

## Index

- Acorn Computers, xiv, 151, 157–159  
 Adaptive optics, 46–47  
 AGI. *See* Artificial General Intelligence  
 AI. *See* Artificial Intelligence  
 Andromeda spiral, 39  
 Anti-trust, 149  
 Arborisation, 63  
 ARM, 157–159  
 Arrhenius, 89–90, 104  
 Artificial Intelligence, 159–161  
   Artificial General Intelligence, 144,  
   161–162  
 Astronomy, observational, 38  
 Athlete  
   female athletes, 31  
   number of Olympic athletes, 31  
 Atlantic Thermohaline Circulation, 95, 97  
 Axon, 62–63  
 Beetle  
   bark beetle, 109  
   bombardier beetle, 109  
   Namibian fog-basking beetle, 126  
 Bellona Foundation, The (Sweden), 129  
 Belyaev, Dmitri, 60  
 Big data, 154–155, 157  
 Biodiversity. *See* Diversity  
 Black hole, 48  
   massive spinning black hole, 48  
 Blanford, Henry, 90, 92  
 Brain  
   plasticity, 63, 65  
   shrinking of brain size, 60–61  
 Branching system, 119  
 Brightness illusion, 55  
 British Olympic Association, 26  
 Brittlestar. *See* starfish  
 Bush, George W., 133  
 CAD. *See* Computer-Aided Design  
 Caesar, Julius, 125  
 Capability  
   individual capability, 137  
   observational capability, 38  
   organisational capability, 142  
   productive capability. *See* production  
   technological capability, 142  
 Carbon dioxide, 89, 102, 108, 129  
 Caviar, 121  
 Cell  
   asymmetric distribution of cell-type  
   forming substances, 12  
   cell differentiation. *See* cell specialisation  
   cell nucleus, 13–14  
   cell replacement therapy, 15, 17–18  
   cell specialisation, 13, 16  
   cell specialisation reversal, 12–13, 18  
   cell transplantation, 17  
   daughter cell, 7, 11–12  
   nuclear transplantation, 13, 15  
   rejuvenated adult cell, 16–17  
   signalling between cells, 11  
 Choice blindness, 76  
 Circulation, atmospheric, 88, 94  
 CISC (Complex Instruction Set  
   Computer), 158  
 Civil unrest, 126  
   link with food price index, 126

## Index

- Climate  
 general circulation model, 96  
 internal variations, 90  
 seasonal variations, 91
- Climate change, 85, 89–90, 102–106, 125–126, 142  
 human-induced climate change, 86, 89, 102, 104
- Climatology  
 statistical climatology, 91
- Closed loop, 112, 119, 122
- Coase, Ronald, 137
- Coffee  
 spent coffee grains, 123
- Cognitive dissonance, 77–78
- Colour selection, 44, 50
- Complex Systems Institute (US), 126
- Complexity, 1, 56, 109  
 complexity of brain, 62  
 complexity of climate change models, 100  
 complexity of human psychology, 57  
 complexity of social environment, 64
- Computer, 143–145  
 4M machine, 151  
 BBC Micro, 151  
 EDSAC, 145–147  
 mainframe, 148  
 minicomputer, 149–150  
 personal computer, 151  
 Raspberry Pi, 152  
 six waves of computing, 148, 161  
 workstation, 151
- Computer-Aided Design, 150
- Condensation, 88, 92, 96, 128  
 freshwater condensation, 128
- Consciousness, 57, 74  
 stream of consciousness, 57, 73
- Consumer, 141–142
- Cosmic expansion. *See* Universe, expansion
- Creativity, 161
- CSP. *See* concentrated solar power
- Cuttle-bone, 116
- Cytoplasm, 8–9, 13
- Darwin, Charles, 58–59, 61, 69
- Dendrite, 62–63
- Deprivation  
 social, 66
- Desert, 125–126
- Desertification, 125–126
- Development  
 non-material aspects, 141  
 social, 66–67
- Development cycle, 28  
 decline phase, 28  
 growth phase, 28  
 learning phase, 28
- Diversity, 59, 122  
 biodiversity, 130
- Domestication, 59–61, 66
- Doppler effect, 40
- Ecological age, 123
- Ecology, 108, 131
- Economics  
 conventional, 109  
 institutional economics, 142  
 neoclassical economics, 137
- Egg, 7–14, 16  
 fertilised egg, 6  
 undivided egg, 9–10, 12  
 unfertilised egg, 13
- Egocentrism, 70
- El Niño, 85, 91, 97
- Electricity, 117, 128–129, 144
- Embryo, 6–12, 15–16
- English Institute of Sport, 25
- ENSO, 92
- Entrepreneurship, 133, 135
- Environment, social, 58–60, 64–65, 79
- Ethernet, 150
- Evans, Martin, 15
- Evaporation, 92, 94
- Eye  
 macular degeneration, 17  
 saccadic movement, 54
- Feedback loop, 48–50
- Ferrel, William, 87, 90

## Index

- Fertiliser, 121, 123  
 Fossil fuel, 109, 112, 118–119, 125–126, 132  
 Fox, Siberian silver, 60  
 Fractionation, 75  
 Frog, 10, 13–14
- Galaxy, 37, 39, 41, 44, 46  
   elliptical galaxy, 40, 47  
   irregular galaxy, 45, 47  
   spiral galaxy, 40  
 Gallup, Gordon, 69  
 Gas  
   infalling gas, 48  
   outflowing gas, 48  
 Gazzaniga, Michael, 75–76  
 Gender, 70  
 Genie problem, 157  
 Genome  
   100,000 Genomes Project, 157  
   human genome sequencing, 155  
 GPT (General Purpose Technology).  
   *See* Technology  
 Gradient  
   chemical gradient of galaxy, 49  
 Grameen Bank, 135  
 Gravitational lensing, 49  
 Greenhouse, 123  
 Greenhouse gas, 85, 92, 98, 102–103  
 Group, 69  
   group consensus, 78  
   in-group identity, 70  
   in-group preference, 69  
   out-group bias, 69  
   out-group identity, 70  
 Gulf Stream, 95, 97, 100
- Hadley circulation, 87  
 Hadley, George, 86–87  
 Haeckel, Ernst, 7  
 Halley, Edmund, 86  
 Homunculus, 7, 74  
 HPA axis, 66  
 Hubble Space Telescope, 37, 45–46, 50  
 Hubble, Edwin, 39, 52  
 Human Brain Project, 157
- Humanist  
   humanist approach to development, 137  
 Hydrogen, 40, 44, 48, 50
- IBM, 149  
   IBM 370, 148  
   IBM PC, 152  
   IBM Watson, 160  
 Ice Age, 59–60, 62, 90  
 Imitation, 67  
 Industrialisation, 138, 142  
 Institution, 141–142  
   collective institution, 139  
 Intel, 152, 158–159  
 International Monetary Fund, 138  
 Internet of Things, 148, 154  
 Intervention  
   public policy intervention, 137  
   state intervention, 138  
 IPCC (Intergovernmental Panel on  
   Climate Change), 103, 106  
   IPCC Report, 99, 102, 104–105
- Jordan, 129, 131
- Kalundborg (Denmark), 120  
 Kanizsa illusion, 54
- La Niña, 91  
 Laissez-faire, 137  
 Linear system, 119, 121  
 Local Area Network (LAN), 150  
 Lock-in, user, 149  
 Loneliness, 80  
 Lorenz, Ed, 101
- Machine learning, 148, 154–157  
 Macular degeneration, 18  
   age-related macular degeneration, 17  
 Marginal gain, 25–26  
 Market  
   free market, 137–138  
 Marshmallow test, 54  
 MDGs. *See* Millennium Development  
   Goals

## Index

- Memories, 56, 62, 69  
   autobiographical, 69–70  
 Memory, 56  
 Mercury delay line, 146  
 Meteorology, 85, 88  
   dynamical meteorology, 92  
 Microfinance, 135  
 Microfinance institution (MFI), 135  
 Milgram, Stanley, 79  
 Milky Way, 37, 39  
 Millennium Development Goals, 136  
 Monsoon, 97  
   African monsoon, 96  
   Indian monsoon, 91, 97  
   monsoon rain, 90  
 Moore's law, 155  
 Murray's law, 119  
 Myelination, 63
- Neo-liberalism, 136, 138  
 Nerve impulse, 62  
 Neuron, 54, 62  
   cortical neuron, 63  
 Nokia, 153, 159
- Oceanography, 85, 91  
 OECD, 134  
 Old Street roundabout, 123  
 Olympic Games, xi, 20, 26  
   Athens Olympics 2004, 25  
   Beijing Olympics 2008, 27  
   London Olympics 2012, 31–32  
   Sydney Olympics 2000, 22  
*Origin of Species, The* by Charles Darwin,  
   54  
 Oscillation  
   North Atlantic Oscillation, 91  
   North Pacific Oscillation, 91  
   Southern Oscillation, 91  
 Ostracism, 61, 80
- Parametrisation, 96  
 Passage wind. *See* Wind  
 Passive heating and cooling, 117  
 Phone renting, 135
- Photoreceptor cell, 17  
 Photosynthesis  
   photosynthetic activity, 126  
 Phylogeny  
   *phylogeny is the mechanical cause of*  
   *ontogeny*, 7  
 Pigmented retinal epithelium cell, 17  
 Post-traumatic stress disorder (PTSD), 122  
 Poverty reduction, 136  
 Precipitation, 92, 94  
 Production, 136–137, 140  
   food production, 126  
   productionist view of economic  
   development, 136, 141–142  
   productive capability, 135–139  
   productive development, 138–139, 141  
 Psychology  
   developmental psychology, 57  
   social psychology, 78
- Qatar, 129–130  
 Quantum computing, 158  
   entanglement, 158  
 Qubit, 157–158
- Recycling, 121  
 Redshift, 41, 44–45, 50  
   2 degree field redshift survey, 42  
 Renewable energy, 129  
 Resilience, 122  
 Resource  
   human resources, 122  
 Resource constraint, 128  
 Resource efficiency, 112, 116, 119, 132  
 RISC (Reduced Instruction Set Computer),  
   158  
 Roman empire, 125  
 Romans, 125  
 Rossby, Carl-Gustaf, 88  
 Rouge test. *See* self-recognition mirror test
- Salinity, 94  
 Sally-Anne task, 71  
 Self, 56–57  
   sense of self, 53, 57

## Index

- Self concept, 56  
 Self illusion, 53  
 Self-control, 73  
 Self-employed workforce, 134  
 Self-esteem, 72  
 Self-recognition mirror test, 69  
 Sen, Amartya, 137  
 Service economy  
   post-industrial service economy,  
     136–137  
 Short-term  
   short-term bias, 141  
   short-term return, 131  
 Singapore, 138  
   manufacturing output, 140  
 Slime mould, 110  
   dog vomit slime mould, 110  
 Smarties task, 71  
 Smartphone, 148, 153–154  
 Socialisation, 60, 65  
 Sociality, pro-, 60–61, 68  
 Solar economy, 112, 119, 132  
 Solar energy. *See* solar power  
 Solar power  
   concentrated solar power, 128–129  
 Solexa, 155  
 Solution  
   integrated solutions, 125  
 Space  
   stretching of space between galaxies,  
     41  
 Spectrograph, 41, 46  
   multi-object spectrograph, 44  
 Spectroscopy  
   multi-object spectroscopy, 41  
 Split brain, 54, 76  
 Spookfish, 113, 116–117  
 Starfish, 113  
 Steam engine, 143–144  
 Stem cell, 11, 15  
   embryonic stem cell, 15–16  
   induced pluripotent stem cell, 16  
 Stone plant, 113  
 Stress, 66  
 Sturgeon, Siberian, 121  
 Subjective contour, 54  
 Supercomputing, 98, 101–102  
 Supernova, 48, 50  
 Surface energy budget, 88  
 Sustainability, 112  
   environmental sustainability, 142  
 Switzerland, 138  
   manufacturing output, 140  
 Synapse, 62–63  
   synaptogenesis, 63  
 System  
   biological system, 122  
   complex system, 122, 129  
   regenerative system, 122  
 Tadpole, 7, 13  
 Technology  
   general purpose technology, 143–145,  
     161  
   technological capability. *See* capability  
   technological wave, 145  
 Teleconnection, 91  
 Telenor, 135  
 Telephone ladies, 135  
 Telescope  
   Hubble Space Telescope. *See* Hubble  
     Space Telescope  
   James Webb Space Telescope, 51  
   Subaru telescope, 44  
   twin Keck 10 metre telescope,  
     44, 46, 51  
 Theory of mind, 71–72  
 Time  
   look-back time, 41, 44–45  
 Tradewind. *See* Wind  
 Turing, Alan, 159  
 Turing test, 160  
 Ultra Deep Field, 37  
 Universe, expansion, 41  
 Universe, formation  
   Cosmic Dawn, 50  
   Dark Ages, 50  
 User interface, 147, 149–150, 153–154,  
   157–158

## Index

- Values  
  human values and AI, 161  
Voice recognition, 154, 156  
Vorticity, absolute, 88
- Walker Circulation, 91  
Walker, Sir Gilbert, 91  
Waste, 122  
  vegetable waste, 123  
  waste water, 123  
  zero-waste. *See* zero waste  
Waste Resource Action Programme  
  (WRAP), 119  
Wave  
  Rossby wave, 88
- Wavelength, 41, 44  
  ultraviolet light wavelength, 13  
Wiles, Graham, 120–122  
Wind  
  surface wind, 94  
  trade wind, 86–88, 94  
  tropical wind, 86  
  westerly wind, 87  
World Bank, 138  
Wormery, 121
- Xerox PARC, 151  
Xiaomi, 154
- Zero waste, 122, 129, 132