine and, 234
 neuron clusters, 35, 108
 psilocybin effects, 132
 reasoning about God's beliefs and, 123
 role in attentional and executive control, 77
 role in error monitoring and reflective processing, 96, 124
 salience network and, 112
 sense of self and, 162
 surprise as expectation violation and, 30
- anterior insula, 18
- anterior insular cortex (AIC), 35, 104, 108, 162
- anxiety buffering theory, of supernatural agents, 180–181
- anxiety disorders, 11
- archaeological evidence, of men's secret societies, 226
- arts, ritualization and, 191
- atheistic religions, and belief in supernatural agents, 7
- atonia, REM sleep and, 42, 80, 187
- attachment theory, of supernatural agents, 181–183
- attention-deficit hyperactivity disorder (ADHD), 11
- autism spectrum disorders, 11, 35
 gaze avoidance, 198
 religiosity and, 61–62
 vs schizophrenia spectrum disorders, 197–199
 stereotypies, 198
- autobiographical memory, 54
- autoscopy, 148
- ayahuasca, 125, 136–138, 140, 141, 168, 205

- basal ganglia, 113, 199, 215, 217
- bear ceremonialism, 190, 201
- behavioral modernity
 - language and the advent of, 209
 - REM sleep and the birth of, 90
- behaviors, ritualization of, 191
- belief updating process
 - role of REM sleep, 29–30, 169
 - role of surprise, 24, 25
- biocultural approach to religion, 13–15
- bipolar disorder, 70, 116
- brain
 - drivers of evolutionary development, 74–78
 - effects of serotonergic psychedelics, *see* psychedelics
 - evolution of, 37–38
 - assumptions concerning, 9
 - evolutionary impact of human domestication, 75–76
 - initial studies on brain and religion, 97–98
 - language precursors, 209
 - regions associated with religious experiences, 119–123
 - sex differences, 12
 - small world architecture, 23, 36–37, 41, 44–45, 64
 - structures supporting the sense of self, 72
- brain disorders, sex differences, 11
- brain injury. *see also* right hippocampal atrophy/ damage
 - religious experiences and, 116–119, 124, 150
 - and religious language, 216
- brain networks, and small group doctrine, 234
- Broca's area, 5, 92, 217
- Brodmann's Area 10, 82
- Buddhism, 7
- Campanian Ignimbrite Eruption, 49
- Catal Huyuk, Malta, 201
- cataplexy, 42, 81, 156
- central executive resources, decentering/surprise
 - events and reallocation of, 26
- cerebral torque, 92
- childhood, 13, 68, 75, 93, 120
- choice, 66, 70
- coalitional behavior, 16, 44
 - sex differences, 195–197
- cognitive science, 4E framework, 15–16
- conceptual blending theory (CBT), 220
- conceptual metaphor theory (CMT), 219–220
- conflict. *see also* genetic conflict
 - intra-genomic, 12
- contention scheduling system, 199
- conversion, religious, 167–169
- Copan, Honduras, temple complex, 204, 205
- counterfactuals, function, 28
- creativity
 - dreams and, 42, 84
 - role of in the decentering process, 41–43
 - schizophrenia and, 91, 110
- credibility-enhancing displays (CREDs), 77
- cultural evolution
 - brain evolution, drivers of, 74–78
 - dependence on social learning behaviors, 77
 - executive control network development
 - and, 76
 - role of REM sleep, 78–90
 - schizophrenia and, 90–93
 - self-domestication hypothesis, 72, 75–76
- culture, evolution of, assumptions
 - concerning, 9
- death, and transformative experiences, 175–177
- decentering
 - agency and, 23–24, 30–32, 34–39, 44, 48, 209, 221
 - concept of, 21, 23, 212
 - creativity and, 41–43
 - dreams and, 29–30, 169, 212, 236
 - enterprise associations and group agency, 229
 - evolution of, 48–53
 - four stages of, 23–24, 30–32
 - cultural scripts and reconstruction of the ego, 40–43
 - diminution in sense of agency/self, 34–39
 - reconstruction of self-concept and reassertion of executive control, 43–48
 - self-concept transferred into suppositional liminal space, 39–40
 - and generation of supernatural agents, 33–34
 - glossolalia and, 213
 - hippocampus and, 41
 - and interaction between individual and group, 236
 - key cognitive elements, 47–48
 - mechanics of, 23
 - metaphor and, 220
 - mounting evidence for, 24
 - pivotal mental states and, 33
 - relationship to religion, 33, 39
 - religious language and, 212–215, 218
 - role of pattern detection, 27–28
 - speech acts and, 213–215, 218
 - supernatural agents and, 178
 - surprise and, 24, 25
 - transformation of the self and, 21
- default mode network (DMN)
 - anatomy, 18
 - counterfactual support, 56
 - decentering and, 45–46

- down-regulation of, 34, 35
 dysfunction in, 71
 effects of psychedelic agents, 132–134, 157
 ego dissolution and, 133
 evolution of the modern human brain and, 37–38
 and evolutionary pressures for self-control, 76
 inhibition of and transfer of self-concept into liminal space, 39–40
 likely mediation of self-transcendent experiences, 96, 124
 LSD and, 133
 narrative self and, 54
 participating structures, 18, 80, 82
 psilocybin and, 132
 religious group assessment and, 234
 REM sleep and, 72, 80
 role in changes in religiousness, 123
 salience tagging and, 77
 schizophrenia and, 112
 sense of self and, 162, 168
 social brain and, 72
 social brain overlap, 18
 social/executive self and, 55
 subsystems, 82
 supporting structures, 72
 Deictic Space Theory, 210
 Denisovans, 74
 dialogic self, 63–64
 and genetic conflict, 163
 and transformative experiences, 162–167
 Dieri peoples, 206
 diffusion spectrum imaging (DSI), 36
 dimethyltryptamine, 125
 discrepancy reduction process, 69, 159
 disinhibition, 44, 105–106, 108, 157
 dissociation, 31, 42, 78, 149
 dissociative identity disorder, 70
 divided self, *see* self
 divine kingship, 7, 200–207
 ancestral roots, 228
 the bear hunt and, 201
 sacrifice and, 203, 205–208
 dlPFC (dorsolateral prefrontal cortex), 117–119, 150
 DMT (dimethyltryptamine), 125, 127, 131, 139–140, 154–155
 dopamine
 ritualization and, 199–200
 role in support of religiosity, 200
 dopaminergic signaling, 95
 doppelgänger, 149
 dorsal medial prefrontal cortex, 18
 Dostoevsky, Fyodor, 103
 double, 148–149, 220
 dreams, 25, *see also* REM sleep
 aggression in, 51
 Bulkeley's "Big Dreams" argument, 185
 creativity and, 42, 84
 cultural evolution and, 78–79
 death and, 176–177
 decentering and, 29–30, 169, 212, 236
 dreaming and loss of agency, 169, 187
 lucid dreaming, 42, 81
 overhaul of rigid inadequate priors in, 151
 phenomenology overlap with psychedelics, 157
 self transformation and, 42
 shamanism and, 90
 simulations of social interactions, 85, 187
 supernatural agents and, 179, 184–188
 transformative experiences and, 169–171
 types of "big dreams", 185
 typical experience, 186
Drosophila melanogaster, 59
 dyslexia, 11, 111
 ecstatic experiences
 encounters with supernatural entities and, 130, 149
 OBEs, 149
 seizures, 103–105, 149–150
 temporal cortex associated with, 124
 trigger, 149
 ecstatic Kabbala tradition, 148
 ego, cultural scripts and reconstruction of, 40–43
 ego dissolution
 associated brain regions, 134
 psychedelics and, 35, 132–136, 169
 egocentric behavior, 106
 enterprise associations, 228–229
 brain networks and, 234
 creation and characteristics, 226
 group agency, 229, 232, 233
 religious evolution and, 233–237
 structure, 229–232
 entheogens, 46, *see also* hallucinations
 entity encounters
 during OBEs, 149
 neurology of psychedelic-induced encounters, 140–144
 epilepsy
 religiousness in, initial studies, 98
 temporal lobe epilepsy (TLE)
 ecstatic seizures, 103–105
 and hyperreligiosity, 98–105
 and Kluver–Bucy syndrome, 101
 Minakata Kumagusu, 98–99
 mystical experiences and, 157

- excessive daytime sleepiness, 42, 81
 executive control network, development of, 76
- facial recognition, 18
 flashbulb memories, 194
 fMRI (functional magnetic resonance imaging), 2, 30, 121–123, 131, 132, 217
 Frazer, James George, 200
 Free Energy Principle, 19, 134
 free riders, 72
 Freud, Sigmund, 176, 177, 192
 frontal-parietal network (FPN), 108
 activated by religious subjects, 120
 effects of psychedelic agents, 132–133
 genetic background, 59
 potential impact of disabling, 118
 role in changes in religiousness, 123
 schizophrenia and, 71, 112
 social self and, 54
 frontoinsular cortex, 132
 frontotemporal dementia (FTD), 35
 and hyperreligiosity, 105–107
 functional imaging techniques
 fMRI, 2, 30, 121–123, 131, 132, 217
 PET, 106, 119–120, 131
 SPECT, 109, 119–120
 fusiform gyrus, 18
- Gallas peoples, 206
 genetic conflict. *see also* sexual conflict
 Crespi and Badcock's theory, 61
 dialogic self and, 163
 Haig on, 58–60, 67
 glioma, self-transcendence after neurosurgery, 150, 169
 glossolalia, 120, 213
 dlPFC damage and, 150
 Göbekli Tepe, Turkey, 201, 226
 God
 anthropomorphized conceptions, 183
 attachment theory and, 182
 belief in modulated by down-regulation of pMFC activity, 119
 belief in USA, 180
 concept preferences in ASD, 62
 conceptual metaphor theory and, 219
 cross-domain mapping, 219–220
 parts of the brain involved in reasoning about, 8, 121–123
 praying to comparable to normal interpersonal interaction, 121
 God spot, repudiation of the search for, 2, 4
 'Golden Bough, The' (Frazer), 200
 group effects
 ancestral group formations, 225–226
 characteristic groupishness of religion, 223–224
 enterprise associations, 228–229
 brain networks and, 234
 creation and characteristics, 226
 group agency, 232–233
 religious evolution and, 233–237
 structure, 229–232
 individual vs group relations, 224–225
 language evolution and, 224–225
 male groups, 226–228
 preservation of lore, 228
 rites of passage, 227–228
 oxytocin and social affiliation, 17, 236
 self-esteem, identification with a group and, 224
- Haig, David, 58–60, 67
 hallucinations
 auditory, 92
 hypnagogic, 42, 81
 hallucinogens, 90, 126, 205
 heautoscopy, 149
 Hebrew Bible, 219
 hippocampal formation, 18, 80, 82
 hippocampus. *see also* right hippocampal atrophy/damage
 communications between the cortex and during sleep, 83
 decentering and, 41
 degeneration in FTD, 105
 dreamlike experiences elicited by direct electrical stimulation, 157
 effects of psychedelic agents, 133
 involvement in memory functions, 18, 80, 83
 nonREM sleep and, 83
 place in the DMN, 18, 82, 156
 potential impact of REM sleep deprivation, 84
 reconstruction of the ego and, 41
 religiosity in age-rated atrophy, 107
 religiosity in FTD and, 106, 122
 religiosity in TLE and, 108, 122
 REM sleep and, 80, 83, 218
 'salience hypothesis' for hyperreligiosity and, 107–108
 TLE and, 102
 Homo erectus, 209
 Homo habilis, 209
 Homo neanderthalensis, 209, *see also* Neanderthals
Homo religiosus, 48, 53
Homo sapiens, 38, 48, 50, 52–53, 111
 homosexuality, 12
 Hood's mysticism scale, 147
 Hopewell shamanism, 87–90

- hormones, masculinization and, 11
- human sacrifice, ritual and, 203, 208
- hunter-gatherer societies
- all male groups, 226, *see also* male groups
 - group formation, 225–226
 - religious beliefs and behaviors study, 86
 - religious consciousness of ancestral hunter-gatherer groups, 225–226
 - self-domestication hypothesis, 76
 - typical size of a hunter-gatherer group, 16
- Huntington's disease, 215
- hypergraphia, 98, 101, 106
- hypermorphosis, 75
- hyperreligiosity
- frontotemporal dementia and, 105–107
 - neurological explanations of, 107–109
 - OCD and, 113–114
 - related neuropsychiatric disorders, 116–119
 - salience hypothesis, 107–108
 - temporal lobe epilepsy and, 98–105
- hypnagogic hallucinations, 42, 81
- hyposexuality, 101–102
- hypothalamus, 132
- ideal self, *see* self
- Ignatius of Loyola, 173
- imagination, 34, 48, 110, 181
- ineffability, and religious language, 221–222
- inferior parietal lobe (IPL)
- connection with the salience network, 118
 - place in the DMN, 18, 80
 - role of in enhanced religiousness, 118, 120
 - self-transcendence and, 118, 168–169
- initiation ceremonies, 227–228
- insula, 18, 95, 121
- internal agents, 65, 67, 163
- ipseity, 70–71
- irritability, 101, 106
- Islamic mystical practices
- nafs as Islamic equivalent of self, 171–172
 - Shaqiq al-Balkhi on transformation of the nafs, 172–173
 - Sūfism, 171–173
- isolated sleep paralysis (ISP), 148
- James, William, 146
- on the varieties of religious experience, 97–98
- Jamesian-Stace list of mystical experiences, 146–147
- kava, 205
- Klüver–Bucy syndrome, 101
- k-selected reproductive strategies, 9, 12
- Kullback–Leibler divergence (DKL), 30
- kykeon, 125
- language
- brain-related precursors, 209
 - schizophrenia and the evolution of, 92, 111
 - types of languages, 211
- lateral temporal cortex (LTC), 18
- learning, role of REM sleep, 83–85
- left-sided peri-sylvian region, role in speech act processing, 215
- life history theory, 10, 13
- Lindow Moss, England, 203
- liturgy, *see* religious language
- lore, preservation of by men's secret societies, 228
- LSD (lysergic acid diethylamide), 125, 133, *see also* psychedelics
- lucid dreaming, 42, 81
- “magic mushrooms”, 125, *see also* psilocybin; psychedelics
- magical thinking, and ritual, 200
- male groups, 226–228
- and masks/masking, 226–227
 - preservation of lore, 228
 - rites of passage, 227–228
- Mayan kings, 208
- medial prefrontal cortex (mPFC)
- activity patterns in Christian vs non-religious participants, 122
 - decentering role, 34, 37, 40, 43
 - mystical experiences and, 134, 147, 157–158
 - place in the DMN, 36, 80, 82, 157, 162
 - potential impact of right hippocampal atrophy, 157
 - prayer and, 121, 217
 - psychedelics and, 35
 - reflecting on God's level of involvement with the world and, 122
 - REM sleep and, 218
 - role in error monitoring and reflective processing, 96, 124, 162
 - sense of self and, 72, 82, 121
 - sex differences, 12
- meiotic drive, 59
- memory, role of REM sleep, 42–43
- mentalizing
- role of in supernatural agent cognition, 62–63
 - schizophrenia and problems with, 91
- metaphor, and religious language, 219–221
- Minakata Kumagata, 98–99
- Minakata mandala, 99
- mind, 4E framework, 15–16
- mirror neurons, 18
- modal verbs, in Christian prayers, 215
- mushrooms, 89, 99, 125, *see also* psychedelics
- music, 32, 103–104, 221
- ritualization and, 191

- mystical experiences, 145
 - defining, 146–147
 - dIPFC damage and, 150
 - east-west interactions and, 147
 - ecstatic seizures, 149–150
 - existing neurological data, 147–150
 - Hood's mysticism scale, 147
 - ineffability, 221–222
 - Jamesian-Stace list, 146–147
 - near death experiences (NDE) model, 152–155
 - out of body experiences, 148–149
 - parietal-prefrontal damage and, 150
 - PPF model, 150–152
 - prevalence of supernatural agents in, 146, 147
 - psychedelics and, 156
 - REM sleep and, 148, 156–158
 - RPL damage and, 117, 150
- narcolepsy, 42, 78, 156
 - and REM sleep, 80–81
 - symptoms, 42, 80
- narrative self, 54, 71, 133
- Neanderthals, 37, 49, 52–53, 74, 76, 78, 79, 90
- near death experiences (NDEs)
 - core features, 154
 - model of mystical experiences, 152–155
 - neurological basis, 153
 - prevalence, 152
 - and REM sleep, 154, 156
 - transformative experience, 175–177
- negative fitness covariance, 58
- neocortical volume, relationship with social
 - network size, 16
- neural crest, 75
- neurohormones, social brain and, 17
- neuroimaging
 - brain effects of psychedelics, 131–133
 - of religious affiliation, 107
 - of religious practices in healthy people, 119–123
- neurology of religious experiences
 - advances in neuroscience, 94–97
 - initial studies on brain and religion, 97–98
- neurology of speech acts, 215–217
- neuropsychiatric disorders, sex differences, 11
- neuroscience, as tool to study religion, 1–5
- neurotransmitters, serotonin. *see also* serotonin
 - 5HT_{2A} receptors
 - pivotal mental states and, 12
 - psychedelic experiences and, 20, 35, 110, 131–132, 134, 135
 - role in decentering process, 45
 - sex differences, 11
 - triggered by cultural mismatch, 236
- serotonergic psychedelics, *see* psychedelics
- Newgrange, Ireland, 201
- Nicotiana rustica*, 89
- obsessive-compulsive disorder (OCD)
 - anxiety compulsions, religious nature, 176
 - and hyperreligiosity, 113–114
 - positive symptoms, 39
 - religious language and, 210
 - ritualistic behaviors, Boyer and Liénard's model, 113
 - scrupulosity and OCD case studies, 114–116
- Ohio Hopewell culture, 87
- Ojibwa, 190
- Omaha tribe, 207
- orbitofrontal cortex, 105, 108, 113, 116, 132
- out-of-body experiences (OBEs)
 - entity encounters, 149
 - NDEs and, 152, 155
 - potential triggers, 149, 210
 - prevalence, 148
- oxytocin, and social affiliation, 17, 236
- paranoid schizophrenia, religious delusions
 - and, 17
- parietal-prefrontal damage, and mystical experiences, 150
- Parkinson's disease (PD)
 - neurology of speech acts and, 123, 215, 216
 - reduced access to religious concepts in, 123–124
- paternity uncertainty, 10–11, 58, 60
- pattern detection, role of in decentering process, 27–28
- Paul, St, 160–161
- Perpetua, 185
- pivotal mental states, and decentering, 33
- positron emission tomography (PET), 106, 119–120, 131
- possession by spirits, 138, 149, 202, 204–205
- possible worlds space, 20, 26, 30, 39, 218
- posterior cingulate cortex (PCC), 18, 36, 72, 80, 82, 132–134, 156
- posterior insula, 95
- posterior medial cortex, 122
- posterior medial frontal cortex (pmFC), belief
 - in God modulated by down-regulation of pmFC activity, 119
- posterior parietal cortex, 101, 168
- posttraumatic stress disorder (PTSD), 11
- PPF, *see* predictive processing framework
- prayer, 19, 183, 212
 - modal verbs in Christian prayers, 215
- neuroimaging, 119, 121, 217
- religious language and, 215, 217
- repurposing of error monitoring systems, 96
- scrupulosity and, 115–116

- precuneus
 characteristics, 36
 decentering role, 32, 34, 37, 39, 43, 104
 function, 18, 38
 ‘hub of hubs’ status, 108
 hyperreligiosity and, 107
 mystical experiences and, 133
 place in the DMN, 18, 34, 80, 82, 156, 168
 potential role in cultural evolution, 77
 prayer and, 121, 217
 psychedelics and, 35, 132
 reflecting on God’s level of involvement with
 the world and, 122
 religious cognition and, 19
 REM sleep and, 50
 salience network and, 112
 self-transcendence and, 169
 sense of self and, 55, 72, 162
 size in humans vs chimpanzees, 38
 structural core status, 36
- predictive processing framework (PPF), 19, 20, 24
 and development of a neurology of religious
 experience, 94–97
 divided self and, 57
 imperative to minimize “surprise”, 24
 PPF model of mystical experiences, 150–152
 the self and, 55–57
 and REM sleep, 72–73
 self transformation and, 161–162
 supernatural agents and, 178, 179
- prefrontal cortex (PFC), 38
 dopamine and religiosity, 200
 executive control and, 76
 hyperreligiosity and, 107–108
 predictive simulations role, 134
 processes implicated in, 19
 psychedelics and, 132
 religious experiences and, 95
 REM sleep and, 50, 82
 salience network and, 112
 sex differences, 12
- prestige-biased cultural learning, 77
- primary motor cortex, 67
- primates
 human sleep compared to other primates, 79–82
 ontogenetic ritualization in, 192
 sexual conflict in, 195
- Proteanism, 43
- psilocybin, 125, 127, 128, 131–133, 135, 157
- psychedelics
 and 5HT_{2A} receptors, 20
 anthropological and archaeological evidence
 of human use, 125–126
 comparison of psychedelic experiences with
 classic religious mystical experiences,
 128–129
 effects on DMN, 132–134, 157
 effects on FPN, 132–133
 effects on PFC, 132
 effects on precuneus, 35, 132
 effects on salience network, 132–133
 ego dissolution and, 35, 134–136, 169
 encounters with supernatural agents induced
 by, 126–127, 188–189
 atheists’ experiences, 126–127, 189
 examples of, 125
 facilitation of religious and spiritual
 experiences, 126–130
 increase in religiosity via disinhibition of
 REM physiology, 157
 link with religious experiences, 136–139
 mPFC and, 35
 mystical experiences and, 145
 NDEs and, 154, 155
 neuroimaging brain effects of, 131–133
 neurology of entity encounters on, 140–144
 phenomenology overlap with dreams, 157
 religious cognition and, 20
 serotonergic psychedelics, 1, 20
 brain effects, 130–134
 serotonergic psychedelics, brain effects
 claustrum/CCC model, 135
 CSTC model, 135
 explanatory hypotheses, 134–136
 REBUS model, 134
 small world neural architecture and,
 36–37
 psychological functioning, sex differences, 11
 putamen, 132
- randomness, in animal behavior, 43
- religion
 4E cognition and, 15–16
 biocultural approach, 13–15
 birth of, 52–53
 characteristic groupishness of, 223–224
 definition, 6–8
 evolution of
 assumptions concerning, 9
 and enterprise associations, 233–237
 initial studies on brain and, 97–98
 Moon on the reproductive-religiosity
 model, 9
 neuroscience as study tool, 1–5
 relationship of decentering to, 33, 39
 self-transformation functions, 174
 sexual conflict and, 9–13
 social cooperation as function of, 9,
 173–174
 as transformational technology, 20–22
 use of to find ways out of impossible/hopeless
 situations, 41

- religious ecstasy, 10, 103
- religious experiences. *see also* neurology of religious experiences
 - neuroimaging of, 119–123
 - social influences, 16–19
- religious language
 - agency and, 209–212
 - brain injury and, 216
 - characteristic features, 212–213
 - decentering and, 212–215, 218
 - defined, 209
 - Deictic Space Theory, 210
 - discourse functions of modal verbs in
 - Christian prayers, 215
 - formal character of language in rituals, 213
 - ineffability and, 221–222
 - metaphor and, 219–221
 - the self and, 217–218
 - speech acts, 213–215
 - illocutionary force, 214–215
 - neurology of, 215–217
- REM Behavior Disorder (RBD), 51
- REM sleep
 - active regions of the brain, 82–84
 - chemical environment, 170
 - creativity and, 84
 - critical for cumulative cultural evolution, 78–79
 - dissociated, 42
 - DMN and, 82
 - dreams, 85
 - evolution of, 48–53
 - human sleep compared to other primates, 79–82
 - and mystical experiences, 148, 156–158
 - narcolepsy and, 80–81
 - NDEs and, 154, 156
 - Neanderthal genes and, 78, 79, 82
 - overlap with social learning networks, 82–86
 - promotion of memory consolidation and
 - creativity, 42–43
 - role in the belief updating process, 29–30, 169
 - role of in learning, 83–85
 - schizophrenia's relationship with disruption of, 93
 - self, PPF and, 72–73
 - supernatural agents and, 184–188
 - tonic and phasic characteristics, 80
 - triggering of by surprise events, 25–27
 - typical dream experience, 186
 - visionary mystical religion and shamanism, 86–90
- reproductive effort, 13, 58, 75
- reproductive strategies
 - k-selected, 9, 12
 - sex differences, 11
- reproductive-religiosity model, 9
- retrosplenial cortex, 18, 80, 82
- right hippocampal atrophy/damage
 - communication with SAs and, 155
 - effects on salience network, 157
 - and enhanced religious and mystical experiences, 99, 101, 105, 106, 117, 118, 128–129
 - hyperreligiosity and, 145
- right parietal lobe (RPL)
 - damage to and mystical experiences, 117, 150
 - decreased function associated with increased senses of closeness to a transcendent being, 116
 - self-transcendent experiences, 117
- right-sided prefrontal regions, role in speech act processing, 215
- rites of passage, 227–228
- ritual
 - archaeological evidence, 203–205
 - ASD vs schizophrenia, 197–199
 - Call and Tomasello on, 192
 - characteristics, 191–194
 - concept of, 190
 - cultural subgroups of religion's key rituals, 193
 - depiction in prehistoric rock art, 206
 - divine king phenomenon and, 200–202
 - divine kings as SAs, 202–205
 - facilitation of transformative experience, 174–175
 - formal character of language, 213
 - Frazer on, 200
 - Humphrey and Laidlaw on, 193
 - involving mind altering substances, 202
 - Liénard and Boyer on, 113, 191–192
 - magical thinking and, 200
 - McCauley and Lawson on, 194
 - Murdock on coalitional behavior, 195
 - narrative and myth of ritualization, 200–202
 - neurology of ritualization, 197–200
 - ontogenetic ritualization in primates, 192
 - Rappaport on, 191
 - religious centers, 201
 - ritualistic behaviors in OCD, 113, 191–192
 - ritualization process, 190–191
 - sacrifice and, 203, 205–208
 - sexual conflict and, 194–197, 207–208
 - shamanistic and visionary forms of, 196
 - signaling behavior, 191–197, 207–208
 - speech acts, 213
 - types
 - doctrinal mode, 193
 - imagistic mode, 193
 - special patient rituals, 194
 - Whitehouse on, 193
 - Wilyaru ceremony, 206–207
- r-selected reproductive strategies, 10

- salience network
 - connections with FPN, 118
 - effects of psychedelic agents, 132–133
 - effects of right hippocampal atrophy, 157
 - ego dissolution and, 133
 - interconnectivity patterns, 112
 - response to expectation violation, 30, 122
 - role in changes in religiousness, 123
 - salience hypothesis for hyperreligiosity, 107–108
 - schizophrenia and, 71, 112–113
 - the self and, 54
- Santa Claus, 7
- schizophrenia
 - aberrant saliency hypothesis of, 112
 - vs ASD, 197–199
 - auditory hallucinations, 92
 - creativity and, 91
 - cultural evolution and, 90–93
 - divided self and, 70–71
 - heritability of, 110
 - hyperreligiosity and, 109–113
 - cultural variations, 110
 - evolutionary explanation, 110–112
 - negative symptoms of, 91
 - positive symptoms of, 90
 - relationship with REM disruption, 93
 - religiosity and, 61–62
 - religious delusions and, 17
 - religious language and, 210
 - salience network and, 71, 112–113
 - and the evolution of language, 92, 111
 - transformative self and, 164–165
- scrupulosity, 113–114, *see also* obsessive-compulsive disorder (OCD)
- segregation distortion, 59
- seizures, ecstatic, 103–105, 149–150
- self, 54–57
 - 4E paradigm and, 55
 - agency and, 64–67
 - aspects of, 54–55
 - breakdowns in, 69–70
 - dialogic self, 63–64
 - and transformative experiences, 162–167
 - diminution in sense of, 34–39
 - divided self, 57
 - genetics of, 57–63
 - medical perspective, 161
 - schizophrenia and, 70–71
 - social cooperation and, 71–72
 - transformative experiences and, 160–161
 - executive, 54
 - ideal self
 - decentering and, 25, 47, 73, 151, 236
 - ideal future self theory, 67–69
 - religion's role in promoting, 9, 159, 165
 - religious conversion and, 168
 - and susceptibility to mystical experience, 143
 - narrative self, 54, 71, 133
 - neurological basis of the sense of unified self, 162
 - PPF and REM sleep, 72–73
 - religious language and, 217–218
 - supporting brain structures, 72
 - theories on religion's transformative functions, 173–174
 - transformation of the, 20–22
- self-concept
 - reconstruction of, 43–48
 - transfer into liminal space, 39–40
- self-domestication of human species,
 - evolutionary impact on brain physiology, 72, 75–76
- self-esteem, identification with a group and, 224
- self-transcendence, before and after
 - neurosurgery, 118, 150, 168–169
- self-transcendent experiences (STEs), 168–169
- semantic memory, 30, 41, 77, 83, 194, 216
- serotonin, 35, 50, 132, 134, 170, *see also under* neurotransmitters
- sexual conflict, 10
 - coalitional behavior and, 195–197
 - Moon on the reproductive-religiosity model, 9
 - in primates, 195
 - and religion, 9–13
 - ritualization and, 194–197, 207–208
- shamanism, 78, 86–90, 225
 - definition of, 87
 - evolutionary emergence, 86–90
 - relationship with schizophrenia, 92
 - schizotypal traits and, 228
- signaling behavior, 191–197, 207–208
- simulation
 - divided self and, 57
 - the self as, 55–56
- sleep apnea, 11
- sleep deprivation, 34
- sleep paralysis, 81
- small world brain architecture, 23, 36–37, 41, 44–45, 64
- social brain
 - Dunbar's hypothesis, 16
 - evolution of, 72
- social cooperation
 - divided self and, 71–72
 - as driver of brain evolution, 74–76, 78
 - as function of religion, 9, 173–174
 - ritualization and sexual conflict, 195–197, 207–208
 - role of agency, 67
- social groups, sex differences, 17
- social identity theory, 224, 234

- social learning networks, REM sleep's overlap with, 82–86
- soma, 125
- somatic effort, 13
- special agent rituals, 194
- SPECT neuroimaging, 109, 119–120
- speech acts
- and decentering, 213–215
 - defining, 213
 - illocutionary force, 214–215
 - neurology of, 215–217
 - in rituals, 213
- spirit possession, 138, 149, 202, 204–205
- Stace, William, 146
- stone tool technologies, 76
- striatal-prefrontal dopaminergic anatomy, sex differences, 12
- stroke, religiosity and, 117, 150
- Sūfism, and transformative experiences, 171–173
- superior, 80
- superior frontal gyrus, 82
- superior temporal cortex, 80
- supernatural agents (SAs)
- anxiety buffering theory, 180–181
 - atheistic religions and belief in, 7
 - attachment theory, 181–183
 - characteristics and features, 8
 - counterintuitive concepts and, 184
 - decentering and generation of, 33–34
 - divine kings as, 202–205
 - epistemic properties of religious beliefs involving, 7–8
 - examples of, 141, 179
 - mental representations of, 183
 - modern age belief in, 179
 - NDEs and, 152–153
 - neurology of psychedelic-induced encounters, 140–144
 - prevalence in mystical experiences, 146, 148
 - psychedelics and, 126–127, 188–189
 - atheists' experiences, 189
 - religious cognition's reference to, 178
 - REM dreams theory, 184–188
 - 3D mind model and, 183–184
 - ubiquity of belief in, 6, 179–180
- supervisory attentional system, 199
- surprise
- cognitive evolutionary model, 24–25
 - mystical experiences and, 151
 - role in the belief updating process, 24, 25
 - triggering of PGO waves and REM intrusion by, 25–26
- temporal lobe epilepsy, *see* epilepsy
- temporo-parietal junction, 55, 104, 121, 217
- temporopolar region, 121, 217
- terminal lucidity, 152
- terror management theory (TMT), 176, 181
- testosterone, 11, 17
- thalamus, 132
- theory of group mind (ToGM), 233
- theory of mind (ToM)
- enterprise associations and, 233
 - prayer and activation of areas related to, 121, 217
 - religious cognition and, 19
 - social cognition and, 93
 - supernatural agents and, 8
- Theravada Buddhism, 7
- 3D mind model, and supernatural agents, 183–184
- tobacco, 89
- torque effect, 111
- Tourette's syndrome, 11
- transformative experiences
- conversion, 167–169
 - death and, 175–177
 - dialogic self and, 162–167
 - divided self and, 160–161
 - dreams and, 169–171
 - as function of religious rituals, 174–175
 - having a child, 159–160
 - Islamic mystical practices, transformation of the self, 171–173
 - liminal space and, 175
 - PPF and self transformation, 161–162
 - RPL damage and, 169
 - self-transcendent experiences, 168–169
 - theories on religion's self-transformation functions, 173–174
 - transformative self, 165–166
 - types of religiously informed transformative experiences, 159
- Tud island, Torres Straits, 206
- United States, prevalence of belief in the supernatural, 179
- unknown unknowns, 20–21, 178, 221–222, 237
- vasopressin, 17
- ventromedial prefrontal cortex (vmPFC), 18, 32, 38, 82, 123
- von Economo neurons (VENs), 35, 107–108
- Wernicke's area, 92, 217
- Wilyaru ceremony, 206–207
- Wolbachia, 59
- working memory, 5, 18, 68
- Xavante peoples, 212
- Zohar, 219