

Index

- Alfvén, Hannes, 3
 Alfvén speed, 28, 121, 139, 253, 254, 306
 Alfvén velocity, 29
 Alfvén waves, 28, 29
 torsional, 29, 254
 Alfvén's theorem, 3, 15
 anelastic approximation, 7, 255, 311, 313, 326, 352, 353
 strong, 311, 353
 Arnold, Vladimir, 70, 71, 78
 Biermann, Ludwig, 2
 bifurcation
 gluing, 76
 heteroclinic, 65, 74, 85
 oscillatory (Hopf), 5, 43, 69, 70
 period-doubling, 97, 98
 pitchfork, 42, 67, 69, 116
 saddle-node, 78
 saddle-node/Hopf, 87, 89
 Shilnikov, 65, 95, 144, 145, 147, 355, 358, 365, 366
 stationary, 5, 42
 subcritical, 67, 71, 116
 subcritical Hopf, 91
 supercritical, 67, 71, 83
 symmetry-breaking, 97, 98
 Takens–Bogdanov, 5, 46, 71
 generalized, 108
 boundary conditions, 54, 57, 61, 62, 330
 illustrative, 40, 66, 360
 rigid, 181
 Boussinesq approximation, 5, 7, 38, 52, 64, 118, 180, 255, 347, 349, 350, 352
 Boussinesq, Joseph, 5, 7, 38, 124, 349
 buoyancy braking, 251
 Busse, Friedrich, 116, 118, 119, 180–182, 237, 283, 341
 annulus, 237
 balloon, 181
 Chandrasekhar, Subrahmanyan, 4, 5, 54
 Chandrasekhar number, 5, 40, 257
 chaotic oscillations, 97, 144, 145, 147, 355
 convective collapse, 301
 convecton, 158, 307
 three-dimensional oscillatory, 209, 210
 Cowling, Thomas, 2, 4, 8, 10
 Cowling's Theorem, 32
 diffusion, 4
 diffusivity
 magnetic, 11, 39
 thermal, 39
 viscous, 39
 diffusivity ratio ζ , 4, 40, 58, 115, 256, 268
 dynamical regime, 139
 dynamos
 α -effect, 37
 cyclic, 324
 fast, 34
 kinematic, 31
 laboratory, 246
 large-scale, 35
 mean field, 36, 324
 planetary, 245
 small-scale, 34, 198, 201, 206, 208, 303, 304, 306, 333, 335
 spherical shells, 240
 stellar, 328
 entropy, 252, 350, 351
 equation of motion, 39, 257, 351
 equation of state, 351
 exchange of stabilities, 5
 exclusion of motion, 119
 Ferraro, Vincenzo, 16, 322
 Law of Isorotation, 16, 322
 fifth-order model, 81–83
 bifurcation structure, 83, 84
 phase portraits, 83, 85, 86
 thermosolutal, 365

flux concentration, 18
 in cylindrical geometry, 25
 in hexagonal geometry, 27
 flux expulsion, 19–23, 119
 in cylindrical geometry, 24, 25
 in hexagonal geometry, 27
 flux freezing, 15
 flux pumping, 316
 flux separation, 159, 275, 291, 296, 307
 force-free fields, 30
 heat equation, 39, 257, 351
 helicity, magnetic, 15
 heteroclinic orbit, 150
 hexagonal lattice, 183, 185–187
 homoclinic explosion, 149, 357
 homoclinic orbits, 152
 horizontal field, 111, 176, 277, 316
 induction equation, 9, 11, 12, 39, 257
 intermittent fields, 298, 300
 ionization, 320, 336
 isolated (localized) states, 158
 isorotation, 16
 Knobloch, Edgar, 70, 72–74, 81, 89, 98, 108,
 109, 153, 160, 185, 265, 361
 logistic map, 98, 355
 Feigenbaum sequence, 98, 355
 modified, 99, 100
 period-doubling, 99, 355
 periodic windows, 356
 symmetry-breaking, 99
 Lorentz force, 26, 28
 Lorenz equations, 82, 355, 356
 heteroclinic bifurcation, 357
 Lorenz, Edward, 65, 144, 355–357
 magnetic buoyancy, 30, 324, 369
 subcritical behaviour, 369
 magnetic pressure, 258
 magneto-Boussinesq approximation, 367
 magnetic buoyancy, 369
 magnetoacoustic waves, 29
 magnetohydrodynamic approximation, 10
 magnetostatic equilibria, 31
 Grad–Shafranov equation, 31
 Malkus, Willem, 5, 67
 Maxwell point, 169, 172
 Maxwell stress, 28, 31
 Maxwell's equations, 9
 mesocellular patterns, 201, 202, 204–206
 Mestel, Leon, 8, 10, 321, 327, 329
 Moffatt, Keith, 8, 17, 20, 21, 32, 35, 323
 Nordlund, Åke, 8, 252, 310, 321, 325, 330, 331,
 334
 normal form equation
 Hopf, 69
 pitchfork, 67
 Takens–Bogdanov, 73, 77, 79

Nusselt number, 115
 Oberbeck, Anton
 Oberbeck convection, 124
 Oberbeck–Boussinesq approximation, 124
 oscillations, nonlinear, 125
 overstability, 5, 43
 Parker, Eugene, 8, 17, 35–37, 63, 301, 323–325
 pattern selection, 280, 282, 284, 287, 289, 294
 periodic windows, 101, 102
 logistic map, 99
 plasma beta, 253–256
 Poincaré, Henri, 64
 Poincaré map, 23, 24, 34, 96
 polytropic index, 253, 256
 Prandtl number, 115, 256
 radiative transport, 320, 331
 Rayleigh number, 5, 40, 257
 critical, 48
 Rayleigh, Lord (J. W. Strutt), 5, 38, 40, 42,
 124, 254
 Reynolds number
 magnetic, 17, 19–21
 Roberts, Paul, 4, 8, 54, 62, 63, 219, 234, 353
 rolls
 oblique, 59
 parallel (longitudinal), 50, 51
 perpendicular (transverse), 50, 52, 111
 rotating convection, 216, 217
 Kuppers–Lortz instability, 218
 spherical shells, 226
 rotating magnetohydrodynamics, 219–222, 225
 dynamoes, 229, 231
 spherical shells, 228
 rotation, 215
 Schüssler, Manfred, 8, 301, 321, 324, 331, 332,
 334, 335, 342–344
 Sharkovsky sequence, 99, 356
 Shilnikov, Leonid, 65
 Shilnikov criterion, 95, 96
 Shilnikov wiggles, 96, 97, 100, 103, 104
 snaking, 168, 169
 slanted, 164–166, 171, 173
 solar
 cycle, 321
 dynamo, 322
 pore, 3
 rotation, 322
 solar magnetic fields
 active regions, 337
 ephemeral active regions, 337
 intergranular, 2, 3, 331
 pores, 316, 333, 335
 sunspots, 2, 316, 340, 341, 344, 345
 penumbral, 340, 341, 344, 346
 umbral, 342, 343
 supergranular, 336
 spatial asymmetry, 127–131

- spatial modulation, 161, 162
- Spiegel, Edward, 73, 253, 254, 349, 351, 363, 366
- square lattice, 183–185, 187–189
- steady branch, 82
 - subcritical, 83
 - supercritical, 86, 87
- stellar magnetic fields, 326, 328
- strong field limit, 174, 175, 211
- sunspot, 1, 2, 315, 340–346
 - magnetic field, 309, 314
- symmetry
 - ρ , 279
 - \tilde{m}_x , 114
 - \tilde{m}_z , 114
 - i , 114, 126, 258
 - m , 66
 - m_d , 279
 - m_x , 279
 - m_y , 279
 - m_d' , 279
 - m' , 66
 - axial, 134
- Taylor number, 216
- Taylor's constraint, 233
- thermosolutal convection, 360
 - chaotic oscillations, 362, 363
 - periodic oscillations, 361
 - resonant interactions, 363, 364
 - Shilnikov bifurcation, 365, 366
 - symmetry breaking, 362
 - travelling waves, 363
- Thompson, William, 4, 43
- three-dimensional patterns, 206, 208
- tilted convection
 - oscillatory, 153, 156
 - steady, 153, 156
- tilted field, 177, 178, 196, 198, 214, 309, 310
- Toomre, Juri, 251, 253, 256, 258, 265, 271, 326, 363
- transition to dynamical regime, 121, 123
- vector potential, 12
- Veronis, George, 5, 67, 69, 70, 81, 349, 351
- waves
 - modulated, 105, 108, 265
 - pulsating, 152, 155, 157, 266
 - standing, 105, 107, 108, 265
 - travelling, 105, 107, 108, 265
- wide cells, 133, 275