
Index

- Adjacency rule, 130–132
Affordance, 202–204, 206–207, 210, 212
AI. *See* Artificial intelligence
Allman, John, 124, 134–135
Aristotle, 22, 110
Artificial intelligence, xii–xii, 4, 11–12, 33, 44, 65, 78, 168–169
Autonomy of the special sciences, xv, 139, 153–156

Baillarger’s Law, 137
Basic concepts, 199–202. *See also* Metaphor
Batterman, Robert, 54, 140, 158–161, 164
Bechtel, William, 48–49, 139
Bickle, John, 139, 143
Block, Ned, 14–15, 17, 20, 170
 and Fodor on multiple realizability, 23, 27–28, 30, 32–33, 44, 59, 65
 on the problem of the inputs and outputs, 172–174, 182, 221
Body neutrality
 and embodied conceptualization, 191, 196–197, 200–201, 204, 206, 211, 213
 and embodied thought, 188–190, 213
 in relation to the separability thesis, 182–184, 186, 212, 225
 as suggested by mind-as-computer view, 169, 170, 175, 181, 185

Brain, as understood in this book, 106
Brain–body relationship, 217–219.
 See also Damasio, Antonio; Brain in a vat
Brain evolution, 108–110, 135–136
Brain in a vat
 Damasio’s response to, 217–218
 and extended mind, 183
 relation to the separability thesis, 169, 225
 and sense-think-act cycle, 177, 181
Brain morphospace, 74–77
Brain wiring, 124–129, 165
Bridge laws, 141–144, 148–149, 156–157. *See also* Strong bridge laws
Brooks, Rodney, 176, 180–181
Burge, Tyler, 37

Cascading convergence, 104, 108, 116–117, 121, 135
Causal inheritance principle, 40
Chalmers, David, 183, 214–215, 219–223
Cherniak, Christopher, 130–131
Circumstantial possibility. *See* Possibility, circumstantial
Cladism, 108
Clark, Andy, 175, 180, 183, 214–215, 219–224
Cognitive science, 166, 168–170, 172, 175, 180–182

- Component placement, 129–132, 134
- Conduction speed, 132–134
- Connectivity, 71, 125–129
- Consciousness, 228–229
- Constitutivity thesis, 36, 38–39, 40
- Constraints, 66, 69, 86, 165–166, 228–229
- on bodies, 167–168
 - on brain wiring, 124–129
 - on component placement, 130–132
 - on conduction speed, 132–133
 - and convergent evolution, 103–104, 107, 109, 116–117, 121
 - and the evaluation of multiple realizability thesis, xiv, 84
 - in evolutionary processes, 11–12, 79
 - historical, 79–87, 109–110, 123, 135
 - on image-forming eyes, 94, 95, 98, 99, 107
 - on mammalian homeostasis, 87, 90, 92, 102–103
 - on sensory systems, 110–120
 - and topographic maps, 123–124
 - and trends in brain evolution, 135–137
 - universal, 79–87, 109–110, 135
- Convergence. *See also* Cascading convergence
- as evidence for the mental constraint thesis, 30–32, 107–108, 119, 165, 228
 - and the eye, 103–104, 99
 - neural, 107–108
 - relevance to the multiple realizability thesis, 28–31, 59, 66–67, 97, 103–104, 108, 119, 137, 165, 228
 - and topographical organization, 123
 - and trends in brain evolution, 137
- Convergent evolution. *See* Convergence
- Conway Morris, Simon, 73
- Copeland, Jack, 176
- Core realization. *See* Realization, core
- Corkscrews
- and their multiple realizability, 46–51, 56, 161–162
 - and R-properties, 53–58, 67
- Cricket ears, 189
- Cummins, Robert, 20, 45, 52
- Damasio, Antonio, 190, 214–220
- Dawkins, Richard, 219–220
- Design, natural vs. engineered, 11–12, 79, 83–84
- Diffraction, 97, 99
- Dimensioned view of realization. *See* Realization, dimensioned view of
- Disparity, 187–188
- Dretske, Fred, 77
- Dualism, 3–4, 13
- Searle’s charge against functionalism, 172
- Dumais, Susan, 204–205
- EC. *See* Embodied cognition research program
- Embodied cognition research program, xii, xv, 168–170, 228
- and embodied thought, 191
 - as opposed to functionalism, 172, 174–175
 - its response to body neutrality and envatment, 181–185
 - and the separability thesis, xiii, 185, 225
- Embodied conceptualization, 183–185, 190–191, 213
- and language comprehension, 202, 211
 - and the Turing Test, 194
- Embodied mind thesis, xi–xiii, xv, 167–169, 225, 227
- and Damasio, 219
 - and embodied conceptualization, 202
 - and envatment, 224
 - support for, 181–182, 184, 191, 212
 - and the Turing Test, 195

- Embodied thought, 182–186, 191, 213
 and Damasio, 215
 in perceptual abilities, 187–191
 Embodiment, xv, 170, 174, 177, 190, 228
 EMT. *See* Embodied mind thesis
 Eņ, Berent, 68, 139
 Entity-bounded realization. *See* Realization, entity-bounded
 Envatment, 169, 183, 225
 and Damasio, 215–219
 and the extended mind, 220–221, 224
 and the sense-think-act cycle, 175, 181
 relation to the separability thesis and the embodied mind thesis, 182, 184
 its support for the separability thesis, 213
 Evolution. *See also* Convergence; Design, natural vs. engineered of brains, trends in, 135–137
 and constraints, 78–84
 of mammalian homeostasis, 90, 92–93
 and the tape of life, 10–11, 105–106
 Extended mind
 Clark and Chalmers’s defense of, 219–222
 Damasio’s defense of, 215–219
 as response to envatment, 183–185, 212
 Wilson’s defense of, 222–224
 External generalizations, 163–164
 Externalism, 37–38
 Eye, constraints on its evolution, 94–104, 107, 138
 Fernald, Russell, 95, 101–103, 107, 116
 Finlay, Barbara, 135
 Fissurization, 137
 Flat view of realization. *See* Realization, flat view of
 Focal length, 100–101, 103–104, 107, 116
 Fodor, Jerry, 13, 169
 and Block on multiple realizability (*see* Block, Ned, and Fodor on multiple realizability)
 and functional analysis functionalism, 20–23, 45
 on irrelevance of neuroscience to psychology, 72
 on the reducibility of the special sciences, 6, 139–149, 151–154, 156–162
 Formal system, 171
 French, Robert, 191–197, 202
 Function
 as defining functional kinds, 47–48, 55
 in discussions of neural plasticity, 60, 63
 etiological, vs. Cummins, 45
 sense of in functional analysis functionalism, 20–21
 and structure, 77, 84, 122
 vagueness in descriptions of, 55, 68
 Functional analysis, 20–21, 45, 51–54, 58, 65, 67. *See also* Task analysis
 Functional analysis functionalism, 20, 23, 26. *See also* Functionalism
 Functionalism. *See also* Functional analysis functionalism; Turing machine functionalism
 and body neutrality, 170–175, 180, 188–189
 Functional isomorphism, 18–19
 Functional kinds, 44, 46–52, 55–57, 60, 67, 160, 166. *See also* Vagueness of functional kinds
 Generality principle, 145–146, 152
 Ghost in the machine, ix–xi, 4, 166, 227

- Gibson, James, 203–204
 Gillett, Carl, 35, 39–44, 55–57
 Glenberg, Art, 183, 202–212
 Gould, Stephen, 10, 79–80, 105, 135
- HAL. *See* Hyperspace analogue to language
 Harnad, Stephen, 205
 Hatfield, Gary, 52, 227
 Haugeland, John, 171, 177–180, 183, 213, 215
 Hering, Ewald, 227–229
 Historical constraints. *See* Constraints, historical
 Historical possibility. *See* Possibility, historical
 Homeostasis, 87–93, 102–103
 Homology, 28, 107, 137
 Homoplasy, 28–29, 107, 137
 Homunculus, 121–123
 Human auditory system, 189
 Human body, as understood in this book, 69, 71
 Human mind, as understood in this book, 69–70
 Human nervous system, as understood in this book, 69, 71
 Hyperspace analogue to language, 204–206
- Identity theory, 13–16, 24, 26, 175.
See also Type-identity theory
 Individualism, 36–38
 Internal generalizations, 163–164
- Jadeite, 147, 157, 163
 Jerison, Harry, 135–136
 Johnson, Mark, 196–202
- Kaas, John, 60, 62, 121, 128, 135
 Kaschak, Michael, 210
 Kemeny, John, 143, 148–149, 151
 Kemp, Thomas, 90–92. *See also* Homeostasis
- Kim, Jaegwon, 39–40, 139–140, 157–159, 161–164
- Lability (of brain), 59. *See also* Plasticity
 Lakoff, George, 196–202
 Land, Michael, 95–96, 100–103, 107, 116
 Landauer, Thomas, 204–205
 Language comprehension, 202–204, 206, 210–212, 225
 Latent semantic analysis, 204–207, 209
 Lateral inhibition, 119–120, 124
 Lens (of eye), 77, 85. *See also* Eye, constraints on its evolution; Convergence, and the eye
 Lewis, David, 16–18
 Lewontin, Richard, 135
 Lexical decision task, 192–193, 195–196
 Likelihood, xiv
 argument for the multiple realizability thesis, 23–27
 of the mental constraint thesis, 75, 123, 138, 165
 of the multiple realizability thesis, 10, 103, 111, 165
 technical meaning of, xi, 1–2
 Likelihood argument, 23–27, 30, 228
 Logical possibility. *See* Possibility, logical
 Loops of Henle, 89, 92–93, 232n7
 LSA. *See* Latent semantic analysis
 Lycan, William, 20, 52
- Mach, Ernst, 119
 Marr, David, 69
 Martin, Robert, 135, 137
 Matthiessen, Ludwig, 100–102, 107, 123
 Matthiessen's ratio, 100, 102–103, 116
 Maynard Smith, John, 79–80
 MCT. *See* Mental constraint thesis

- Mental constraint thesis, xi, xii, xiv, 2, 166–167, 227. *See also* Convergence, as evidence for the mental constraint thesis; Likelihood, of the mental constraint thesis
 depiction in morphospace of, 72, 75–77
 evidence for in the nervous system, 123, 129, 132, 137–138
 Metaphor, 196–202, 225
 Methodological solipsism, 169
 Microreduction. *See* Reduction, microreduction
 Mind. *See* Human mind
 Mind-as-program, 169–172, 174–175, 181, 185, 225
 Mind–body relationship, xi, 13. *See also* Sense-think-act cycle and the separability thesis, 166–169, 227–228 (*see also* Problem of the inputs and outputs)
 Mind–brain relationship. *See also* Ghost in the machine
 according to the identity theory, 5, 13–14
 and the mental constraint thesis, 166
 and the multiple realizability thesis, ix, xi, 3, 5
 according to Turing machine functionalism, 14
 Miller, George, 70
 Modularity, 71, 128–129, 132, 134, 136
 Morphospace, 72–76. *See also* Brain morphospace
 Morrell, Pierre, 132–133
 MRT. *See* Multiple realizability thesis
 Multiple realizability argument
 against reduction, 140, 143, 149, 151, 153, 157
 Multiple realizability thesis, ix–xiv, xiii, xiv, 1, 70–71
 conceptual arguments for, 13–23, 170
 constraints on, 83–86, 109, 124
 depiction in morphospace of, 72–77
 empirical arguments for, 23–33, 44 (*see also* Likelihood, argument for the multiple realizability thesis)
 as an empirical thesis, 8–9, 78–79
 evaluating the evidence for, 48, 55, 67–68, 131–132, 134, 138, 228 (*see also* Convergence, and its relevance for the multiple realizability thesis)
 evidence for, xii (*see also* Likelihood, of the multiple realizability thesis) and neural plasticity, 59–60, 64–65
 its predictions about the mind–brain relationship, xi, 105, 110, 166, 227
 its relationship to the separability thesis and the embodied mind thesis, 167–168
 its scope, 6–13
 radical, 7–8
 SETI, 7–8, 12, 72
 standard, 7–8, 12
 terrestrial, 11–13, 74, 81–82
 weak, 7–8, 12, 72
 its significance, 3–6
 Mundale, Jennifer, 48–49, 139
 Myelin, 71, 132–134
 Nagel, Ernst, 143–144, 153, 157
 Nephrite, 147, 157, 163
 Neural convergence 107–108
 Newell, Allen, 170
 Newton, Isaac, 227–229
 Nilsson, Dan, 95, 98–99
 Nomological possibility. *See* Possibility, nomological
 Norton, William, 132–133
Ommatidia, 97
 Oppenheim, Paul, 143, 148–154, 156
 Parallax, 188–189
 Parsimony, 30

- Photon noise, 97–99
- Physical possibility. *See* Possibility, physical
- Physical realization thesis, 157–158
- Plasticity, 27, 44, 59–61, 64–65, 67.
See also Lability (of brain)
- Polger, Thomas, 7, 12, 72, 139
- Possibility, 8
circumstantial, 9, 12, 80 (*see also* Possibility, historical)
historical, 9, 12, 80 (*see also* Possibility, circumstantial)
logical, 8–9, 22–23, 78–79, 94, 101, 167
nomological, 8–9, 12, 33, 78, 80, 145 (*see also* Possibility, physical)
physical, 22, 78, 90, 165 (*see also* Possibility, nomological)
- Principle of causal individuation of kinds, 157–158
- Problem of the inputs and outputs, 173–175
- Property identity, 141, 144–146, 148, 150, 152–153, 156
- Putnam, Hilary, 37. *See also* Turing machine functionalism
and convergence, 30, 59
his likelihood argument for the multiple realizability thesis, 25–26, 44
and reductionism, 143, 147–156
- Pylyshyn, Zenon, 57, 72
- Qualia, 228–229
- Radical MRT. *See* Multiple realizability thesis, radical
- Ramsey, Frank, 18
- Rating Game, 193–194, 196
- Raup, David, 73, 75, 76
- Realization
constraints on, 86, 121, 123, 145, 165–167
core, 38, 222–224
differs from causation, 35–36
dimensioned view of, 42–44
entity-bounded, 223
and envatment, 213, 218
flat view of, 40, 42–43
Gillett's views on, 39–44, 57
sameness and difference in, 44–57, 67, 95, 160
standard view of, 39–43
total, 38, 222–224
wide, 223
Wilson's views on, 36–39, 222–223
- Receptive fields, 112–121, 134
- Reduction, xv, 5–6, 78, 165. *See also* Reductionism
and autonomy of the special sciences, 154–156
Fodor's conception of, 140–148
Kemeny and Oppenheim's conception of, 148–149
microreduction, 149–152, 155–156
Nagel's conception of, 157
Oppenheim and Putnam's conception of, 150–153
- Reductionism, 139, 140, 145, 152, 156. *See also* Reduction
- Refractive index, 99–103
- Relative depth, 187–188
- Renormalization strategy, 159–160
- Ringo, James, 125–129, 131
- Robertson, David, 205–209
- R-properties, 52–60, 65–68, 86
of brains, 105, 108, 111, 121, 124, 137
and consciousness, 229
as dimensions of brain morphospaces, 76
of eyes, 95
as related to the autonomy of the special sciences, 155–156
and the renormalization strategy, 159–161
- Ryle, Gilbert, ix–x, 4, 227
- Save-wire principle, 130
- Schaffner, Kenneth, 143, 149

- Searle, John, xiii, 20, 171–172, 205, 221
- Sense-think-act cycle, 175–177, 180, 183
- Separability thesis, x–xiii, xv, 39, 167–169, 227–228
and envatment, 213, 218–219, 225
(*see also* Damasio, Antonio)
relation to body neutrality and envatment, 181–182, 184–186, 191, 212
and the Turing Test, 195–197
- SETI MRT. *See* Multiple realizability thesis, SETI
- Shakey, 176–177, 179–180, 213, 215, 218
- Shapiro, Lawrence, 53, 69, 139
- Shoemaker, Sydney, 38, 40
- Similarity judgments, 46–52
- Simon, Herbert, 170
- Sober, Elliott, 6, 20, 24, 139, 146, 155
- Somatic marker hypothesis, 190
- Specialization, 128–129. *See also* Modularity
- Special sciences, xv, 139–140, 144–145, 152–156, 162–164. *See also* Autonomy of the special sciences
- Spherical aberration, 100–101, 103
- Standard MRT. *See* Multiple realizability thesis, standard
- Standard view of realization. *See* Realization, standard view of
- Strong bridge laws, 143–148, 150–151, 156. *See also* Bridge laws
- Structure (vs. function), 77, 84
- Subcognitive associative network, 192–196
- Sufficiency thesis, 36, 38, 40
- Sulcal complexity, 71, 137
- Sur, Mriganka, 63–64
- Symbol grounding problem, 206
- Tape of life, 10, 105–106, 108–109, 135–136
- Task analysis, 51, 56–57, 67, 76, 82, 95, 160–161, 229. *See also* Functional analysis
- Terrestrial MRT. *See* Multiple realizability thesis, terrestrial
- Theory replacement, 149, 151
- Token identity, 5, 145
- Topographic maps, 71, 105, 121, 123–124
- Total realization. *See* Realization, total
- Turing, Alan, 170, 191–192
- Turing machine functionalism, 13–15, 18, 20, 26, 45, 170. *See also* Functionalism
- Turing Test, 191–192, 194–196, 202
- Type-identity theory, 4–6, 25. *See also* Identity theory
- Unification, 5–6, 143, 151–154
- Universal constraints. *See* Constraints, universal
- Universality, 158–161
- Vagueness of functional kinds, 47–52, 68
- Vogel, Stephen, 81, 83, 134
- Weak MRT. *See* Multiple realizability thesis, weak
- Wide mind, 222–223
- Wide realization. *See* Realization, wide
- Wilson, Robert
on extended mind, 214, 219–220, 222–224
on realization, 35–41