

INDEX

- abdominal ganglion, 51, 55
 abstract thinking, 17
 acetylcholine (ACh), 9, 11, 32, 128, 138–39
 acetylcholinesterase (AChE), 11
 action potential, x–2, 9–10, 12, 51, 53, 56–58, 66, 68,
 74–76, 90–91, 95, 147, 166
 conduction of action potential, 7
 generation of action potential, 6
 active zone, 10, 54–55, 57, 59
 activity-dependent presynaptic facilitation
 (ADPF), 68–69
 adenosine triphosphate, 57, 67–68, 78
 adenylyl cyclase, 57, 67–68, 78, 138
 adrenal glands, 206
 adrenaline, 9, 32, 120
 alertness, 133, 139
 alphaCaMKII, 126
 Alzheimer's disease, 176, 182, 205
 amacrine cell layer, 203
 amacrine cells, 203
 amine, 9
 amino acids, 206
 AMPA receptor binding protein (ABP), 92
 AMPA receptors. *See* α -amino-3-hydroxy-5-methyl-4-
 isoxazole propionate
 amphetamines, 32
 amygdala, ix, xii, 18, 81, 180, 205
 basolateral, 122, 135
 central nucleus, 122, 128, 135
 fear, 119, 122–24, 126, 128
 lateral nucleus, 122–24
 taste, 133–35, 137, 139–40
 Anderson, P., 73
 angular gyrus, 18
 angular nucleus, 147, 149–51, 153
 anterior, 15–17, 20, 105, 122, 133,
 155, 165
 anterior commissure, 175
 anterior forebrain pathway, 187, 190
 anterior interpositus nucleus, 105
 anterograde tracer, 30
 AP5, 82
Aplysia, x, xi, xii, 49–51, 59, 62–63, 68–69, 75, 78,
 101, 114
 classical conditioning, 63
 habituation, 48, 53
 sensitisation, 55
 arachidonic acid, 78
 arachnoid layer, 14
 archistriatal gaze field (AGF), 156
 area F5, 194
 area X, 187, 191, 194
 arithmetic, 18
 Aschoff, J., 199, 201
 association, 39, 62, 79, 106, 112, 133, 140
 associativity, 78–79
 astrocytes, 2–3
 ATP. *See* adenosine triphosphate
 auditory, xii, 18, 120, 122–23, 143, 145, 147, 151,
 154–57, 162–66, 168–69, 175–76, 180, 187,
 191–92, 194–95
 auditory cortex, 18, 121–22, 143, 154, 164–65,
 167, 169–70
 auditory map, 156
 augmentation, 133, 140
 autophosphorylation, 77, 82
 Avian Brain Nomenclature Consortium, 20
 axoaxonic, 9
 axon, x–2, 5, 7–9, 11, 13, 23, 27, 30, 59, 72, 74, 88,
 91, 95, 103, 121–22, 151, 166–67, 175
 axon hillock, 11, 51
 axodentric, 9
 axosomatic, 9
 azimuth, 145–47
 babble, 186
 barn owl, 143–47, 149, 155
 basal ganglia, 187
 basilar membrane, 147, 163
 basket cells, 31, 102
 Bear, M., 94
 bicuculline, 135
 biosensors, 32
 bipolar cells, 203

- bipolar layer, 203
 birds own song, 191, 194–95
 birdsong learning
 behaviour, 186
 song system, 187
 bitterness, 132–33
 Bliss, T., 73
 blood-oxygen level dependent (BOLD), 25
 BOS. See birds own song
 boundary cells, 179
 brainstem, 16, 88, 102–3, 133
 Broca, P., 37, 185
 Broca's aphasia, 17
 Broca's area, ix, 17, 26, 194
 Brodmann, K., 17
- CA1, 82, 93, 95, 102, 110, 112, 174–75, 177–78
 Ca²⁺. See ion (calcium)
 CA3, 93, 102, 110, 112, 175
 calmodulin, 68, 77–78, 139
 CAMKII. See α -calcium-calmodulin-dependent protein kinase II
 cAMP. See cyclic adenosine monophosphate
 carbon monoxide, 78
 carboxylic acid, 9
 cardiovascular disorders, 201, 208
 Carew, T., 72
 caudal, 15
 cell adhesion, 59
 cell membrane, 3, 13, 31, 77
 central nervous system, 2, 69
 central sulcus, 16–17
 cerebellum, xi, xii, 14, 16, 18, 102, 105, 108, 110, 147, 205
 eye-blink conditioning, 103, 105–6
 long-term depression, 88, 90, 93, 97
 cerebral spinal fluid, 14, 32
 cerebrum, 16, 147
 CF, 160–61, 165, 168
 CF-CF, 167, 169
 CF-FM, 160–62
 c-Fos, 28, 133
 channel
 calcium, 10, 53, 57–58, 75, 91
 potassium, 5, 7, 57–58, 68
 sodium, 7
 channelrhodopsin, 31
 chemotopy, 133
 Chiroptera, 159
- cholesterol, 206
 choroid plexus, 15
 chronotherapy, 208
 chronotype, 208
 circadian rhythms, 199, 201, 203, 205, 208
 neural basis, 201
 Cl⁻. See ion (chloride)
 classical conditioning, xi, 40–41, 45, 62–63, 65–66, 69–70, 79
 climbing fibres, 88, 90, 102, 104, 106, 110
 clock genes, 202–3, 205
 CLOCK:BMAL protein complex, 202, 205
 CNS. See central nervous system
 cochlea, 143, 163–64
 cochlear apex, 163
 cochlear nucleus, 147, 150, 164
 cognition, 17
 colour, 18, 23, 28, 203
 complex field neuron, 155
 computerised tomography, 23
 conditioned stimulus (CS), 39, 103, 132–33
 cones, 203
 conjunctive cells, 179
 contralateral, 15, 26, 151, 153–54, 170
 COOH. See carboxylic acid
 cooperativity, 78
cornu ammonis. See CA3/1
 coronal, 15, 23, 174
 corpus callosum, 16, 23
 CRE (cAMP response elements), 205
 CREB. See cyclic AMP response element-binding protein
 cresyl violet, 28
Cry (Cryptochrome) gene, 202
 Cry protein, 202
 crystallised song, 187
 CSF. See cerebral spinal fluid
 Cuvier, G., 160
 cyclic adenosine monophosphate, 58, 67–68, 78, 138
 cyclic AMP response element-binding protein, 78, 82, 126, 138–39, 205
 cytoplasm, 137, 202
- DAG. See diacylglycerol
 de Mairan, J., 199
 declarative memories, 73, 181
 de-depression, 95, 97
 deep brain stimulation (DBS), 34
 delay lines, 151, 166–67

- delayed-tuned neurons, 165
 dendrites, 1, 9–13, 27–28, 78–79, 83, 88
 dentate gyrus, 73, 110, 174–75
 dentate nucleus, 102, 105
 dephosphorylation, 96–97
 depolarisation, 6, 69, 75–76, 83, 90, 95
 depotentiation, 82, 95, 97
 depression, 199
 Descartes, R., 38, 100
 desensitisation, 92–93
 detectability, 81
 DF. *See* dorsal fringe
 diabetes, 208
 diacylglycerol, 58, 90
 diffusion gradient, 4, 6
 diffusion tensor imaging (DTI), 23
 diurnal, 206, 208
 dopamine, 9, 32, 126, 138, 205
 Doppler effect, 162, 169
 Doppler shift, 161–64, 169–70
 Doppler shift compensation, 163
 Doppler, C., 162
 Doppler-shifted CF region, 169
 dorsal, 15, 122–24, 154, 179
 dorsal fringe, 165
Drosophila, 48
 DSCF. *See* Doppler-shifted CF region
 du Monceau, H-L, 199
 Dudek, S., 94
 dura mater, 14
- eardrum, 163
 echo, 162–66
 echolocation, xii, 159–60, 163, 169
 - behaviour, 162
 - distance information, 164
 - neural basis, 163
 - signal types, 160
 - velocity information, 167
- EEG. *See* electroencephalogram
 electroencephalogram, 33–34
 electrostatic pressure, 4
 elevation, 145–47, 154, 156–57
 emetic response, 132
 emotion, 18, 40–41, 72, 79, 118–19, 126, 185, 202
 endocytosis, 93
 entorhinal cortex, 73, 110, 174, 178, 181
 entrainment, 200–1, 203, 205–6, 209
- epilepsy, 33, 73, 98
 - temporal lobe epilepsy, 29, 180
- episodic memory, 20
 EPSP. *See* excitatory postsynaptic potential
Eptesicus, 160, 165
 ERK. *See* extracellular signal-regulated kinase
 ERPs. *See* event-related potentials
 evening people/owls, 208
 event-related potentials, 33
 excitatory postsynaptic potential, 11–12, 35, 51, 53, 57–58, 66, 68–69, 75–76, 88, 90–91, 93–95, 97
 exocytosis, 53
 extracellular, 3–4, 32, 35
 extracellular signal-regulated kinase, 126, 138, 196
 eye blink reflex, 38, 100–1
 eye-blink conditioning, 101, 108
 - behaviour, 101
 - cellular and molecular mechanisms, 108
 - cerebellar circuit, 103
 - electrophysiological mechanisms, 106
 - role of hippocampus, 110
- face cells, 34
 facial nerve, 133
 facial ruff, 144, 146–47, 157
 fastigial nucleus, 102, 105
 fear conditioning, 118, 120, 122, 124, 126
 - behaviour, 119
 - brain structures and circuits, 120
 - electrophysiological mechanisms, 123
- feeding buzz, 160–61
 FF area, 164–66, 168
 Field L, 154–57, 191–92
 FM, 160–62, 165
 FM-FM, 164–65
 fMRI. *See* functional MRI
 fornix, 175
 freezing behaviour, 122–23, 126
 Fried, I., 180
 frontal eye field, 156–57
 frontal lobe, 16–17, 21, 32, 37, 180, 185
 functional MRI, 25–26, 33
- GABA. *See* gamma-amino-butyric acid
 Galambos, R., 160
 gamma-amino-butyric acid, 10, 32, 102, 110, 128, 135, 140, 205
 Garcia, J., 131
 geniculohypothalamic tract (GHT), 205

- ghrelin, 206
 gill, 49, 51, 53, 55, 57–58, 63–64, 66, 101
 glial, 1–2, 11, 108
 globose nucleus, 102
 globus pallidus, 34
 glossopharyngeal nerve, 133
 glucocorticoids, 206
 glucose, 3, 25, 206
 GluR1 receptor, 92, 96–97
 GluR2 receptor, 92
 GluR3 receptor, 92
 GluR4 receptor, 92
 glutamate, 9–10, 32, 56, 58, 66, 68, 75–76, 78, 90–91, 93, 95, 97, 102, 138–39, 203
 glutamate receptor-interacting protein (GRIP), 92
 goal-directed behaviour, 178
 Golgi stain, 27
 G-protein. *See* guanosine triphosphate binding protein
 granular cell layer, 88
 granular cells, 88, 102–3, 175
 great tit *Parus major*, 176
 grid cells, 38, 178–79
 Griffin, D., 160
 guanosine triphosphate binding protein, 11, 57–58, 67–68, 75, 90
 gyrus, 16
- habenula, 205
 habituation, 48, 50, 55
 biochemical and molecular mechanisms, 52
 circuit and electrophysiological mechanisms, 51
 short- and long-term habituation, 53
 haemoglobin, 25
 halorhodopsin, 31
 harmonics, 161, 165, 168–69
 head direction cells, 178
 Hebb, D., 72–73, 78, 80, 88
 Hebb's law, 72
 Hebbian plasticity, 72
 hedonic shift, 133–35
 hemisphere, 14, 16, 18, 37, 73, 102, 105, 119, 185, 207
 Henry Molaison (HM), 37, 73, 181
 Hertz (Hz), 33
 heterosynaptic long-term depression, 90, 93
 HFS. *See* high frequency stimulation
 high duty cycle, 162
 high frequency stimulation, 75–76, 79–81, 95, 123
 higher vocal centre. *See* HVC
- hippocampus, ix, xi, xiii, 18, 20, 23, 28f3.4, 30f3.5, 28–31, 34, 37–38, 73, 97
 eye-blink conditioning, 102, 110, 112
 long-term depression, 93–94, 97
 long-term potentiation, 73, 81–82
 navigation, 174–76, 178, 180–81
 Hobbes, T., 38
 homeostatic drive, 207
 homosynaptic long-term depression, 90, 93–94
 horizontal, 15, 23, 25, 145–46, 151, 154, 156–57
 horizontal cell layer, 203
 horizontal cells, 203
 Hubel, D., 38
 Human Brain Mapping, 38
 HVC, 186–87, 189–92, 194
 hydrocephalus, 15
 hydrochloride acid (HCl), 132
 hyperpolarisation, 6
 hyperstriatum, 20
 hypertension, 208
 hypothalamus, 201, 205
 hypothalamus-pituitary-adrenal (HPA), 206
- IC. *See* insular cortex
 immunohistochemistry, 28
in situ hybridisation, 28
 incus, 163
 inferior colliculus, 120, 154, 164–67, 169
 inferior olive, 104, 106
 inferior parietal lobule, 18
 inferotemporal cortex, 34
 inhibitory postsynaptic potential, 12
 inositol triphosphate (IP3), 90
 input-specificity, 78–79
 instrumental learning, 39, 62
 insular cortex, 133, 137–40
 intensity difference, 146, 150, 156
 intergeniculate nucleus, 205
 internal clock, 199–201, 203, 205
 internalisation, 92–93, 97
 interneurons, 51, 55, 57, 63–64, 67, 69, 102, 166, 195
 interpositus nucleus, 105–8, 110
 intracellular, 3–4, 126
 invasive, 29
 invertebrate, x, xi, 51, 53, 72, 101, 185
 ion
 calcium, 10, 31, 53, 56–58, 66–68, 75–77, 82–83, 91–92, 96, 126, 139

- chloride, 4, 10, 31
 magnesium, 75–76
 potassium, 3–5, 7
 sodium, 3–7, 10, 31, 75–76, 91–93, 95, 97
 ionised calcium binding adaptor molecule 1 (IBA-1), 28
 ionotropic, 10–11
 ipsilateral, 15, 105, 151, 154, 170
 IPSP. *See* inhibitory postsynaptic potential
 Ito, M., 88
- jet lag, 201
 Jurine, C., 159
- K⁺. *See* ion (potassium)
 Kandel, E., xi, 49–51, 53, 55, 66, 72
 knee-jerk reflex, 100
 Knudsen, E.I., 144–45
 Konishi, M., 144–45, 154
 Kramer, G., 173
- L28, 55–56
 L29, 55–57, 63, 67
 lactate, 3, 32
 laminar nucleus, 150–51, 156–57
 landmarks, 29, 44–45, 172–73, 175, 177
 language, ix, xiii, 17–18, 26, 37–38, 73, 118, 143
 birdsong learning, 185–87, 190
 lateral entorhinal cortex (LEC), 175
 lateral geniculate nucleus, 203
 lateral hypothalamus (LH), 122, 133, 135
 lateral lemniscal, 151, 153, 157, 164
lateral lemniscus. *See* lateral lemniscal
 lateral magnocellular nucleus of the anterior
 neostriatum, 187, 190, 194, 196
 lateral mammillary nucleus, 178
 Leborge, 185
 LeDoux, J., 122
 leptin, 206
 lesion, ix, 23, 26, 29–30, 33, 105–6, 108, 110, 112,
 122, 135, 175, 189–92
 LFS. *See* low frequency stimulation
 LiCl. *See* lithium chloride
 ligand, 3, 10
 light/dark shuttle box, 45
 limited field neuron, 155–56
 lipid, 90
 lithium chloride, 134, 137–40
 LMAN. *See* lateral magnocellular nucleus of the
 anterior neostriatum
- localisation of function, ix, 186
 Lømo, T., 73
 London taxi drivers, 176
 long-term depression, 88–97, 101–2, 108
 long-term memories, 53, 65, 72–73, 77, 101, 190
 long-term potentiation
 cellular and molecular mechanisms, 75
 early LTP, 77
 electrophysiological mechanisms, 73
 late LTP, 78
 learning and LTP, 80
 maintenance of LTP, 76
 long-term sensitisation, 58
 Lorenz, K., 49
 low duty cycle, 162
 low frequency stimulation, 75–76, 79, 82, 90, 94–95
 LTD. *See* long-term depression
 LTP. *See* long-term potentiation
 Lynch, G., 93–94
- magnetic resonance imaging, 23
 magnetoencephalography, 26
 magnocellular nucleus, 147, 150–51, 157
 malleus, 163
 mantle, 49, 64–66
 MAPK. *See* mitogen-activated protein kinase
 Marler, P., 186
 marsh tit *Parus palustris*, 176
 massed training, 53
 master clock, 202, 205
 Maxim, H., 160
 maze, 40–43, 174, 178
 Barnes maze, 44
 elevated plus maze, 45
 radial arm maze, 44
 T-maze, 44
 water maze, 44, 81–82, 175
 Y maze, 178
- MEC. *See* medial entorhinal cortex
 medial, 15, 105, 122–23, 155, 165
 medial entorhinal cortex, 175, 178–79
 medial geniculate nucleus, 121
 medulla, 88, 102
 MEG. *See* magnetoencephalography
 megachiroptera, 159
 melanopsin, 203
 meninges, 14
 meningitis, 14
mesencephalicus lateralis pars dorsalis, 154–56

- metabotropic, 11, 75, 90
 Mg²⁺. See ion (magnesium)
 MGN. See medial geniculate nucleus
 microchiroptera, 159–60
 microdialysis, 32
 microglia, 2, 28
 midbrain, 121–22, 157
 migration, 172–73
 Mimosa plant, 199
 mirror neurons, 194
 mitogen-activated protein kinase, 78, 126, 196
 MLD. See *mesencephalicus lateralis pars dorsalis*
 molecular layer, 88, 103
 morning people/larks, 208
 Morris, R., 44
 Moser, E., M.-B., xiii, 38, 176, 178
 mossy fibres, 103, 105–6, 110, 175
 motif, 189
 motor, xi, xii, 20, 37, 44, 81, 100, 105, 118, 175–76, 187, 190, 195
 motor cortex, 17, 26, 81, 105, 187
 motor memory, 73
 motor neuron, 51–53, 55, 57–58, 63–64, 66, 68–69, 189
 MRI. See magnetic resonance imaging
 multiple sclerosis, 9
 muscimol, 135
 mustached bat, 163–65, 169
 myelin sheath, 1, 8
Myotis daubentonii, 160
Myotis L lucifugus, 165
- Na⁺. See ion (sodium)
 NAcb. See nucleus accumbens
 neocortex, 93
 neostriatum, 20
 neurogenesis, 176
 neuropeptide Y, 9, 205
 NH₂. See amine
 nidopallium caudal medial (NCM) nucleus, 190
 Nissl stain, 28
 nitric oxide, 78
 NMDA receptor 2B (NR2B), 82
 NMDA receptors, 82. See N-methyl-D-aspartate receptors
 N-methyl-D-aspartate receptors, 75–77, 82–83, 95–96, 126, 138–39, 190
 Nobel Prize, x, xi, xiii, 38, 83, 176, 202
Noctilio leporinus, 161
 node of Ranvier, 8
- non-associative learning, 62
 non-photoc stimuli, 205
 non-rapid eye movement (non-REM), xiii, 206
 noradrenaline, 126, 138
 norepinephrine. See noradrenaline
 NST. See nucleus of the solitary tract
 nucleus accumbens, 133–35, 178, 205
Nucleus Angularis. See angular nucleus
 nucleus interface (Nif), 192
Nucleus Laminiscus. See laminar nucleus
Nucleus Magnocellularis. See magnocellular nucleus
 nucleus of the solitary tract, 133
- O'Keefe, J., xiii, 38, 176–77
 obesity, 208
 occipital lobe, 16–18, 20–21, 34
 olfactory, 20, 175–76, 180, 205
 olfactory bulb, 205
 oligodendrocytes, 2, 8
 Olton, D., 44
 operant conditioning, 39–40, 45
 optogenetics, 31
 oscines (order passeriformes), 186
 owl, xii, 143
- pacemaker, 34, 201–3
 parahippocampal complex, 176, 179–81
 parallel fibres, 88, 90–91, 93, 103–4, 108
 parietal cortex, 121
 parietal infarct, 23
 parietal lobe, 16–17, 20–21
 Parkinson's disease, 32, 34
 path integration, 180
 pattern recognition, 62
 Pavlov, I., x, 38–40, 62–63, 132
 Payne, R., 144
 PBN. See pontine parabrachial nucleus
 peptide, 9
Per (Period) gene, 202
 Per protein, 202
 Per/Cry protein complex, 202–3
Per1 gene, 205
Per2 gene, 205
 perforant pathway, 73–74, 81, 175
 periaqueductal grey area, 122
 peripheral nervous system, 2, 72
 perirhinal cortex, 110
 personality, 17, 41, 73
 PET. See positron emission tomography

- phagocytosis, 2
 phase advance, 201
 phase delay, 201, 203
 phase-locking, 147, 149
 phospholipase C, 90
 phospholipid bilayer, 3–4
 phosphorylation, 57, 59, 68, 77–78, 92–93, 126, 202, 205
 photosensitive retinal ganglion cells, 203
 pia mater, 14
 Pierce, G., 160
 pituitary adenylate cyclase-activating protein (PACAP), 203
 pituitary gland, 205
 PKA. See protein kinase A
 PKC. See protein kinase C
 place cells, 34, 38, 176–81
 planning, 17, 20, 181
 plasticity, xi, 35, 83, 87, 89–90, 94, 96–97, 108, 110, 123, 126, 192, 207
 platelet-activating factor, 78
 PLC. See phospholipase C
 pontine nuclei, 88, 103, 105–6
 pontine parabrachial nucleus, 133–34
 positron emission tomography, 25, 33
 posterior, 15, 17, 33, 121, 151, 153, 176, 187, 190
 posterior descending pathway, 187
 posterior interpositus nucleus, 105
 postsubiculum, 178
 postsynaptic membrane, 10, 57–58, 66, 68, 74–78, 93, 95–97
 postsynaptic potentials, 74–75, 77–78, 81
 potassium dichromate, 27
 prefrontal cortex, 128, 194
 premotor cortex, 17
 presynaptic membrane, 10, 76, 95
 procedural memories, 73
 prosopagnosia, 18
 protein, 28–29, 31, 57–59, 67, 78, 80, 90, 92, 96, 108, 132, 202, 206
 protein channel, 3
 protein interacting with C kinase (PICK), 92
 protein kinase A, 68, 82, 126, 138
 protein kinase C, 58, 78, 90, 92–93, 126, 138
 protein phosphates, 96
 PSPs. See postsynaptic potentials
Pteronotus parnellii, 165
 puff of air, 101, 104–7, 110, 112
 pulse, 161–62, 164–66, 168
 pump, 3
 sodium-potassium pump, 5, 7, 9
 Purkinje cell layer, 88
 Purkinje cells, 88, 90–93, 102–8, 110
 Purkinje, J., 88
 PVN. See thalamus (paraventricular nucleus of thalamus)
 pyramidal cells, 3, 31, 175
 quinine, 132
 RA. See robust nucleus of the archistriatum
 radiation, 25, 131–32
 Ramon y Cajal, S., 37
 Ranck, J., 38, 178
 raphe nuclei, 205
 rapid eye movement (REM), xiii, 206
 reading, 18
 reflex, 48, 63, 100–1, 110
 refractory period, 7
 Reppert, S., 202
 resting membrane potential, 3, 6–7, 10, 13, 75
 retinal ganglion cells, 203
 retinal ganglion layer, 203
 retinohypothalamic tract (RHT), 203
 retrograde messenger, 78
 retrograde tracer, 30
 retrosplenial cortex, 178
Rhinolophus rouxi, 160, 164–65
 robust nucleus of the archistriatum, 187, 189–91, 194
 rods, 203
 rostral, 15, 133, 165
Rousettus, 159–60
 saccharin, 135, 137–39
 sagittal, 15, 23
 saltiness, 132
 Samuelson, R., 44
 saturation, 81, 95
 Schaffer collaterals, 93–95, 110, 175
 schizophrenia, 199
 Schnitzler, HU, 163
 Schwann cells, 2
 Schwartz, J., 72
 SCN. See superchiasmatic nucleus
 search coil, 145
 seizures, 29, 34, 37, 73, 180–81
 sensitisation, 48, 55, 65–66
 circuits, electrophysiological and biochemical mechanisms, 55

- sensorimotor, 46
 sensorimotor period, 187, 190, 192
 sensory neuron, 51, 53–59, 63, 66–69
 sensory-motor junction, 53, 55, 58, 63
 ser-831, 97
 ser-845, 97
 serotonin, 9, 56–58, 67, 128, 205
 Sherrington, C., 37
 shift work, 201, 208
 short-term habituation, 53
 short-term memories, 44, 53, 55, 58, 73, 76, 126, 138, 181
 short-term potentiation, 77, 79
 short-term sensitisation, 58
 siphon, 49, 51–52, 55–56, 58, 63–68
 Skinner, BF, 39, 45, 49
 sleep, xiii, 33, 199–200, 205–9
 SM (patient), 118–19
 Small, WS, 42–43
 smell, 20, 44
 social jet lag, 208
 sodium, 132, 134
 sodium cyanide, 132
 soma, 1, 7, 9, 11
 somatosensory cortex, 17, 121, 164
 somatosensory thalamus, 121
 sonar, 160
 songbird, xiii, 186, 190, 194
 sound intensity, 145
 sound localisation, 20, 143, 147, 150
 behaviour, 144
 neural circuit, 147
 spaced training, 53
 Spallanzani, L., 159
 spatial memory, 20, 174, 176, 181
 spatial navigation, xiii, 172
 spatial neglect, 18
 speech, 17–18, 185–86
 speed cells, 179
 spinal cord, 2, 16, 121
 spines, 78, 80
 spiral ganglion cells, 164
 staining, 26, 28
 stapes, 163
 stellate cell, 102
 stereotaxic frame, 29
 stress, 45, 118, 120
 striatum, 32, 93, 178
 stroke, 23, 208
 subarachnoid space, 14
 subiculum, 175, 179
 sub-song, 187
 substance P, 9
 subthalamic nucleus, 34
 sucrose, 134–35
 sulcus, 16
 superchiasmatic nucleus, 201–3, 205–6
 superior lobule, 17
 supramarginal gyrus, 18
 Sylvian fissure, 16, 18
 synaptic bouton. *See* synaptic terminal
 synaptic cleft, 1, 9–11, 13, 53, 74–76, 90, 95
 synaptic plasticity, 73, 88, 190
 synaptic terminal, 1, 7, 9–10, 53, 56–58, 67–68, 90–91
 synaptic transmission, 9
 synaptic vesicles, 9, 53–55, 58–59, 68

 tag, 79
 Tan, 185
 taste aversion, 131–35, 137
 behaviour, 131
 brain circuit, 132
 neural changes following conditioning, 133
 temporal lobe, 16–18, 20–21, 34, 110, 122, 143, 174, 186
 test, 45
 forced swim test, 46
 open field test, 45
 social interaction test, 46
 tail suspension test, 46
 thalamus, 20, 30–31, 175, 205
 anterodorsal nucleus of thalamus, 178
 auditory thalamus, 121–23
 dorsolateral thalamus, 187
 lateral dorsal nucleus of thalamus, 178
 paraventricular nucleus of thalamus, 134, 206
 rostral thalamus, 178
 somatosensory thalamus, 121
 Thorndike, E., 39, 62
 Thorpe, W.H., 186
 threshold, 6, 8, 11–12, 77–78
 timing difference, 147, 149–50, 156–57
 Tinbergen, N., 49
 TMS. *See* transcranial magnetic stimulation
 Tolman, E., 40–41, 43
 tonotopic, 18, 143, 145
 tool making, 20

- touch, 17, 105, 160
 tracing, 30
 transcranial magnetic stimulation, 26
 transforming growth factor-beta (TGF-beta), 59
 transverse, 15
 trigeminal nerve, 104
 trough, 144, 146
 tumour, 15, 23, 26, 29
 24-hour period, 202–3, 205, 207
 2-deoxyglucose, 25
Tyto alba. See barn owl
Tytonidae, 143
- ubiquitin, 59
 umami, 132
 unconditioned stimulus (US), 39, 104, 132–33
- V4 (visal area), 18
 vagus nerve, 133
 ventral, 15–16, 121, 124, 154, 179
 ventral fringe, 164–65
 ventral pallidum (VP), 135
 ventral tegmental area, 205
 ventricles, 14–15
 vermis, 102
 vesicles. See synaptic vesicles
 vestibulocochlear nucleus, 103
 VF. See ventral fringe
- view cells, 180
 visual, 9, 17–18, 20, 23, 38, 143, 156, 175–76, 178, 180–81, 203
 visual agnosia, 18
 voltage-dependent calcium channel. See calcium channel
 Von Frisch, K., 49
- Watson, J., 43
 Wernicke, C., 37, 186
 Wernicke's aphasia, 18
 Wernicke's area, 18, 186
 Wiesel, T., 38
 Wiltschko, W., 173
 withdrawal response, 50–51, 53, 55, 63, 65–66, 69
 working memory, 17, 25, 44–45
 writing, 18
- X-ray, 23
- zebra finch, 186–87, 190, 192
Zeitgeber, 201
 zif-268 protein, 191
- α -amino-3-hydroxy-5-methyl-4-isoxazole propionate, 75–77, 90–93, 95–97, 108, 126
 α -calcium-calmodulin-dependent protein kinase II, 77, 82–83, 96, 139