

Index

- 3-*j* coefficients 2326
- 6-*j* coefficients 2329, 2330

- Abbé relation 617
- aberration 1500, 1839, 1840
 - chromatic 283, 2870
 - spherical 618, 635
- ab initio* calculations 1601
- abrasion 2781
- absorptance 2219
 - spectral 208
- absorption coefficient **1**, 528
 - volumetric 85
- absorption spectrum 852
- absorptivity 2219
 - monochromatic 986
- acceleration 1212
- acceleration methods, novel **1734**
- accelerators 281, 285, 312, 2651, 2659
 - beam-driven wakefield 1738
 - belt-type 16
 - betatron 190, 492
 - bevatron 2650
 - Cockcroft–Walton 11
 - cosmic 91
 - drift-tube linear 4
 - Dynamitron 11, 13
 - electrostatic 11
 - high-energy 495
 - laser wakefield 1738
 - linear **2**, 55, 288
 - magnetic resonance 490
 - media-based 1737
 - near-field 1735
 - Pelletron 17
 - potential-drop linear **10**
 - principle of phase stability 492
 - radiofrequency quadrupole linear 4
 - tandem 11, 288
 - Tandetron 17
 - two-stage 16
 - Van de Graaff 15, 288
- accelerometer 25
- accelerometry 2746
- acceptor states 575
- accretion disks 125
- aces 2159
- acidic site 301
- acoustical design 33
- acoustical holography 28
- acoustical measurements **21**
- acoustic imaging 2339
- acoustics **29**
 - architectural **32**
 - high-intensity 35
 - linear and nonlinear **35**
 - physiological **50**
- acoustoelectric effect **54**
- acoustooptic interaction 2827
- actinide contraction 2775
- actinides 717, 2756, 2775
- actinometer 1320
- action-angle variables 544, 2484
- action at a distance 71, 805, 2786
- action integral 538
- activated reactive evaporation 2727
- activation analysis 2203
- activation energy 1227
- active galactic nuclei 93, 118
- active sites 1683
- actuators 2230
- adaptive optics 102
- adhesion 57, 256, 855, 2781
- adhesives 2307

- adiabatic approximation 328
- adiabaticity condition 1971
- Adler–Weisberger sum rule 490, 2559
- admittance 1693
- adsorption **57**, 856
- aeronomy 1143, 1144, 1574
- aerophysics 830
- aerosols **61**
- aerosol sources 61
- aether *see* ether
- aftershock 2368
- aftersound 1674
- Aharonov–Bohm oscillation 1475
- aircraft, supersonic 2411, 2414
- air shower detectors 97
- Airy disk 1499
- Aitken nuclei 61
- Akhieser effect 2824
- akinetors 2849
- Alfvén’s theorem 1402, 1403, 1406
- Alfvén number 1405, 1409
- Alfvén velocity 1406
- Alfvén waves 174, 1406, 1409, 2458
- algebra of charges 950
- alkali-like spectra 133
- alkali fine & hyperfine structure 810
- allotropy **63**
- alloys **65**, 1915, 1919
 - amorphous 76, 1380
 - binary 1911
 - iron–cobalt 1382
 - microcrystalline 2388
 - nickel–iron 1381
- α decay **67**, 1786, 2784
 - angular distribution 78
 - hindrance factor 70
 - Preston theory 70
 - selection rules 68
 - transition probability 70
- α particles 67
- α rays 187
- α scattering 2295
- alternant-molecular-orbital method 1605
- alternating-gradient focusing 495
- Amontons’ laws 2780, 2781
- amorphization 2185
- Ampère’s law **71**, 568, 585, 1465
- Ampère’s theorem 71
- amplification factor 2855
- amplifier 2472
 - optical 1260, 1268
- analytic signals 2128
- analyzing power 1149, 1775
- anapole moment 1891
- Anderson impurity model 1115, 1117
- Anderson lattice 1118
- Anderson localization 277, 2466, 2469
- Andrade equation 2857
- Andromeda galaxy 863, 2833
- anelasticity **72**, 75, 1121, 1467
- angular momentum 1627, **2310**, 2502, 2504
 - addition of independent 2319
 - alignment 1836
 - conservation 369, 537, 1700, 2312
 - coupling 131
 - operator 2315, 2320, 2327
 - orbital 2317
 - quantization 2314
 - recoupling coefficients 2329
 - theory 2317, 2321, 2328
- angular overlap model 449
- anharmonicity 1161
- anisotropic systems 1906, 1919
- anisotropy 1911
 - magnetic 1381
 - magnetocrystalline 774, 776, 1366, 1367
- anode 564
- anomalous dispersion 484
- antenna pattern 103
- antennas 103, **2760**
- antenna temperature 105
- anthropic principle 391, 709, 1924
- antibaryons 179, 181, 366
- anti de Sitter space 2548
- anti de Sitter superalgebra 2602
- antielectron 2046
- antiferromagnetic order 1392
- antiferromagnetism 443, 773, 1006, 1392
- antiferromagnets 442, 754, 1911
 - anisotropic 1918
- antihelium 82
- antimatter **81**, 2050
 - detector 82
- antiparticles 81, 671
- antiproton 2046
- antistars 82
- antisymmetrization 300
- Antoine equation 2847

- anyons 2468
- apodization 738
- arc column 84–86
 - electrical conductivity 88
- Archimedes' principle 2358
- arcs **84**, 1021
 - vacuum 88
- arc stability 86
- area defects 2399, 2461
- Argand plot 1898
- Arrhenius equation 1227, 2303
- Arrhenius law 907
- Arrhenius plot 363
- astigmatism 1840
- astrobiology 2488
- astrochemistry 109
- astronomical instruments 101
- astronomy
 - extragalactic radio 107
 - geometrical 1025
 - high-energy neutrino **89**
 - optical **100**
 - physical 1025
 - radio **103**
 - x-ray **110**
- astrophysics **122**, 835
- asymmetric top rotor 1548
- asymptotic completeness 794, 796
- asymptotic freedom 690, 880, 1294, 2101, 2162, 2554, 2555
- atmosphere 126
 - composition 126
 - Jovian 830
 - structure 127
- atmospheric circulation 1487
- atmospheric physics **126**, 1486
- atmospheric radiation 128
- atmospheric science 1486
- atmospheric window 128
- atomic capture 1663
- atomic collisions 160
- atomic hypothesis 715
- atomic mass
 - unified scale 1178
 - unit 162
- atomic mirrors 159
- atomic ordering 1380
- atomic spectra 130
- atomic states, high-field **1013**
- atomic structure **212**
- atomic structure calculations
 - electronic correlation **138**
 - one-electron models **141**
 - relativistic atoms **149**
- atom probe 788, 790
- atoms **161**
 - cold **316**, 1251
 - exotic **1662**
 - kaonic 1664
 - mass number 163
 - mesonic **1662**
 - muonic **1662**, 2094
 - name 162
 - pionic 1665
- attenuation coefficient 361
- attractor 273
 - linear 2700
 - nonchaotic 274
 - punctual 2695, 2700
 - strange 273, 835, 2695, 2700
- audibility 30
- Auger effect **169**, 1142, 1663
- Auger electrons 324, 601, 2356
- Auger microscopy 784
- Auger process 2918
- Auger transition 169, 170
- augmented plane wave method 66, 627
 - linearized 627
- aurora **173**, 2176, 2454, 2458
- auroral electrojet 174
- autocatalytic effects 2697
- autocorrelation receiver 106
- autoionization 1142, 1943
- avalanche chamber 437
- avalanche effect 1859
- avalanche multiplication 2477
- average t-matrix approximation 66
- Avogadro's hypothesis 1218
- Avogadro constant 163, 372, 1178, 1223
- axiomatic field theory 440
- axion 705, 2546
- Azbel'–Kaner cyclotron resonance 752
- Babinet compensator 1849
- baby universes 207
- backbending 1819
- backward-wave oscillators 1231
- bacteriorhodopsin 1679

- balance equation 2691
- Balmer series 164, **177**, 178, 216, 2932
- Banach space 1829, 1830
- band calculations 153
- band gap 278, 626, 2356, 2394
 - photonic 516, 1736, 1949
- band structure
 - many-valley 55
 - photonic 1948, 1949
- band-structure engineering 2397
- bandtail states 667
- band theory 968, 1102, 1337, 2278
- Bardeen–Cooper–Schrieffer theory 747, 1434, 2584, 2585, 2588, 2589, 2824
- baryonic matter 108, 863
- baryon number 81, 180
 - conservation 366
 - nonconservation 366
- baryon resonances 180
- baryons **179**, 671, 912, 957, 1076, 1077, 2067, 2614
 - asymmetry 83, 703, 707
 - conservation 671
 - missing 120
 - multiplets 180
 - quark content 181
- basic site 301
- basin boundaries 275
- Basquin law 745
- batteries 566
- Bauer formula 1895
- Bayes' theorem 2064, 2523
- Bayesian inference 2873
- BCS–BEC crossover 220, 2803
- BCS gap equation 2588
- BCS Hamiltonian 2586, 2587
- BCS wave function 2586
- beam dynamics 7
- beams, atomic and molecular **182**
- beamstrahlung 228
- beatwave 1737
- beautonium 2153, 2155, 2156
- beauty 957
- Bechgaard salt 1861–1865
- Becker nozzle 1172
- Beer–Bouguer law 2219
- Beer–Lambert law 1357
- Bekenstein–Hawking relation 206, 2548
- Belleville washers 2805
- Bell inequality 1012, 1925, 2150
- Bénard convection 257, 1409, 1410, 2697
- Bénard problem 2697
- Bennett distribution 597
- Bernoulli equation 824
- Bernoulli system 730
- Berry phase *see* quantum phase, geometric
- Berthelot equation 1066
- β decay **186**, 368, 579, 677, 1700, 1786, 2198, 2784, 2901, 2908
 - ^{60}Co 2901
 - double 367
 - inverse 124
 - neutrinoless double 701
 - weak interaction 188
- β emission 78
- β function 2279
- betatron **190**
 - oscillations 2051
- Bethe–Born approximation 1140
- Bethe–Heitler formula 2092
- Bethe–Salpeter equation **192**
- Bethe–Weizsäcker formula 1814, 2591
- Betz coefficient 2436
- Bhabha scattering 777, 779
- Bianchi identities 2497
- bias voltage 2472
- bicritical point 1918
- bifurcation 250–257, 276
- Big Bang 83, 118, 122, 123, 425, 865, 914, 930, 1058, 1059, 1126, 1446, 1823, 1919, 2785, 2834
- binary fluid 1919
- binary mixture 816, 1903, 1913
- binding energy **197**, 1779
- Bingham plastics 2302
- binomial distribution 2063
- biofuels 2439
- bioluminescence 305, 1350
- biomass conversion 2427
- biomass energy 2424, 2440
- bionics 1677
- biophysics **198**, 2299
 - ultrasonic **2820**
- bioreology 2299
- biosensors 1678
- Biot–Savart law 72, 2885
- Birge ratio 384
- Birkeland currents 174

- Bitter magnet 590
bivariation principle 1607
blackbody 2217, 2218, 2670
 definition 208
 radiation 109, **208**, 214, 2111
 simulators 211
black holes 97, 111, 124, 125, **203**, 256, 865,
 927, 1415, 2498, 2528, 2530
 accreting 113
 blackbody radiation 206
 emission of radiation 206
 entropy 2548
 Kerr–Newman 205
 spin 114
 supermassive 118
blast waves 828
Bloch's law 1118
Bloch's theorem 160, 622, 627, 629, 748, 749,
 2394
Bloch conditions 2277
Bloch energies 1432
Bloch equations 637
Bloch lines 1371
Bloch sphere 893
Bloch wave functions 1477
Bloch waves 160, 2463
blocking effect 271
block spin methods 1911
blooming layer 2895
Bogoliubov approach 2801
Bohmian mechanics 2149
Bohr frequency condition 1096, 1523, 1945,
 2289
Bohr magneton 373, 772, 954, 1386
Bohr theory 164, 168, **212**, 2314
bolometer 183, 1097, 1524, 2576
Boltzmann's constant 386, 390, 1223, 2692
 determination 233
Boltzmann equation 955, 2768, 2769, 2771
Boltzmann H theorem *see* H theorem
Boltzmann model 1475
Boltzmann relation 2275
Boltzmann theory 2767
Boltzmann transport equation 2518
bonded magnet 1383
bonding
 chemical **295**, 1616
 coordinate covalent 1620
 covalent 450, 1619
 ionic 449, 1620
 metallic 450
 molecular 450
 orbital models 300
 seven-center 300
 three-center 298
bone densitometry 2212
bootstrap 686
bootstrap conjecture 2336
Born–Oppenheimer approximation 301, 341,
 1160, 1161, 1601, 1619, 2739
Born approximation 327, 520, 1141, 1717, 2739
Born series 193
Bose–Einstein condensate 160, 316, 1242, 2739
 wavefunction 2801
Bose–Einstein condensation 161, **218**, 256, 317,
 446, 995, 1246, 1434, 1919, 2105,
 2107, 2109, 2137, 2799
Bose–Einstein statistics **221**, 222, 1131, 1463,
 1855, 2100, 2767
Bose gas 218, 995, 1434, 2107
bosonova 219
bosonization 2084
bosons 218, 222, 1131, 2504
 composite 2584
 intermediate vector 678
 molecular 220
 parity of wavefunction 747
 scalar 488
 vector 488, 489, 2908
Bouguer anomaly 939
Bouguer law 1
boundary conditions 1908, 1916
boundary layers **223**
 Hartmann layer 1408
boundary lubrication regime 856
bound states 2738
box-counting dimension 273
Boyle's law 1219
brachytherapy 2208
bracketing operator 1608
Brackett series 178, 216
Bragg's law 476, 616, 2240, 2919
Bragg–Williams model 1860
Bragg condition 817, 1931
Bragg diffraction 2827
Bragg equation 523
Bragg peaks 907
Bragg reflection 480, 523, 1477

- Bragg scattering 1332, 1708, 1716
 brane 705, 708, 1391
 brane world 2547
 Bravais lattice 65, 461, 467, 468, 942
 Bravais net 1347
 Brayton cycle 979, 981, 2432
 breakup reactions 2739
 breeding 1803
 Breit–Rabi formula 1667
 Breit–Wigner formula 1898, 2290
 Breit–Wigner resonance 2249
 Breit interaction 152, 811
 bremsstrahlung **226**, 571, 602, 1979, 2092, 2917, 2918
 inverse 1094
 magnetic 227
 Brewster’s angle 1313, 2238
 Brillouin function 755, 1653
 Brillouin scattering **230**, 231, 232, 817, 1318, 1931, 2804, 2806, 2815
 stimulated 232, 1094, 1281, 1282, 1841, 1844, 1931
 Brillouin spectrum 230
 Brillouin theorem 1608
 Brillouin zone 66, 278, 623, 626, 749, 750, 1099, 2393, 2462
 diamond lattice 2394
 necks 750
 zincblende lattice 2394
 bronchoscope 781
 brontides 2363
 Brown–Ravenhall disease 153
 brown dwarf 425, 2528
 Brownian motion **233**, 2699
 Brueckner T -matrix method 1004
 Brønsted acid–base reaction 302
 bubble chamber **312**, 686
 bubble device 1369
 bubble memory 1371
 buckminsterfullerene 858, 859
 bulk modulus 550
 buncher 1228
 Burgers vector 1121
 Burton–Cabrera–Frank model 456
 Butler–Volmer equation 565
 butterfly catastrophe 253

 Cabibbo–Kobayashi–Maskawa matrix 699, 2554, 2907
 Cabibbo angle 696
 Calabi–Yau space 2545
 calandria 1800
 calcite, anisotropy 1313
 Callan–Symanzik beta function 2101
 Callan–Symanzik equation 2279
 Callisto 1081, 2453
 calorimeter 235
 isoperibol operation 238
 quasiadiabatic mode of operation 238
 calorimetry **235**, 238
 differential scanning 238
 cancer treatment 2205
 canonical distribution 1913, 2136
 canonical field operator 488
 Cantor set 273, 276
 capacitor 1686, 1688
 distributed 1515
 capacity 2284
 capacity dimension 273
 capillary
 flow **238**
 force 256
 pressure 239
 waves 2608
 carbon
 crystal structures 64
 nanotubes 858
 carbon–nitrogen–oxygen cycle 2526
 Carnot–Clausius relation 2690
 Carnot cycle **241**, 978–981
 Carnot engine 242, 980, 2669
 carrier
 concentration 2401
 lifetime 2406
 statistics 2371
 cascade decay 77
 Casimir–Polder retardation effects 812
 Casimir effect 206, **244**
 Cassegrain focus 101
 Cassini–Huygens mission 1579
 Cas A 115
 catalysis 57, **246**, 1681
 homogeneous 247
 polymerization 2034
 catalysts
 activity 247
 cracking 2230
 Friedel–Crafts 2036

- poisoning 248
- selectivity 247
- Ziegler–Natta 2037
- catalytic converters 2230
- catastrophe theory **250**
- catcher 1228
- cathode 564
- cathode rays 212
- cathode ray tubes 281
- cathodoluminescence 602, 604
- Cauchy's integral theorem 529
- Cauchy formulas 2335
- Cauchy relation 550
- Cauchy sequence 1830
- causality 355, 1034, 2264, 2499, 2787
 - Einstein 2787
 - strict 2787
- caustic 250–257
- cavitation 819, 2821, 2825
- cavity, optical 1240
- celestial sphere 2832
- cell biology 198
- cellular automata **258**
 - machine 261
- Celsius scale 1015, 2669
- center-of-mass
 - energy 2051
 - system **262**
- central-field approximation 131, 143
- central-limit theorem 2064, 2533
- centrifugal distortion 1161, 1548
- centrifugal force 1355, 2313
- centrifugation **2357**
- ceramics **263**, 1381
 - polycrystalline 264
 - superconducting 264
- Čerenkov angle 268
- Čerenkov condition 268
- Čerenkov counter 2191, **2348**
- Čerenkov emission 98
- Čerenkov radiation 90, **267**, 2191, 2351
- cessation 2036
- chain matrix 1694, 1695
- chain reaction 1798
- Chandrasekhar limit 124, 927
- channeling **268**, 2196
 - radiation 271
- chaos **272**, 1150, 2474
 - quantum 277
- chaotic transients 274
- Chapman–Enskog theory 2857
- Chapman–Jouquet point 2417
- Chapman–Jouquet theory 2416
- Chapman–Kolmogorov identity 2532
- characteristic function 2062
- characteristic polynomial 1697
- characteristic radiation 2917
- charge **553**, 674
 - carrier mobility 563
 - carriers in electrolytes 563
 - conjugation 677, 949, 1128
 - conservation 553
 - distribution 555
 - multiplet 1156
 - quantization 702, 706
 - symmetry 2738
 - transport 666
 - weak 2905
- charge-coupled device 102, 657, 2375, 2865
- charge-density wave **277**, 2469
- charge-transfer complex 302
- charm 957
- charmonium 698, 2153, 2155, 2156
 - family 950
- Charon 2453
- Chasles' theorem 1630
- chemical affinity 2692
- chemical friction 2692
- chemical potential 2685
- chemical reaction 1920
 - kinetic order 1227
- chemical shift 1769
- chemical thermodynamics *see* thermodynamics
- chemical vapor deposition 780, 2727
 - plasma enhanced 2378
 - thermal 2378
- chemiexcitation 304
- chemiluminescence **304**, 1350
- chemisorption 57, 248, 856, 1911, 1937, 2609
- Chew–Goldberger–Low equations 1986
- χ^2 distribution 2521
- Child–Langmuir flow 596
- Child–Langmuir law 2681
- chirality 1618
 - and symmetry 459
- chiral symmetry 950
- chromophores 1540, 1557
- circuit

- analysis *see* network analysis
- breakers 88
- diagram 651
- electronic 651
- integrated **306**, 651, 2481, 2748, 2749
- Johnson noise 233
- oscillations 2474, 2476
- phase shift 647
- circular birefringence 1834
- circular dichroism 1834
 - magnetic **1356**
- circumstellar disks 839
- Clapeyron equation 2847
- clathrates 1086, 1087, 2232
- Clausius–Clapeyron equation 1340, 1904
- Clausius–Mosotti equation 557, 1996
- Clebsch–Gordan coefficients *see* Wigner coefficients
- Clemmow–Mullaly–Allis diagram 1987
- climate research 1489
- climatology 2419
- clock paradox 2263
- clocks
 - accelerating 2797
 - atomic 317, 812, 1835
 - atomic and molecular **310**
 - chemical 2697
 - relativity 2796
- closed graph theorem 1829
- closed operator 1829
- closed systems 2691
- cloud chamber 169, **312**
- clouds 128, 1321
 - molecular 836
 - star-forming 835
 - stratiform 1324
- cluster 1906, 1910, 1913
- Cnare technique 1374
- COBE 931
- coercive field 1379, 1380, 1383
- coercivity 909
- coexistence
 - line 1901, 1909
 - region 1904, 1905, 1915
- Coffin–Manson law 745
- coherence 990, 2129
 - degree 2129
 - function 2129
 - length 1315, 1475
 - partial 2130
 - spatial 1315
 - temporal 2896
 - theory 1852
 - time 1315
- coherent potential approximation 66
- coherent state 2131
- coincidence experiment 78
- coincidence rate 78, 80
- Coleman–Mandula theorem 2599, 2601
- colliders
 - electron–positron 228, 2050, 2051
 - hadron **958**, 1735
 - heavy-ion 2596
 - lepton 958
 - linear 2051, 2053
 - synchrotron 2658
- collimator systems 289
- collisional excitation 317, 324
- collisions 256
 - atomic and molecular **317**
 - heavy-particle 1140, 2594
 - inelastic 326
 - nucleus–nucleus 2591
 - soft high-energy 1088
 - ultra-cold 318
- colloidal systems 1915
- colloid bands 337
- colon notation 339
- colonoscope 781
- color 688, 2160, **2866**
 - blue sky 2235
 - force 2153
 - quarks 911, 912, 914
- color centers **332**, 341
 - applications 347
 - formation 343
- column vector 1454
- combustion **349**, 819
 - engine 241
 - exhausts 350
- common-band approximation 66
- commutation relation 2312, 2315, 2830
 - angular momentum 2312
- commutativity 794
 - local 795
- commutator 542, 2120
- compactification 705
- compass 889

- compensators 1849
 complementarity **354**, 2113
 complementary metal oxide semiconductor 306, 656
 complete neglect of differential overlap
 method 1611
 completeness assumption 2118
 complex systems **356**
 compliance tensor 1960
 composites 65, 704
 compound nucleus 1148
 compressibility 820, 1905, 1906, 1915, 2675
 adiabatic 2721
 isentropic 821
 compressible gasket apparatus 2804, 2811
 compression corner 2414
 Compton effect **359**, 1946, 2113, 2178, 2192
 Compton scattering 82, 122, 191, 571, 778, 779, 875, 876, 1944
 differential cross section 360
 inverse 110, 865
 Compton upscattering 119
 computational complexity 357
 computerized tomography 2211
 computer simulation 1295, 1913, 1915
 concentrated Kondo systems 989
 concentrator systems 2426
 concordia 888
 condensation 1901
 conductance 2838
 conduction **362**
 gaseous 615
 protonic 1085
 thermal 1225
 conduction band 968, 2356
 conductivity 1310
 electrical 453, 1102, 1104
 ionic 453
 thermal 85, 363, 446, 866, 982, 1913, 1917, 2694, 2771
 conductors 554
 ionic 563
 organic **1861**
 configuration interaction method 140, 143, 1605
 configuration space 538, 547
 confinement 688, 691, 910, 911, 950, 1294, 2554
 magnetic 1406
 conformal field theory 2548
 conformal invariance 1911
 conjugate gradient algorithm 1460
 conservation laws 81, **364**, 536, 1298, 2312, 2313
 and invariances 2312
 conservative systems 273
 conserved vector current hypothesis 950
 consistent histories 2148
 constant-photocurrent method 2381
 constants, fundamental **371**
 time variation 391
 constants of the motion 536, 539
 constraint forces 536
 contact angle 239, 240
 contact electrification 667
 contact potential 1958
 containerless heating 1018
 containment integrity 1054
 contextual theories 1010
 continuity of states 1338
 continuum-distorted wave eikonal-initial state
 method 1141
 convection 362, 1913
 conversion factors 371
 convexity 2686
 convolution 521, 842
 cooling 444
 buffer-gas 317
 evaporative 2802
 magnetic **1359**, 2230
 nuclear magnetic 1360
 polarization-gradient 1251
 sympathetic 2802
 ultrafast 905
 cooperative phenomena 1859
 Cooper minimum 151
 Cooper pairs 220, 363, 988, 2108, 2566, 2567, 2584
 Copernican revolution 920, 922
 copolymers 2029, 2030
 Coriolis acceleration **393**
 Coriolis force 891, 1355, 1487, 2313
 corona discharge **394**, 669
 coronal mass ejection 415, 1419
 coronary angiography 201
 correlated-electron systems 1115, 1119
 correlation
 angular 78, 79
 electronic 138
 perturbed angular 79

- polarization–directional 78
- polarization–polarization 78
- correlation coefficient 2063
- correlation energy 1430
- correlation function 79, 817, 1906, 2128
 - angular 78
 - time-dependent 1100
- correlation length 1906, 1909, 1910, 1913, 1915–1917
- correspondence principle 946, 2116, 2121
- corrosion 57, 566, 2781
- cosmic background radiation 420, 422, 1446, 1824
- cosmic censorship 205
- cosmic expansion 125
- cosmic rays 670
 - anomalous components 416
 - astrophysical effects **397**
 - atmospheric secondaries 417
 - cutoff energy 417
 - east–west effect 417
 - galactic 413
 - latitude effect 417
 - solar 414
 - solar flux 400
 - solar modulation 413
 - solar system effects **410**
 - ultrahigh-energy 91
- cosmic strings **418**, 2542
- cosmological constant 245, 246, 424, 703, 2254
- cosmological redshift 421
- cosmology 83, 245, **421**, 916, 930, 2499
 - inflationary 916
- Coster–Kronig transition 171, 2918
- Cotton–Moulton effect 741
- Cotton effect 1834
- Couette flow 1063, 1064, 2360
- Coulomb’s law 554, 568, 584, 768, 1465, 1466
- Coulomb-cusp relaxation 138
- Coulomb barrier 2785
- Coulomb blockade 1476
- Coulomb capture 1663
- Coulomb energy 1147
- Coulomb excitation 1793, 1811, 2295
- Coulomb gas model 1000
- Coulomb gauge 2087
- Coulomb interaction 2737
- counting tubes **428**
- covariance 2063
- covariant derivatives 2852
- Cowling’s theorem 891
- CP* conservation 83, 368
- CP* invariance 699
- CPT* theorem 369, **438**, 797, 2047, 2099, 2904
- CP* violation 2907
- Crab Nebula 115, 2071, 2659
- crack propagation 745
- crater formation 88
- creep 501, 1471
 - rate 501
- crisis 275, 276
- critical exponent 1859, 1906, 1907, 1912, 1915, 1918, 1919, 2104, 2465
 - dynamic 1913
- critical layer thickness 2139
- critical opalescence 814, 818, 1906
- critical phenomena
 - dynamic **534**, 818, 1913
 - isomorphism 1859
- critical point 254, **441**, 1340, 1341, 1902, 1905, 1914
 - classical 1917
 - quantum 443, 991, 1120, 1918
- critical properties 822
- Crooke’s dark space 395
- cross section 956, 1149
 - collisional 319
 - differential 287
 - differential scattering 1805
 - integral 325
 - neutron scattering 1714
 - nuclear fusion 1757
- cryogenics **444**
- cryostat 236
- crystal field **447**
 - effects 1906
 - potential 739
- crystallization 904
- crystallography
 - axial frames 463
 - cell 466
 - elementary cell 466
 - fundamental cell 466
 - lattice 464
 - orbit 471
 - primitive cell 466
 - reduced cell 466
 - texture 1380

- unit cell 466
- x-ray **474**
- crystals 522
 - binding **449**
 - classes 469, 942
 - defects **451**
 - deformation **499**
 - growth **455**, 2913
 - magnetic 2357
 - mechanical properties 1120
 - morphology 455
 - noncentrosymmetric 2072
 - organic molecular 1869
 - photonic 516, **1948**
 - photorefractive 1048
 - piezoelectric 2827
 - polarization 2072
 - symmetry **458**
 - systems 467
 - thermotropic 1327
- C_s -barrier 618
- cumulant function 2062
- Curie–Weiss constant 1007
- Curie–Weiss law 1882
- Curie law 1115, 1766, 1882
- Curie method 1881
- Curie point 1145, 1146, 1422, 1858
- Curie temperature 765, 766, 773, 818, 892, 909, 1882, 1902, 2582, 2642
- current 673
 - charged 676
 - electric 71
 - electromagnetic 595
 - electromagnetic neutral 2909
 - filaments 1920
 - hadronic 676
 - in particle theory **487**
 - neutral 680, 2904
 - strangeness-changing neutral 696
 - weak charged 595, 2909
 - weak neutral 490, 595, **2908**
- current–voltage characteristic
 - corona discharges 395
 - ZnO varistor 265
- current algebra 950
- cusp catastrophe 252, 253
- cusp confinement 1974
- cyclic loading 2781
- cyclotron 288, **490**
 - cyclotron frequency 491, 868
 - cyclotron radiation 227
 - cyclotron resonance **497**, 739, 2406
 - acoustic 1397
 - Doppler-shifted 1397
 - electron 289
 - cyclotron resonance condition 491
 - Czochralski machines 457
 - Czochralski method 308
- d'Alembertian 2250
- damping 1913
 - coefficient 2855
 - magnetic 1408
- dangling bonds 2399
- Daniell cell 557, 564, 565
- Darcy's law 2420
- dark energy 120, 125, 245, 703, 2550
- dark matter 120, 121, 123, 425, 863, 1520, 2834
 - cold 708
- Darmstadtium 2594
- dart leader 1323
- dating
 - dendrochronology 888
 - radiocarbon 888
 - radiometric 885, 2204
 - systems 885
- Davisson–Germer experiment 617
- D-branes 2547
- dead time 313, 432, 435
- de Boer parameter 1003
- Deborah number 2309
- de Broglie relation 616, 2767
- de Broglie wavelength 158, 296, 616, 993, 1003, 1251, 1475, 1619, 2800
- Debye–Hückel model 563
- Debye–Scherrer pattern 617, 618
- Debye–Sears apparatus 24
- Debye–Waller factor 619, 1005, 1645
- Debye equations 74
- Debye law 59, 1927
- Debye length 563, 1963, 1978, 1993
- Debye model 1005
- Debye peak 74
- Debye sphere 1963
- Debye temperature 727, 1003, 1288, 1293, 2588
- Debye theory 727, 728, 976
- Debye waves 230, 232
- dechanneling 270

- decimal indicator 2619
- declination 889
- decoherence 2148, 2345
- decomposition of the identity 1831
- decontamination factor 2201
- deconvolution 843, 1504
- deep inelastic scattering 1796
- defocusing 962
- deformation band 500
- deformation potential 55
- degeneracy pressure 124, 204
- degrees of freedom 2333
 - classical mechanics 535
 - thermodynamic 1904
 - topological 1687
- de Haas–van Alphen effect **502**, 625, 629, 751, 1118, 1414, 1423, 1865
 - in ultrasonic attenuation 1398
- de Haas–van Alphen frequency 503
- de Haas–van Alphen oscillations 990
- Delbrück scattering 2094
- delocalization 1619
- demagnetization 1383
- demineralization **507**
- Democritus 162
- dendrochronology 888
- dense random packing model 907
- density 2062, 2684
 - classical fluctuations 817
 - definition 2685
 - fluctuations 534
 - gradient 2416
 - measurement of oscillations 24
- density-wave theory 1521
- density functional theory 139, 146
- density matrix 2333
 - time-dependent 2512
- density of states 2138, 2356
- deoxyribonucleotides 199
- depletion depth 2370
- depth sounders 2486
- detectors 2472
 - charged-particle 290
 - dielectric track 2191
 - gas-filled 2187
 - heat-sensitive 1625
 - lithium-drifted 291
 - phoswich 293
 - photoacoustic 1524
- determinants 1457
- detonability 2416
- detonations **2411**, 2416
- deuterium 1163, 1164
- deuteron 1772, 1774, 1789, 1885, 2621
 - quadrupole moment 185
- diabatic states 329
- diamagnetism **508**, 510
- diamond indenter-diamond anvil apparatus 2804
- dichromacy 2870
- dielectric constant 528, 529, 1120, 1289, 1310
- dielectric function 514, 515
- dielectric properties **512**
- dielectric relaxation time 1930
- dielectric strength 1105
- dielectric tensor 1960
 - inverse 1932
- difference-frequency generation 1282
- differential scanning calorimetry 2671
- differential thermal analysis 2671
- different orbitals for different spins method 1605
- diffraction **516**, 616, 1088, 1313, 1846, 1850, 2242
 - acoustooptic 1931
 - low-energy positron 1348
 - photoelectron 1939, 2610
 - sound 36
 - x rays 474
- diffraction catastrophe 255
- diffraction limit 1258, 1282, 1840
- diffractometer 480
 - four-circle 479
- diffusion 363, **526**, 1225
 - coefficient 363, 526, 1913, 2694, 2771
 - molecular 2838
 - photoassisted 2378
 - process 1913
 - single-atom 790
 - thermal 816
- diffusion chamber 313
- diffusion mask 308
- diffusivity 526
 - magnetic 1401
 - turbulent 1405
- dilaton 2546
- dilution refrigerators 1359
- diode
 - Gunn 1517, 2474, 2480, 2481
 - heterojunction hot electron 2481

- IMPATT 2750
- laser 577
- light-emitting 575, 657, 2750
- pin* 2474, 2478
- plasma 2750
- pn* junction 2477
- pnp* 2473, 2474, 2478
- Schottky 2477, 2478
- semiconductor 2750, 2787
- space-charge-limited 183
- step-recovery 2477
- thermionic 649
- transferred-electron 2750
- tunnel 2474, 2478
- variable reactance 2749
- volt-ampere curve 645
- Zener 2477
- diode equation 1958
- diode rectifier 2749
- dipole interaction 159, 160, 640, 1903, 1907
 - induced 1249
- dipole moment 738
 - atomic magnetic 1386
 - electric 703, 763
 - induced 1248
 - macroscopic 763, 764
 - magnetic 812, 1385
 - molecular electric 556
 - nuclear magnetic 1771, 1783, 1788
 - permanent 1107
- Dirac's impulse function 841
- Dirac-Coulomb equation 153
- Dirac-Slater wavefunction 149
- Dirac equation 579, 593, 807, 879, 2045, 2335
- Dirac notation 2317
- Dirac particle 1703
- Dirac picture 2089
- Dirac pole 1390
- Dirac theory 808, 809, 974
- discharge 84, 1021, 1322, 1324
- discommensurations 279
- discordia 888
- disk region 1520
- dislocation 451, 1471, 2399, 2461
 - edge 453
 - flow stress 499
 - pinned 454
 - screw 453
- dispersion 283, 1313
 - anomalous 483
 - dispersion curve 1833
 - phonon 1286
 - dispersion interaction 57, 1108
 - dispersion relation 513, 528, 531, 2335, 2768
 - surface waves 2607
 - dispersion theory **528**
 - dispersive media 2897
 - displacement current 585, 1465
 - displacement damage 346
 - displacement pickups 25
 - displacement vector 2312
 - dissipation 2690
 - dissipative structures 2690, 2695, 2697
 - distillation 507
 - distorted-wave Born approximation 1794
 - distribution 2062
 - divergence theorem 884
 - DNA 199, 200, 663, 1069, 1070
 - haploid 200
 - local conformation 200
 - shear degradation 200
 - docking sites 1683
 - domains, magnetic **1366**, 1422
 - domain wall 1366
 - donor states 575
 - doping 2399
 - postdeposition 2379
 - Doppler anemometer 2884
 - Doppler broadening 533, 1527
 - Doppler effect **532**, 1057, 1247, 1252, 2164
 - Doppler shift 158, 160, 852, 1246, 1441
 - second-order 185
 - Doppler velocimetry 634
 - dosimeter 347, 2189, 2191, 2716, 2719
 - dosimetry 2191, 2192, 2205, 2206, 2209, 2717, 2718, 2820
 - ultrasonic 2822
 - double-minimum potential 1133
 - double-resonance experiments 1834
 - double layer
 - compact 566
 - electrical 565
 - double star 2250
 - down-conversion 161
 - drag coefficient 2358
 - drainage 2418
 - drift chambers 429, 434
 - drift velocity 2406

- driftwood, motion 55
- driving-point function 1692
- Drude–Lorentz theory 2582
- Drude resonance 1118
- ductility 500, 501
- Dushman relation 645
- dynamical systems 258, 273
- dynamic collective model 1954
- dynamics
 - analytical **535**
 - Hamiltonian 540
 - Newtonian 536
- Dynamitron 11, 13
- dynamo theory 891, 1403
- Dyson–Schwinger equation 196
- Dyson equation 1435
- Dyson operator 2089

- ear, human 31, 50
- Earth 839, 894, 1415, 2452
 - atmosphere 102
 - dip poles 889
 - liquid iron core 891
 - magnetic anomalies 892
 - magnetic field 1403, 1410, 2175
 - magnetic poles 889
 - magnetosphere 2175
 - mass 922
 - polarity reversals 891
 - radiation 128
- earthquake 895, 896, 898, 901, 1957, 2361–2364, 2367–2369, 2490
 - epicenter 2364
- echelon 1113
- echo 1985
 - acoustic 31, 33, 36
 - neutron spin 1712
 - photon 1243
 - spin 1767
- Eckert number 985
- eddy current 832, 1301, 1380
 - losses 1381
- edge focusing 493
- Edison effect 644
- effective-mass tensor 626
- Efimov effect 2740
- eigenfunction **547**, 2119
- eigenspace 1830
- eigenvalue 547
 - equation 1459, 2119
 - problem 1459
- eigenvector 547
- eikonal approximation 2242
- Einstein’s field equations 800, 1355, 2797
 - de Sitter solution 1057
 - Lense–Thirring solution 1628
- Einstein–de Sitter model 424, 425
- Einstein–Maxwell theory 803, 804
- Einstein equation 649
- Einstein formula 233
- Einstein relation 363, 563
- Einstein ring 932–934
- Ekman layer 224
- Ekman number 1410
- El-Nino Southern Oscillation 1489
- elastic compliances 1468
- elastic constants 549, 550, 1120, 1121, 1399
 - higher-order 552
 - temperature dependence 552
- elasticity **548**, 1467
- elastic limit 1470
- elastic moduli *see* elastic constants
- elastic rotation tensor 1399
- elastic strain response 1121
- elastic waves 35
- elastocapillary number 256
- elastohydrodynamic effects 2782
- elastohydrodynamic lubrication 857
- elasto-optic effect *see* photoelastic effect
- electrets 764
- electric-field-gradient tensor 1789
- electrical breakdown 1105
 - voltage 2477
- electrical steel 1380
- electrical storms 828
- electric field 2, 568, 2688, 2747, 2763, 2784, 2864
- electricity 554
- electric moment 1547, 1556, 1772, 1784, 1813
 - macroscopic 2072
- electric moments **554**
- electroacoustic effects 31
- electroacoustic reinforcement 33
- electroacoustic transducers 30
- electrochemical conversion and storage **557**
- electrochemistry **563**
- electrocrystallization 455

- electrodes 564, 565, 2187, 2370, 2479, 2480, 2651, 2745
 electro dialysis 507
 electro dics 564, 565
 electro dynamics
 classical **567**, 579, 798, 883
 emergence 1027
 gauge symmetry 419
 quantum *see* quantum electro dynamics
 electroluminescence **574**, 1349
 electrolysis 565
 electrolytes 563, 1623
 electromagnetic field 673, 1464, 2083
 electromagnetic interaction **579**, 673, 957, 2083, 2642
 range 911
 electromagnetic radiation 516, 534, 568, **583**, 611, 638, 871, 932, 1254, 1512
 dipole 587
 spectrum 1310
 electromagnetic waves 1, 226, 272, 359, 498, 512, 583, 584
 electromagnetism 743, 2067, 2083, 2104, 2158, 2250, 2257, 2259, 2271, 2336, 2551
 electromagnets 315, **589**, 776, 1372, 1380, 2760
 electromechanical transducers 21, 1959
 electromotive force 558, 569, 742, 1401, 2624
 electron 212, 363, **591**, 669, 671, 1297, 1774, 2621, 2766
 charge 591
 classical radius 390
 Compton wavelength 359, 390
 dipole moment 591
 discovery 591
 effective mass 977
 g factor 1386
 g factor 375
 gyromagnetic ratio 591, 2045
 inner-shell 301
 magnetic moment 1386, 2045, 2085, 2095
 magnetic moment anomaly 582
 mass 371, 591
 name 553
 pairing 301
 polarization 1776
 properties 2046
 spin 166, 591, 593, 716, 1619, 2045, 2503
 spin polarization 2357
 electron–hole droplets **631**, 1478
 electron–hole liquid 631
 electron–hole pair 332, 336, 578, 631, 1870, 1937, 1958, 2193, 2370
 electron–nucleon scattering 489
 electron–phonon interaction 498, 1423, 1928, 2588
 electron–positron colliders 2053
 electron–positron pair production 361
 electron–quark interaction 2910
 electron–coupled resonance 2727
 electron affinity, negative 2355
 electron beam evaporation 2754
 electron beams **595**
 luminosity 2052, 2053
 technology **605**
 electron bombardment **611**
 electron capture 188, 1786, 2198, 2199, 2901
 electron collisions 1139
 electron configuration 131
 electron correlation 142
 electron density 481, 482, 628, 909, 967, 1013, 1108, 1648, 1975
 electron diffraction 517, 520, 523, **616**, 859, 1337, 1573, 2386
 high-energy 618, 2728
 low-energy 524, 618, **1345**, 1939, 2728, 2729
 low-energy inelastic 1348
 reflection high-energy 524, **2240**, 2728
 electron ejection 324, 600
 electron emission
 field 84
 photoelectric 649
 secondary 600, **2354**
 thermal 84, 644
 thermionic 649
 electron energy spectrometer 604
 electron energy states **621**
 electron fluid 1430
 electron gun 1228
 electronic noses **659**
 electronics 57, **651**
 electronic structure 2355
 electron impact **600**
 electron microscope 281, 635, 636, 2728
 electron multipliers 2357
 electron paramagnetic resonance *see* electron spin resonance
 electron reflection 601, 617

- electron scattering 1795, 2293, 2909
- electron shakeoff 1142
- electron spin resonance 338, 348, **637**, 2381, 2719, 2932
- electron synchrotron 493
- electron transfer 1142
- electron tubes **644**
- electrooptic effect 767, 1960
- electrooptic tensor 1933
- electroosmosis 2694
- electrophilic center 301
- electrophoresis **663**
- electrophotography 395, 397, **665**, 666–668, 1867, 2385, 2386
- electroplating 566
- electrorheology 2301
- electrostatics 568, **669**, 841, 883
- electrostriction 232, 2179
- electrostrictive effect 1845
- electroweak interaction 418, 807, 812, 2153, 2448, 2551, 2643
- electroweak theory 489, 884, 910, 911, 1890, 2443, 2908
- elementary charge 371
- elementary excitations 2463
- elementary particles **671**, 1912, 2613
- elementary processes 1227
- elements **713**
 - concept 162
 - fusion of light 1975
 - radioactive 2197
 - superheavy 2779
- electron–positron colliders 2053
- ellipsometry **718**, 2728
- Elsasser number 1410
- embrittlement 908
 - hydrogen 2810
- $E = mc^2$ 2270
- emission
 - acoustic 2825
 - amplified spontaneous 1268
 - nonthermal 107
 - spontaneous 158, 1246, 1254, 1256, 1269–1271
 - stimulated 158, 1254–1256, 1258, 1265, 1268–1271
 - thermal 107
 - thermionic 644, 670, **2678**, 2915
- emission channeling 271
- emissive power
 - monochromatic 985
 - total 985
- emissivity 211, 2218, 2220
 - effective 211
 - monochromatic 985
 - total 208
- emittance 285, 962, 1735, 2218
 - radiant 2220
 - spectral radiance 208
 - spectral radiant 208–210
 - total radiant 208, 209
- emitter-coupled logic 656
- enantiomerism 1618
- enantiomorphism 1833
- energy 720, 975
 - and work **720**
 - chemical 2411
 - conservation 365, 537, 720, 975, 978, 1448, 1700, 2312
 - conservation of relativistic 365
 - electrical 2411
 - equipartition 1019, 1220
 - gravitational 722
 - internal 853
 - isothermal potential 853
 - kinetic 537, 721, 1005, 1213
 - magnetoelastic 1421
 - magnetostatic 1367
 - mechanical 2411
 - ocean 2424
 - photogalvanic conversion 566
 - potential 537, 722, 1213
 - quantization 1926
 - relativistic 721, 723, 2267
 - relativistic kinetic 2045, 2267
 - relativistic rest 2268
 - relativistic total 2268
 - transport by radiation 208
 - units and conversions 1534
 - vibrational resonant transfer 1100
- energy–momentum tensor 245, 798, 800
 - conservation 369
- energy density 586
- energy levels, nuclear 871
- energy product 1382
 - maximum 1381
- ensemble 1488, 1853, 1926, 2128, 2465, 2511, 2512

- canonical 1636, 1639, 2516
- equivalence 2516
- grand canonical 1436, 2516
- microcanonical 2513
- oriented 76
- stationary 2513
- entanglement 1925, 2078, 2081, 2145
- enthalpy 825, 2606, 2672, 2682, 2687
 - activation 304
 - reaction 304
- entropy **723**, 853, 978, 1028
 - absolute 236
 - flow 2691
 - fluctuations 230
 - microscopic definition 2136, 2692
 - production 2691, 2696
 - topological 274
- enzymes 199, 247, 249, 305, 1350, 2785, 2893
- epitaxial films 308
 - growth 455, 790
- EPR paradox 1011, 1924
- equal-time equations 195
- equation of continuity 40, 564, 568, 824, 1061, 1386, 2122, 2300
- equations of motion 41, 281, 536, 538, 540, 544, 545, 551, 884, 1121, 1285, 1437, 1472, 2060, 2285, 2401, 2858
 - Euler 823
 - Euler–Lagrange 488
 - Hamilton 540, 542, 543, 579, 972
 - Heisenberg 2096
 - Lagrange 538
 - Newton 40, 536, 579, 729, 1213, 1355, 1447, **1725**, 2310, 2312, 2313
- equations of state **725**
- equilibrium 250, 2274, 2276
 - chemical 241
 - magnetostatic 1405
 - thermal 208
- equilibrium constants 1194, 2682
 - isotope effects 1161
- equilibrium diagrams 1483
- equipoint 471
- equivalent noise temperature 106
- ergodic hypothesis 1438
- ergodicity 546, 2559
- ergodic theory **728**, 2513, 2519
- ergosphere 205
- error analysis **730**
- error interval 2065
- escape depth 2355
- estimation 2065
- estimator 1639, 2065, 2521
 - Bayes 2521
 - of parameter 2065
- etalon 231, 1113, 1258, 1264, 1274
- ether 584, 923, 1033, 1465, 1493, 2257
- Euclidean group 469
- Euclidean space 2313
- Euler’s construction 460, 462
- Euler–Lagrange equations 538, 798–800
- Euler angles 2310
- Eulerian flow 822
- Europa 1081, 2453
- eutectic mixtures 65
- evaporative cooling 161
- event horizon 114, 204–206, 256, 928, 2498
 - and entropy 205
- evolved-gas detection 2671
- Ewald sphere 476
- exchange integrals 448, 642, 1003, 1006, 1008, 1234, 1235
- exchange interaction 138, 278, 754, 1108, 1366, 1367, 1399, 1907, 2508
- exchange operator 1602, 1609
- exciton bands 336, 338, 339
- excitonic insulators 1478
- excitons 631, **734**, 1478, 2464
 - confined 2141
- exclusion principle *see* Pauli exclusion principle
- exclusive reactions 689, 1087
- exitance 2218, 2220
- expectation value 1601, 2062, 2118, 2135
- explosions 828
- explosives 2411
- explosive waves 48
- extended x-ray absorption fine structure 2662, 2923
- extensive variables 2685
- extinction coefficient 1
- extraterrestrial physics 2488
- extrudable gasket apparatus 2804, 2811
- eye, human 2870
- Eyring theory 1161
- Fabry–Pérot interferometer 1113, 1532
- factoring 2082
- Faddeev–Povov quantization 2088

- Faddeev equations 2738, 2739
 Fahrenheit scale 1015, 2669
 Fano–Lichten model 1141
 Fano factor 2371
 far-field pattern 2762
 far-infrared spectra **737**
 Faraday's law 569, 584, **742**, 769, 770, 1465
 Faraday's laws of electrolysis 558
 Faraday constant 376, 558
 Faraday cup 286
 Faraday dark space 395
 Faraday effect **741**, 1126, 1208, 1367, 2406
 Faraday rotation 1209, 1356, 1357
 fatigue **744**, 2781, 2825, 2854
 F center 333, 334, 345
 Fellgett advantage 737, 1098
 Fenton reaction 2035
 Ferguson plot 663
 Fermat's principle 250, 255
 Fermi–Dirac distribution 1463
 Fermi–Dirac statistics 222, **746**, 747, 748, 751, 1131, 1297, 2100
 Fermi–Kurie plot 189
 Fermi-liquid theory 2463
 Fermi constant 677
 Fermi degeneracy 2137
 Fermi energy 278, 2463, 2801, 2914
 Fermi function 189, 2767, 2768
 Fermi gas 988, 2108, 2767
 degenerate 316, 317, 976
 ultracold 220
 Fermi hole 296
 Fermi level 278, 977, 1864
 tunnel diode 2478
 Fermi liquid 988, 1114–1116, 1118, 1432, 1918, 2168, 2278
 degenerate 747
 fermions 220, 1131, 1297, 2504, 2831
 composite 971
 conservation of number 366
 exotic 703
 parity of wavefunction 747
 statistics 747
 Fermi operators 2559
 Fermi pressure 2802
 Fermi sea 2126, 2802
 Fermi sphere 1430
 Fermi statistics 2584
 Fermi sum rule 2294
 Fermi surface 66, 629, **748**, 988, 1414, 1863, 1865, 2463
 determination 625
 Fermi theory 2904, 2906
 Fermi velocity 363
 ferrimagnetism **753**, 773, 1078
 ferrimagnets 589, 753, 1379, 1393, 1720
 Faraday rotation 741
 ferrite magnets 1382
 ferrites 264, 776, 1381, 1383
 hexagonal 1382
 ferroelastic devices 763
 ferroelasticity **761**, 767
 frozen 762
 ferroelastic switching 761
 ferroelectric domains 765
 ferroelectricity 762, **763**
 ferroelectrics 442, 763, 764, 766–768
 ceramics 2823
 ferromagnetism 762, **768**, 773, 1078, 1392, 1908
 glassy metals 909
 ferromagnets 442, 725, 753
 Faraday rotation 741
 isotropic 1913
 magnetic susceptibility 534
 oxides 1384
 uniaxial 1902, 1905, 1906, 1908, 1909
 Feshbach resonance 219, 220, 317, 2109, 2802
 Feynman diagram 193, 389, **777**, 1435, 1608, 2090, 2098, 2100, 2542, 2908
 Feynman gauge 2087–2090
 Feynman polaron model 2005, 2006
 Feynman propagator 2090
 Feynman x variable 1088
 fiber optics 26, 348, **779**
 fibers 26, 233, 578, 741, 2043
 Fick's law 526, 2419, 2693, 2771
 field-emission microscope 783, 785
 field curvature 1500, 1840
 field emission **782**
 field evaporation 787
 charge exchange model 788
 field index 492
 fields **805**
 relativistic transformations 570
 theory of quantized 791
 field theory
 axiomatic **791**, 792
 classical 797

- unified **803**, 910
- field variables 2685
- filamentation 2476, 2477
- fine-structure constant 371, 673, 969, 2086
- fine interaction **807**
- fine structure 582, 807
 - alkali atoms 810
 - calculation 811
 - experimental techniques 812
 - helium 582, 811, 812
 - hydrogen 582, 808
 - interval rule 810
 - inversion 810
 - many-electron atoms 812
 - molecular rotational 812
 - semiclassical argument 808
 - two valence electrons 810
- finite-amplitude acoustics 35
- finite-range droplet model 1815
- finite-size corrections 2466
- finite-size effects 1915, 1916
- finite-size scaling 1915
- fission
 - nuclear 2591, 2779
 - spontaneous 2198
- Fitzgerald contraction 2262
- Fizeau fringes 1850
- Fizeau interferometer 1113
- flames **349**
 - laminar speed 351
- flammability limits 351
- flash 1322
- flashover 2357
- flavor 688, 2159, 2160
 - oscillations 915
- floating bonds 2383
- flow
 - fluid 257, 1060
 - heat 1919
 - helicity 1403
 - inviscid 824
 - laminar 2856
 - magnetohydrodynamic 819
 - shear 1919
 - supersonic 2414
 - supersonic and hypersonic 828
 - Taylor–Couette 257, 1920
 - turbulent 832
 - viscous 830
 - viscous shear 832
- flow stress 500
- fluctuation–dissipation theorem 816, 1100, 2465
- fluctuation measures 2559
- fluctuations 534, **813**, 1852, 2465, 2511
 - density 456
 - divergence 818
 - energy-level 2559
 - heterophase 456
 - hydrostatic 814
 - measurement 817
 - quantum 1917
 - time evolution 816
- fluence 344
- fluid dynamics 1060, 2299
- fluidity 2299
- fluid mechanics 1060
- fluid mixtures 1909, 1915, 1918, 2688
- fluid physics **819**
- fluids 819
 - anisotropic 1062
 - barotropic 2884
 - dynamics 822
 - energetics 825
 - Newtonian 802, 820, 2856
 - non-Newtonian 820, 2301, 2858
 - quantum 1000, 1428, 1429, 2135
- fluorescence **1349**, 1505, 1506, 2705
- fluorescence yield 1142
- flux, magnetic 1380
- flux-peaking effect 271
- flux density 2220
- flux pinning 2569
- Fock–Dirac density matrix 1602
- Fock matrix 1604
- Fokker–Planck equation 1985, 2532, 2534
- Forbush decrease 415
- force constants, molecular 1003, 1096, 1098, 1536, 1543
- foreshock 2368
- form factor 695
- Foucault’s pendulum 393, 1355, 1356
- four-point function 193
- four-vectors 369, 570, 1217, 2125, 2273
- four-wave mixing 1243, 1844, 2134, 2863
- Fourier law 982, 2771
- Fourier pair 841
- Fourier series 840
- Fourier synthesis 103

- difference 486
- Fourier transform 481, 519, **840**
- Fowler–Nordheim equation 782
- fractal dimension 847, 2700
- fractals **847**
- fracture 57
- frame of reference 2258
 - barycentric 2340
 - center-of-mass 2340
 - inertial 1355
- frame rotation 2310
- Franck–Condon factor 1539, 1869
- Franck–Condon principle **850**, 1263
- Frank–Read loops 2825
- Frank–Read source 500
- Franz–Keldysh effect 2406
- Fraunhofer condition 2896
- Fraunhofer diffraction 517, 1850, 2896
- Fraunhofer lines **851**, 2862
- Fraunhofer region 1850
- Fredholm integral equations 1460
- free–free emission 107
- free-electron gas 144, 450, 1334, 2469, 2566
- free energy **853**, 1910, 1917
- free induction decay 638, 1767
- free will 1034
- Frenkel defect 2399
- freon 314
- frequency-modulation effect 2277
- frequency conversion 1281, 1282
- frequency doubling 1842
- frequency mixing 1281
- frequency shifts, isotopic 1161
- frequency standards 185, 1444
- frequentist interpretation 2062
- Fresnel’s formulas 719
- Fresnel–Kirchhoff diffraction theory 1850
- Fresnel biprism 1849
- Fresnel coefficients 1312
- Fresnel diffraction 517, 524
- Fresnel rhombs 2002
- friction **854**
 - coefficient 854
 - internal 74, **1120**, 1469, 2825
- Friedel’s law 475
- Friedel mates 484
- fringes 1110, 1113, 1314, 1852
- Frisch grid chamber 2188
- Fröhlich–Coulomb model 2017
- Fröhlich coupling constant 2004
- Fröhlich Hamiltonian 2004
- Fröhlich polaron 2004, 2006
- Froissart bound 2248
- frozen flux theorem 1402, 1406
- frugivory 2871
- fuel cells 566, 1624
 - high-temperature 566
- fuel cycle, nuclear 2202
- fullerenes **858**, 1875
- future 2741
- gain broadening 1274
 - homogeneous 1273
- gain saturation 1272
- gain switching 1277
- galaxies **863**
- galaxy clusters 119, 123, 420, 863
- galaxy luminosity function 864
- Galilean group 1217, 2310, 2312
- Galilean transformation 2258, 2259, 2495
- Galileo’s law 921
- galvanic cell 557–560, 565
- galvanomagnetic effects **866**, 967, 1412
- game of life 258
- γ -ray bursts 93, 124, 398
- γ -ray spectrometers **875**
- γ camera 2212
- γ decay **871**, 2784
- γ rays 187
- Gamow–Teller operator 2294, 2559
- Gamow–Teller resonance 2295–2297
- Ganymede 1081, 1415, 2453
- Garlick–Gibson equations 2709
- gas centrifuge 1164
- gas chromatography 662
- gas constant 1227
- gas counter 290, 291
- gas diode rectifier 649
- gases 313, 819
 - car exhaust 248
 - kinetic theory 363
 - lattice 260
 - liquefied 444
 - molecular 396
 - quantum **2799**
 - ultracold 220, 2799
- gas multiplication 2189
- gasoline engine 978

- gas sensor systems 659
- gas triodes 649
- gastroscope 781
- gauge bosons 179, 679, 911, 912
- gauge coupling constant 678, 912
- gauge field 878
- gauge groups 951
- gauge hierarchy problem 912, 916
- gauge invariance 369, 674, 807
 - electromagnetic 910
 - S matrix 2336
- gauge symmetries 912
 - broken 911, 2584
 - local 2102
- gauge theories 489, 678, **877**, 911, 950
 - non-Abelian 678, 690, 805, 2101, 2551
- gauge transformations 878, 1465
- gauginos 914
- Gauss' law 568, 584, **883**
- Gauss' theorem 884
- Gaussian distribution 2063
- Gaussian software package 1098
- geckos 1678
- gedanken* experiments 2079
- Geiger–Müller counter 429, 434, 2189
- Geiger–Nuttall rule 69
- gels 2307
- generalized conjugate residual algorithm 1460
- generalized coordinates 1213, 1214
- generalized gradient approximations 146
- general one-trap equation 2709
- generators 180, 2582, 2600, 2601
 - broken symmetry 2646
 - hypercharge 2615
 - infinitesimal 944, 1831
 - isospin 2615
 - rotation group 2559
 - supersymmetry 2601
- geocentrism 1025
- geochronology **885**
- geodynamo 891, 892
- geomagnetic poles 890
- geomagnetic storms 2454
- geomagnetism **889**
- geometric oscillations 1396
- geophysics **894**
- Georgi–Glashow group 914
- Gibbs' phase rule 1904
- Gibbs–Duhem relation 2685
- Gibbs–Wilff theorem 2611
- Gibbs distribution 1463
- Gibbs free energy 2606, 2682, 2687
 - change in Galvanic cell 558
- Gibbs law 2696
- Gibbs potential 853
- Ginzburg–Landau variable 2567
- Ginzburg–Landau expansion 279
- Ginzburg–Landau formulation 2467
- Glan–Foucault prism 1849
- Glan–Taylor prism 2001
- Glan–Thompson prism 1849, 2001
- Glashow–Salam–Weinberg theory 2104
- glasses **903**, 905, 907, 1016, 1337
 - elastic properties 76
 - metallic 1380
- glass transition 1903
- glassy materials 2462
- glassy metals 904, **905**
- Glauber approximation 2739
- global warming 129
- globular clusters 2833
- glow curve 2705
- glow discharge 394
- glow peaks 2705
- glueballs 692, 1474
- gluinos 952
- gluons 488, 489, 691, 911, 957, 1474, 2553, 2618
- Goddard Earth Model 940
- Gödel universe 2797
- golden rule 2123
- Goldstone bosons 679, 797, 2103, 2642
- Goldstone modes 1909, 1916
- Goldstone theorem 2102, 2642, 2643
- goniometer 474
- goniospectrophotometers 2501
- goodness of fit test 2523
- Goos–Hänchen shift 2786
- Gouy–Chapman–Stern model 566
- Gouy method 1882
- gradient corrections 145
- grain-oriented steel 1380
- grain boundaries 451, 2399, 2462
- grand unified theories 83, 180, 419, 705, **910**, 912, 916, 951, 1925, 2449
- graphical unitary group approach 1606
- Grashoff number 985
- grating 1346, 1736

- diffraction **917**, 1048, 1113, 1264, 1525, 2897
- echelle-type 918
- holographic 918, 1048
- intracavity 2863
- grating equation 917
- grating orders 917
- grating spectrometer 737
- gravitational-wave detectors 125
- gravitational collapse 927
- gravitational constant 722
- gravitational equivalence principle 1447
- gravitational interaction 579, 673
- gravitational lensing 123, 2166, 2242, 2834
- gravitational radiation 929, 2255
- gravitational waves 122, 935, 2255, 2498, 2542, 2608
- gravitino 2604
- graviton 705, 2540
- graviton problem 703
- gravity 122, 256, 919, 2497, 2607
 - Earth's 938
 - local symmetry 910
 - Newtonian 2497
 - quantum 703, 931, 2499, 2540
 - repulsive 245
 - theory 910, 1356
 - topographic effects 939
- graybody 208, 2219
- grazing incidence 2240
- Great Attractor 422
- Green's function method 66, 627, 1435
- Green's functions 520, 777, 1428, 1607, 1637, 2097
- greenhouse effect 129, 350, 1489
- greenhouse gases 2425
- green salt 2202
- Grille spectrometer 1529
- Gross–Pitaevskii equation 218, 2801
- group frequencies 1101
- groups 910, 1308, **2613**
 - Abelian 679
 - E_6 881
 - $E_8 \times E_8$ 709
 - elements 458
 - gauge 489, 910
 - generators 691
 - grand unified 914
 - linear representation 2314
 - quantum 952
 - representation 942
 - $SO(10)$ 881
 - $SU(2)$ 2314, 2317, 2320
 - $SU(3)$ 911, **2613**
 - $SU(4)$ 2559
 - $SU(N)$ 910
 - $SU(2) \otimes U(1)$ 489
 - $SU(3)$ 489
 - $SU(5)$ 881
 - $SU(N)$ 879
 - translation 464
 - $U1$ 489
 - $U(N)$ 2559
 - $U(1)$ 679
 - unitary representations 2314
- group theory **942**
- group velocity 257, 2897
 - surface waves 2608
- Grüneisen parameter 1293, 2676, 2677
- Guinier–Preston zones 2048, 2613
- gyrator 1686, 1689
- gyromagnetic ratio **953**
 - nuclear 1766, 1784
- gyroscope 780
- gyrotron 598
- Hölder's inequality 1830
- Haag–Ruelle procedure 794
- Haag–Ruelle scattering theory 794
- Haar transform 846
- Haber–Bosch process 249
- Hadamard transform 846
- Hadley Cell 1487
- hadrons 179, 671, 911, **956**, 1885, 2614
- Hagen–Poiseuille's law 2300
- Haidinger fringes 1850
- Haines jump 240
- half-cells 564, 565
- Hall-effect amplifiers 868
- Hall coefficient 504, 967
- Hall effect 741, 868, **965**, 970, 2406, 2766
 - anomalous 869
 - fractional quantum 970, 1861, 2469
 - quantum 375, 870, **969**, 1864, 2469, 2612
- Hall plateaus 375, 970, 971
- Hall resistance 375, 870
 - quantized 969
- Hall voltage 965, 970

- halo 1520, 1521, 1797
- Ham effect 1198
- Hamilton's equations 543
- Hamilton's principal function 545
- Hamilton's principle 538
- Hamilton–Jacobi equation 544, 545, 2121
- Hamiltonian 536, 540, 973, 974, 2121
 - completely integrable 544
 - diabatic 329
 - effective 1430, 1911
 - electronic 139
 - fixed-point 1911
- Hamiltonian function **972**
- Hankel functions 256
- Hankel transforms 841
- hard-sphere
 - equation of state 727
 - fluid 727
 - gas 1429
 - model 1336
 - potential 1342
- hardening 501
- Hartmann layer 1408
- Hartmann number 1408
- Hartree–Fock–Slater equation 144
- Hartree–Fock–Slater wavefunction 149
- Hartree–Fock method 138, 139, 142, 1436, 1602
 - closed-shell 139
 - general 1604
 - generalized 1434
 - multiconfiguration 139
 - open-shell 139
 - projected 1604
 - restricted 1604
 - unrestricted 1604
- Hartree method 142, 1430
- Hassium 2594
- Hawking radiation 257
- Hawking theorem 204
- Haynes–Shockley experiment 2406
- H center 338
- heat 241, **975**
- heat capacity **976**, 2672
 - measurement 235, 236
- heat conduction equation 982
- heat engines 241, **978**
 - efficiency 566
- heat transfer **982**
- heat transfer gauges 2416
- heat treatment 1483
- Heaviside step function 841, 1832
- heavy-atom method 482
- heavy-fermion systems **988**, 1114, 1119, 1120, 1232, 1918
- Heisenberg's commutation relations 1129
- Heisenberg equation 2122
- Heisenberg ferromagnet 951
- Heisenberg model 773
- Heisenberg operator 974
- Heisenberg picture 974, 2089, 2122, 2135
- Heisenberg representation 2122
- Heisenberg S matrix 2343
- helion 373
- helioseismology 1957, 2563
- heliosphere 411
- helium
 - fine and hyperfine structure 811
 - liquid 446, **992**
 - solid **1001**
- helium burning 1825
- Hellmann–Feynman theorem 1608, 1619
- Helmholtz–Lagrange invariant 285
- Helmholtz equation 1461, 2346, 2784, 2786
- Helmholtz free energy 728, 2515, 2606, 2687
- Helmholtz laws 2884
- Helmholtz plane 566
- Henry's law 2848
- Herman–Skillman codes 145
- Hermann–Mauguin notation 459–461, 470
- Hermitian operators 1830
- Hertzsprung–Russell diagram 2528
- Hessian 2686
- heterojunction barrier 2481
- heterojunction hot electron device 2474
- heterojunctions 498, 577, 1517, 1994, 2010, 2385, 2408, 2479, 2482, 2612
- Heusler alloy 1709, 1716
- hidden variables **1010**, 2149
- Higgs boson 679, 682, 951, 2912
- Higgs fields 915, 2160
- Higgs mechanism 419, 679, 1919, 2103, 2551, 2643, 2646
- Higgs scalar 881
- high-resolution transmission electron microscopy 2728
- high-temperature superconductors 1477, 2230
- high-vacuum system 2837
- highest occupied molecular orbital 1610

- Hilbert space 547, 794, 796, 878, 884, 1601, 1607, 1830, 2118, 2314, 2317, 2334
 GNS construction 796
 separable 2316
 Hilbert transform 530
 hindrance factor 1154
 Hoffman modulation contrast 1501
 hohlraum 1090
 hole burning
 spatial 1273–1275
 spectral 1273, 1274
 hole centers 337
 holes 2046, 2049, 2141, 2185, 2193
 self-trapped 338
 hole theory 594, 974, 2046, 2085
 hologram 1851
 holographic dualities 2549
 holography 517, **1044**
 holonomy effects 893
 holons 2468
 holor 2848, 2853
 Holstein–Hubbard model 2016
 Holstein Hamiltonian 2011
 Holstein polaron 2004
 homogeneous gain broadening 1273
 homopolymers 2029
 Hooke’s law 72, 549, 722, 1541
 Hopf algebra 952
 hopping 364
 hot-atom chemistry **1052**
 hot cells **1054**
H theorem **955**, 2692
 Huang–Rhys factor 342
 Hubbard bands 1479
 Hubbard model 1432, 1433
 Hubble constant 421, 933, 934, 1057, 1059
 Hubble diagram 1057, 1059
 Hubble effect **1057**
 Hubble law 421, 1057, 1058, 1218
 Hubble length 421
 Hubble Space Telescope 1059, 2750
 hubs 357
 Hückel method 1610
 Huggins–Flory equation 2038
 Huggins equation 2039
 Hugoniot curve 2413, 2416
 human destiny 1034
 Hume-Rothery rules 66
 Hund’s rule 772, 773, 2931
 modified 151
 Hunter’s sword 835
 Huygens–Fresnel principle 1850
 Huygens principle 517, 845
 hybridization 300, 858, 859, 988, 1115, 1118
 hydrate crystals 2892
 hydrodynamic instabilities 1095
 hydrodynamics **1060**
 hydroelectric power 2424
 hydrogen
 atomic spectrum 164, 177
 hyperfine constant 809
 hydrogen bond **1065**
 hydrogen bonding 302, 1081, 2675, 2891
 hydrogen burning 1823
 hydrogen embrittlement 2814
 hydrology 2419
 hydromagnetic convection 1417
 hydrophones 22, 24
 hypercharge 684, 949, 2158, 2614
 weak 911
 hyperfiltration 507
 hyperfine interaction **807**, 1399
 formula 809
 hyperfine structure 374, 808
 calculation 811
 hydrogen 582, 809
 inversion 810
 many-electron atoms 812
 molecular 812
 muonium 582
 tabulation for alkali atoms 810
 hypergeometric functions 2330
 hypernuclear interactions **1072**
 hypernuclear physics **1072**
 hypernuclei 1072, 1806
 hyperons 1072, **1076**
 hypersatellites 2921
 hypersonics 830
 hyperthermia 2205, 2209
 hypertriton 1074, 2740
 hypervelocity vehicles 819
 hypothesis of limiting fragmentation 1088
 hysteresis 280, 764, 771, 775, **1078**, 2475
 ice **1081**, 1901
 polymorphs 2891, 2892
 ideal-gas law 725
 Ikeda sum rule 2294, 2297

- image motive 2679
- immunoassays 305
- impact parameter 320
- impedance 1686, 1693, 2284
- imperfections 2461
 - structural 451
- impulse approximation 2344
- impurities 451, 1915, 2461
 - amphoteric 2399
 - deep 2400
- impurity-induced absorption 739
- in-cell bridge crane 1056
- incandescent lamp 2861
- incandescent light 574
- incidence, radiant 2220
- inclination 889
- inclusive processes 686
- inclusive reactions **1087**
- incoherence 2129
- independent-particle model 138, 142, 1808
- indeterminism 1034
- index of refraction 528, 2242
- inductance 2284
 - mutual 770
- induction 508, **742**, 769
 - electromagnetic in fluids 1401
 - magnetic 568
- induction forces 1107
- inductor 1686, 1688
 - distributed 1515
- inelastic scattering 2355
- inertia tensor 1626, 1629, 1631
- inflector 496
- information theory 724, 2136, 2690
- infrared 1096
- infrared divergences 1912
- infrared slavery 880
- infrasound 2366
- injection current 1265
- inner product 2320
- inside-out collapse 837, 838
- insulators **1102**, 2356, 2766
 - antiferromagnetic 622
- integrated injection logic 656
- intensity, radiant 2220
- intensive variables 2685
- interatomic forces **1106**
- interfaces 563, 718, 1909, **2609**, 2688
 - curvature 239
 - semiconductor-insulator 498
- interference 517, 1313, 1475, 1846, 2062, 2242
- interference pattern 1044, 1849
- interferogram 1851
- interferometers **1110**
 - space-based laser 930
- interferometry 845, **1110**
 - holographic 1046, 1049
- intergalactic medium 120, 123
 - warm-hot 120
- intermediate neglect of differential overlap
 - method 1611
- intermediate normalization 1607
- intermediate valence compounds **1114**
- intermetallic compounds 65
- intermittency 275
- intermolecular forces **1106**
- internal conversion 1551, 2198
- internal rotation 1617
- International System of Units 390
- interplanetary magnetic field 411
- intersite hopping 767
- interstellar dust 2833
- interstellar medium **1123**
- interstitialcy 2461
- interstitials 451, 453, 501, 563, 2183, 2185, 2196, 2399, 2461
- intersystem crossing 1352, 1353, 1550, 1869
- invariance principles **1127**, 2314
- invariance transformations 2312
- inverse scattering transform 1733
- inversion **1132**, 2785
- inversion doublet 1133
- inversion spectra 1135
- involution 544
- Io 1415, 1419, 2453
- Ioffe machine 1972
- ion-beam sputtering 2727
- ion beams **595**
- ion exchange 507
 - band-displacement 2230
 - elution chromatographic 2229
- ionics 563
- ion impact **600**
- ion implantation 2185, 2379
- ionization **1139**
 - above-threshold 1014
 - dissociative 1142
 - multiphoton 1845

- ionization chamber 291, 430, 2187
- ionization counter 430
- ionization damage 338, 346
- ionization potential 1139
- ion milling 604
- ionoluminescence 604
- ionosphere 128, 497, 891, **1143**, 2171
- iron
 - crystal structures 63
 - saturation magnetization 1381
- irradiance 1847, 1849, 2220
- irreversibility 1429, 2690, 2741
- irreversible processes 724
- irrigation 2418
- isentropic processes 1361
- Ising model 259, 456, **1145**, 1638, 1860, 1910, 1917, 2281
 - 2D 59
 - quantum 1917
- islands of isomerism 1817
- islands of stability 1787, 2592
- isobaric analog states **1147**, 1794
- isobaric spin *see* isospin
- isoclinic chart 891
- isoclinics 890
- isoelectric focusing 664
- isoelectric point 663, 664
- isogonic chart 890
- isogonics 890
- isomagnetic charts 890
- isomerism 1616, 2029
- isometry 1831
- isomorphic transition 1119
- isomorphous replacement 483
 - multiple 484
- isomorphy 484
- isoscalar monopole resonance 2295
- isoscalar quadrupole resonance 2295
- isoseismals 2364
- isospace 1157
- isospin 180, 683, 949, 1147, **1155**, 1474, 2614
 - conservation 367
 - weak 910
- isostasy 939
- isotones 2622
- isotope dilution 2203
- isotope effects **1160**, 1161
 - vapor-pressure 1162
- isotopes 715, 1163, **1176**, 2622
 - separation 1161, **1163**
- isotope separators 281
- isotopic substitution 1160
- isotropic magnets 1909
- isotropic systems 1908
- Jacobi identity 1215
- Jacobi integral 539
- Jahn–Teller effect 850, **1197**
- Jastrow pair function 1004
- jet engines 2230
- Johnson noise 233
- Josephson constant 372
- Josephson current 1202, 2480
 - frequency 1200
- Josephson effect 372, 375, **1198**, 2468, 2571, 2584
 - in thin films 2731
- Josephson junction 1198–1200, 1203, 2470, 2480, 2482, 2572
- Josephson logic gates 2577
- Josephson parametric amplifier 2576
- Josephson relation 1200, 2584
- Josephson sampler 2579
- Jost functions 2343
- Junge power law 61
- Jupiter 839, 1415, 1419, 2452
 - x ray emission 111
- k-calculus 2272
- Kac–Moody algebras 952, 1131
- Kadomtsev–Petviashvili equation 1733
- Kaluza–Klein excitations 2545
- Kaluza–Klein theory 705, 804
- Kanisza’s triangle 2874
- Kant–Laplace hypothesis 1921
- kaon decay 2903
- Kapitza thermal boundary resistance 1364
- Karlsson’s effect 2164
- Kármán vortex 2884
- Kelvin–Helmholtz instability 1990, 2884
- Kelvin–Helmholtz turbulence 1416
- Kelvin equation 241
- Kelvin probe 2915
- Kelvin relations 2703
- Kelvin scale 1015, 2669
- Kepler’s laws 921, 1026, **1205**
- Kerr coefficient 1208
- Kerr effect 760, 1842

- electro-optical **1208**, 1282
- magneto-optical 741, **1209**
- Kerr ellipticity 1210
- Kerr rotation 1210
- keto–enol tautomerism 2785
- Kikuchi patterns 618
- kilogram prototype 372
- kinematics **1212**
- kinetics **1212**, 2509
 - chemical **1226**
- kinetic theory 1028, **1218**, 2772
- kink band 500
- Kirchhoff's laws 208, 651, 652, 986, 1691, 2219, 2472
- Kirchhoff integral 520
- Klein–Gordon equation 579, 807, 2045, 2126
- klystron **1228**
- Knudsen cell 2727
- Knudsen number 2771
- Kohn–Sham equation 145, 146
- Kohn–Sham exchange potential 146
- Kolomogorov–Arnold–Moser theorem 546
- Kolomogorov spectrum 2458
- Kondo condensation 1656
- Kondo effect **1232**
 - multichannel 991
- Kondo insulator 1118, 1120
- Kondo resonance 1116
- Kondo temperature 989, 1116, 1119
- Koopmans' theorem 145
- Korringa–Kohn–Rostoker band model 1937
- Korringa–Kohn–Rostoker method 66
- Korringa constant 1362
- Korteweg–de Vries equations 952, 1732, 2483, 2899
- Kosterlitz–Thouless scenario 1000
- Kosterlitz–Thouless transition 58, 1909
- Kramer's rule 2931
- Kramers–Kronig relations 528, 530, 1313, 1441, 2291
- Kramers–Kronig theorem 2465
- Kramers degeneracy 1197
- Kronecker delta 2849
- Kronecker product 2323
- Kruskal–Shafranov condition 1965
- Kutta lift 2887

- ladder approximation 193
- Lagrange's equations 2312

- Lagrangian 488, 539, 673
- Lagrangian density 580
- Lagrangian dynamics 537
- Lagrangian mechanics 1214
- Lagrangian points 2491
- Laguerre–Gaussian beam 159
- Lamb-dip effect 1241
- Lambert's law 986
- Lambert–Beer Law 1
- Lambertian surface 2220
- Lamb shift 185, 206, 374, 488, 809, 2085
 - measurements 809
- Lamé constants 1469
- Lanczos algorithm 1460, 2737
- Landau–Ginzburg–Wilson Hamiltonian 1911
- Landau–Ginzburg equations 2589
- Landau–Peierls term 510
- Landau–Placzek ratio 231
- Landau–Rabi levels 954
- Landau diamagnetism 509
- Landau levels 970, 971, 1414, 1864, 2406, 2469
- Landau parameters 2168
- Landau quantization 1423, 1864
- Landau singularities 2335
- Landau theory 254, 442, 747
- Landé g factor 1249, 1387, 2929
- Landé interval rule 810
- Langevin diamagnetism 510
- Langevin equation 2536, 2537, 2539
- Langevin formula 1882, 1997
- Langevin method 1639
- Langmuir–Blodgett films 609
- Langmuir waves 2484
- lanthanide contraction 2229, 2775
- lanthanides 717, 2227, 2756
- Laplace's equation 825, 2607
- Laplace development 1457
- Laplace pairs 841
- Laplace transform 653
- Laplacian 2121, 2250, 2851
- lapse rate 127
- Large Magellanic Cloud 205, 397, 864, 1123
- Larmor's power formula 572, 573
- Larmor frequency 1766, 1771, 2060, 2928
- Larmor precession 79, 2060
- Larmor transformation 282
- laser 1090, 1315, 1901, 1919
 - alexandrite 1261
 - amplifying medium 1257

- amplitude modulation 1280
- argon-ion 1261, 1262, 1264
- atom 219, 2803
- brightness 1258, 1259
- buildup 1271, 1275, 1277
- cavity 1255
- cavity dumping 1259, 1277
- cavity mode 1257
- Cd-vapor 1262
- chemical 1101, 1263
- CO₂ 1262
- color-center 347, 1261
- Cu-vapor 1257, 1262
- diode 311, 1100, 1260, 1265–1267
- double-heterostructure 1266
- dye 1261, 1262, 1264
- efficiency 1257, 1260, 1269, 1272, 1282
- excimer 1268
- external-cavity 1268
- fiber 1257, 1260, 1261, 1281, 1282
- four-level 1256, 1260, 1261, 1270, 1271
- free-electron 8, 573, 1269, 1315, 2663
- frequency tuning 1280
- gain peak 1258
- gain switching 1259
- gas 1262, 1263, 1274
- gas-discharge 1262
- gas-dynamic 1263
- glass 2230
- He–Ne 1262
- high-energy 1093
- in medicine 2215
- inverse free-electron 1736
- lead-salt 1267
- linewidth 1258
- mode-locked dye 2817
- mode locking 1259, 1261, 1264, 1277, 1278, 2827
- multimode operation 1273
- Nd-glass 1260
- Nd:YAG 1260, 1261, 1264, 1282
- nitrogen 1268
- optically pumped 1835
- pulsed 1260, 1267, 1275, 1525
- Q* switching 1259
- quantum-cascade 1267
- quantum-dot-based 2142
- Raman 1282, 1844
- rare-earth ion 1260
- rate equation model 1269
- resonator 1255, 1257
- ruby 1259–1262
- semiconductor 1257, 1260, 1264, 1267
- single-frequency operation 1274
- single mode 1257
- solid-state 1259–1261, 1264, 1274, 1384
- three-level 1256, 1260, 1270, 1271
- Ti:sapphire 1261, 1262
- transition-metal 1261
- tunable 1525
- UV 1262, 1268
- vertical-cavity surface-emitting 1267
- vertical external cavity surface emitting 1578
- x-ray 1268, 2917
- YAG 2230
- laser–matter interactions 1095
- laser-Doppler vibrometer 26
- laser ablation 2727
- laser cooling 157, 160, 218, 446, **1246**, 1317, 2801
- laser dynamics 1269
- laser interferometry 2416
- laser repeaters 2230
- lasers **1254**
- lasers in medicine 2205
- laser spectroscopy *see* spectroscopy, laser
- laser vibrometer 26
- lateral inhibition 2867
- lattice
 - optical 160, 161, 219
 - reciprocal 476, 477
- lattice defects 270
 - microstructure 790
- lattice dynamics **1284**
- lattice gas 1911
- lattice gauge theory 691, **1294**
- Laue–Bragg scattering 1717
- Laue cones 478
- Laue diagram 617
- Laue diffraction pattern 201
- Laue method 480
- Laue spots 618
- law of corresponding states 2588
- law of large numbers 2064
- law of octaves 715
- law of photometric summation 1315
- law of the iterated logarithm 2064

- leakage current 2373
- leaky-box model 405
- least-squares method 376, 384
- leaving group 302
- Lebesgue measure 276
- Le Châtelier–Braun principle 2696
- Leclanché cell 557
- Ledermann’s theorem 1286
- Lee–Wick phenomenon 2597
- Legendre polynomials 78
 - associated 555
- Legendre transformations 2687
- Leggett theory 1000
- Lehmann representation 1436
- length contraction 2261
- Lennard-Jones potential 1109
- lens
 - electron 606
 - electrostatic 282
 - electrostatic einzel 284
 - Fresnel 1839, 2431
 - gravitational 932, 933
 - magnetic 284
 - magnetic focusing 7
 - multifocal 1839
 - optical 1311
 - second-order 282
 - theory 1840
- Lense–Thirring effect 113
- Lenz’s law 569, 743, 1300
- Lenz–Ising model *see* Ising model
- leptogenesis 707
- lepton number 81, 701
 - conservation 366
- leptons 179, 488, 595, 671, 911, 912, 1077, **1297**
 - charged 1701
 - generations 2906
 - masses 914
- levitation, electromagnetic **1299**
- Liapounov criterion 2697
- Liapounov relaxation time 2700
- librons 1720
- Lichtenberg figures 337
- Lick catalog 421
- LIDAR 1243
- Lie algebra 678, 944, 1215, 2317, 2559
 - graded 2599
 - infinite-dimensional 952
- Lieb–Thirring constants 2832
- Lie groups 678, 912, 944, **1308**, 2599, 2600
- Lie superalgebra 952
- lifetime 1914
 - spontaneous 1261, 1268
- Lifshitz–Kosevich theory 505
- Lifshitz point 1907, 1919
- ligand field *see* crystal field
- light **1310**
 - coherence 1315
 - intensity 1313
 - linearly polarized 1313
 - momentum 157
 - polarization 1313
 - polarization of scattered 2235
 - polarized 1832, **2000**
 - scattering intensity 2235
 - slow 257
 - speed in medium 1311, 1838
 - speed in vacuum 371, 568, 1311, 2257
 - visible 583
- light-sensitive materials **1319**
- light clock 2263
- light cone 2264, 2496
- lightning 670, **1321**, 2411
- light pressure 427
- light scattering **1316**
- light shift 159
- likelihood function 2065, 2521
- limit cycles 2697
- limited streamer counters 436
- limiting speed 2261
- Lindemann criterion 1001
- Lindemann ratio 1003
- linear combination of atomic orbitals 627
- linear muffin tin orbitals method 627
- line defects 451, 2399, 2461
- linewidth
 - Doppler 1529
 - homogeneous 1241, 1251
 - isobaric analog states 1148
 - lasers 1258, 1264
 - microwave 1242
 - natural 1527
 - optical 1242
 - Raman 1928
- Liouville equation 1999, 2135, 2136, 2518, 2539
 - classical 2513
 - quantum-mechanical 2512
- Liouville theorem 285, 544, 962

- Lippmann–Schwinger equation 2738
liquid–liquid extraction 2230
liquid-crystal displays 2750
liquid crystals **1325**, 1920, 2309, 2462
liquid drop model 2591
liquids 819
 overheated 1914
 structure **1338**
 theory 1334
 undercooled 1903
 viscous 1472
liquidus temperature 65
lithography 607, 670, 2662
Little Higgs models 704
Littlewood–Richardson numbers 2330
local density approximation 146
local equilibrium assumption 2692
Local Group 2833
local order 2461
lodestones 1381
logarithmic decrement 1470
London forces 1108
long-range interactions 57, 1903, 1911, 1915
long-range order 58, 2461
longitudinal waves 35
Lorentz–Fitzgerald contraction 2262
Lorentz force 492, 497, 504, 568, 579, 799, 868,
 965, 1401, 2659, 2768
Lorentz force equation 569, 867
Lorentz frame 884
Lorentz group 439, 792, 806
 inhomogeneous 2312
Lorentzian lineshape 1442
Lorentzian metric 438
Lorentz invariance 910, 2260, 2334
Lorentz relation 530
Lorentz tensor 570
Lorentz theory 2928, 2932
Lorentz transformation 262, 799, 910, **1344**,
 2259, 2260, 2264, 2496
 homogeneous 438
 inhomogeneous 438
 orthochronous 439
Lorenz–Mie scattering 62
Loschmidt constant *see* Avogadro constant
loss modulus 2307
loss tangent 2308
loudness 31
loudspeakers 1381
low-pass filter 652
lowest unoccupied molecular orbital 1610
lubricant 855, 856, 2782
lubrication 57, 856
luciferase 1350
Lüders bands 500
luminescence 338, 576, 600, 604, **1349**, 2193
luminol 305, 1350
Lummer–Gehrcke plate 1113
Lundquist number 1407
Luttinger theorem 988
Lyapunov exponent 274
Lyddane–Sachs–Teller relation 739, 1290
Lyman- α forest 2165
Lyman series 178, 216

Mach’s principle **1355**, 2904
Mach–Zehnder interferometer 1849
Machian effects 1355
Mach number 828, 830, 2415
 magnetic 1405
MacMahon’s master theorem 2330
macromolecules 199
 as catalysts 249
 structure analysis 478, 483
 structure determination 200
 techniques for investigation 202
macrosonics 35
macrostates 729
Madelung energy 450
magic-angle spinning 1769
magic numbers 1779, 1811, 1812
magnetic anisotropy 1380
 field-induced 909
magnetic bubbles **1366**
magnetic buoyancy 1405
magnetic compass 1381
magnetic domain 2357
magnetic field 2688
 force-free 1406
 high **1372**
 strength 770
magnetic materials 1079, **1379**
magnetic moments 637, 1366, **1385**
 hyperfine interactions 809
magnetic monopole problem 916
magnetic monopoles 584, 707, 913, **1389**, 1465,
 1771
magnetic ordering **1392**

- magnetic pressure 1405
 magnetic recording 1380, 1383
 magnetic resonance imaging 2213
 magnetites 1381
 magnetization 509, 512, 513, 1145, 1209, 1379,
 1383, 1915, 2584
 macroscopic 1392, 1393
 saturation 771, 1380, 1381
 spontaneous 1146, 1902, 1905, 1908, 1909
 superconductors 2583
 surface 1916
 temperature-dependence 754
 magneto-optical materials 1384
 magnetoacoustic attenuation 752
 magnetoacoustic effect **1396**
 magnetoacoustic waves 1408
 magnetocaloric materials 2230
 magnetoelastic coupling 1399
 magnetoelastic interaction 1398, 1399
 magnetoelastic phenomena 774, **1398**
 magnetogyric ratio *see* gyromagnetic ratio
 magnetohydrodynamic instabilities 1763
 magnetohydrodynamics **1401**
 magnetometer 868, 1203, 2723
 optically pumped 1835
 magnetopause 1417
 magnetoplasma effects 740
 magnetoresistance 752, 868, 870, **1412**, 1865,
 2406
 anisotropic 869
 colossal 869
 giant 869, 1395
 tunneling 869
 magnetosphere **1415**, 2174
 magnetostatics 1405, **1425**
 magnetostriction 774, 1399, **1421**
 giant 2230
 magnetostrictive coefficient 1422
 magnetostrictive effect 30
 magnetothermal oscillations 504
 magnetotransport 1865
 magnetron 598
 magnets
 high-power 1372
 iron-core 1372
 permanent 1379, 1381, 1383, **1425**, 2760
 superconducting 289, 1373
 uniaxial 1910
 magnon 1720, 2464
 Magnus force 2887
 Majorana condition 440
 Majorana force 949
 Majorana mass 367
 Majorana particle 701, 1703
 many-body theory **1428**
 many-worlds interpretation 2148
 Marangoni convection 2489
 Markov chain 1687, 2532
 Markov process 2532
 Marple–Hess prism 2001
 Mars 839, 2452
 Marx generator 596
 maser 1135, **1440**
 ammonia 185
 hydrogen 185, 311, 374, 809
 mass **1447**, 1626, 2267
 conservation 365
 Newtonian 2267
 relativistic 723
 relativistic increase 1448
 unit 1447
 mass–energy conservation 1448
 mass–energy equivalence 2270
 Massenfilter 1453
 Massieu functions 2687
 mass spectrometer 1178
 atom-probe 790
 mass spectroscopy **1448**
 secondary-ion 604, 2379, 2728
 master–slave manipulator 1055
 Mathiessen’s rule 2404
 Mathieu’s equation 1136
 matrices **1454**
 cofactor 1458
 rotation 459
 matrix algebra 1454
 matrix shifts 1566
 Matrix theory 2547
 matroid theory 1686
 Mattauich’s rule 1192
 Mattauich–Herzog mass spectroscope 1451
 matter
 dark *see* dark matter
 mechanical properties **1467**
 non-baryonic 2834
 nuclear 1429
 radiation interaction **2192**
 stability 2832

- matter–wave interferometry 161
 Matteuci effect 1421
 maximal analyticity 2335
 maximum likelihood 2065
 Maxwell's displacement current 568
 Maxwell's equations 512, 567, 579, 580, 584,
 585, 587, 651, 743, 799, 800, 807, 878,
 910, 1027, 1028, 1310, 1311, **1464**,
 1846, 2084, 2259
 differential 884
 solution in time domain 1461
 Maxwell's law 568
 Maxwell–Boltzmann distribution 184, 318, 955,
 1161, 1463, 1527
 modified 182
 Maxwell–Boltzmann law 1222, 1223
 Maxwell–Boltzmann statistics 222, 363, **1463**
 Maxwell distribution 1221
 Maxwell stress 570, 1402
 M center 334
 mean-field theories 754, 1859
 mean free path 84, 1224, 1475, 2355
 measurement 2333
 nondemolition 2147
 quantum theory **2144**, 2147
 mechanical memory 2304
 mechanics 2509
 medical physics 199, 2205
 Meissner effect 418, 510, 2467, 2580, 2581
 generalized 419
 Meitnerium 2594
 Mellin transforms 841
 melting 1339, 1901, 1903, 1904
 in 2D systems 58
 melting curve 1904
 memory function 2006
 memory switch 2479
 memory systems 1369
 optical 2481
 merates 2848
 Mercalli scale 2364
 Mercury 839, 1415, 2452
 precession of perihelion 1727, 2255
 Mermin–Wagner theorem 1909
 mesons 179, 671, 956, 957, **1473**, 2067, 2153,
 2158, 2615
 mesopause 127
 mesoscopic physics **1474**
 mesosphere 127
 metallography 1482
 metallurgy **1482**
 metals **1485**, 2356, 2460, 2766
 electrical conductivity 1477
 irradiated 2185
 liquid **1334**
 supercooled liquid 905
 temperature-dependence of resistance 66
 theory 1429
 typical properties 1334
 metal tape 1384
 metamagnets 1918
 metastability 1914
 meteorites 2231, 2453
 meteorology **1486**, 2419
 metric
 Euclidean 2495
 Gödel 2499
 Lorentzian 2497
 Minkowskian 2254
 Taub–Newman–Unti–Tamburino 2499
 metric coefficients 2849
 metrology **1490**
 temperature 2720
 Metropolis method 1638
 Michelson–Morley experiment 1345, **1493**,
 2257, 2259, 2495
 Michelson interferometer 737, 845, 936, 1111,
 1849, 2863, 2896
 Twyman–Green form 1111
 micro-electromechanical systems 2662
 microdosimetry 2189
 microemulsions 1342, 1343
 microfiltration 2031
 microgels 2031
 microgravity 353
 conditions 1908
 levitation 1018
 science 2488
 micromechanical devices 2662
 microphones 22–24
 micropositioners 763
 microrheology 2309, 2858
 microscopy 2728
 atomic force 2781
 electron 201, **635**
 field-ion **785**, 786–788
 fluorescence lifetime imaging 1505
 near-field scanning optical 1507

- optical **1496**
- scanning-probe 1684
- scanning electron 784, 2357
- scanning tunneling **2337**, 2728, 2788
- stimulated emission depletion 1507
- total internal reflection fluorescence 1506
- transmission electron 1684
- ultrasonic 2820, 2822
- microstates 729
- microtopography 1110, 1112, 1113
- microtron 490, 2657
- microwave circuitry **1512**
- microwave monolithic integrated circuits 1517
- microwaves **1512**
- microwave spectroscopy **1508**
- midlatitude red arc 173
- Mie scattering 2235
- Mikheyev–Smirnov–Wolfenstein effect 2449
- Milankovich oscillations 1489
- Milky Way 865, **1520**, 2561, 2833
- Miller indices 467
- Millikan experiment 212, 592, 830
- minimal coupling 878
- Minkowski space 923, 925, 2496, 2498
- mixed lubrication regime 857
- mixed valence 1118
- mixing angle 696, 699
- mobility edges 2466
- mock gravity 427
- mode–mode coupling 1990
- moderating ratio 1799
- modified intermediate neglect of differential overlap method 1611
- modulators 2472
- modulus of rigidity *see* shear modulus
- molecular-beam epitaxy 2241, 2727
- molecular-orbital promotion model 1141
- molecular-weight distribution function 2041
- molecular approximation 328
- molecular biology 198
- molecular dynamics calculations 1100
- molecularity *see* reaction molecularity
- molecular orbitals 1606
- molecular sieving 663
- molecular structure calculations **1600**
 - muonic 2738
- molecules **1615**
 - cold **316**
 - interstellar 109
 - isoelectronic 297
 - isomeric 297
 - mesomeric 1622
 - rotational isomeric 1134
 - structural isomeric 1616
- Möller scattering 680
- molten salts **1622**
- momental ellipsoid 1510
- moment of inertia 721, 1548, **1626**, 1628, 1630
 - principal 1510
- momentum **1633**
 - angular *see* angular momentum
 - conjugate 539
 - conservation 71, 536, 569, 1928, 2312
 - distribution 1005
 - generalized 539
 - relativistic 2267
 - relaxation time 2402
- momentum-shell renormalization 1912
- Monin–Obukhov length 224
- Monin–Obukhov similarity theory 224
- monochromator 918, 1097
- monoclonal antibodies 2209
- monocomponent development 667
- monolayer 856
- monomer 2028
- Monte Carlo method 269, 1342, 1606, 2773
- Monte Carlo simulation 1296
- Monte Carlo techniques **1635**
- moonquakes 2361
- morphotropes 450
- Morse potential 1539
- Morton tube 2753
- Moseley’s law 165, 716
- Moseley diagram 2919
- Mössbauer effect 533, **1642**
- Mössbauer isotopes 1644
- Mott–Wannier excitons *see* excitons
- Mott insulator 161, 2803
- moving-coil watt-balance experiments 389
- M theory 708, 2547
- Muller–Lyer illusion 2881
- multicomponent solid 1905
- multiconfigurational SCF method 1605
- multicritical phenomena 442
- multicritical point 442, 1918, 1919
- multilayer structures 2727
- multiparticle production 1088
- multiparticle scattering 1089

- multipass cell 1240
- multiple-beam interferometers 1113
- multiple spin exchange 1007
- multiplex advantage 737, 1098
- multiplication factor 1801
- multipolarity 78
- multipole fields **1659**
- multipole interactions 1107
- multipole method 1461
- multipole moments 555
 - electric 1660
 - magnetic 1388, 1660
- multiscattering wave method 1609
- multistep reactions 1794
- muon 90, 94, 671, 1297, 1774, 2621
 - number conservation 366
- muonium 374, **1667**, 2055
- muon spin rotation 990
- musical instruments **1671**

- n-vector model 1911
- Nambu–Goldstone bosons 1756
- nanobionics **1677**
- nanoclusters 1684
- nanolithography 609
- nanoscale effect 1682
- nanotribology 2781
- nanowires 862
- natural expansion 1606
- natural frequencies 1686
- natural orbitals 1606
- natural philosophy 1025
- Navier–Stokes equations 223, 802, 823, 832, 834, 1060, 1062–1064, 1401, 2300, 2301, 2538, 2857, 2886
 - Reynolds-averaged 223
- NBS voltage standard 1200
- Necker cube 2880
- Néel model 756
- Neptune 839, 1415, 2452
- Nernst–Einstein equation 527
- Nernst equation 558, 565
- nerve impulses 566
- network, continuous random 904
- network theory **1686**
- neuromagnetic imaging 2215
- neuromagnetometry 2205, 2215
- neutralino 99

- neutrino 89, 95, 397, 488, 595, 671, 863, 915, 1298, **1700**, 2562, 2621
 - atmospheric 701
 - detection of solar 2201
 - flavor 89
 - fundamental properties 98
 - GZK 97
 - mass 89, 699, 2906
 - masses 915
 - prediction 187
 - reaction 2297
 - solar 89, 700, **2442**
- neutrino detectors 90
- neutrino oscillations 98, 124, 367, 671, 699, 1701
- neutrino scattering 2908, 2909
 - probability 2901
- neutrino telescopes 95, 96
- neutron 911, 956, 1774, 2621
 - delayed 1799
 - diffraction 201, 523, 773, **1705**, 1719
 - energies 1714
 - inelastic scattering 2559
 - magnetic moment 1715
 - polarized 1776
 - scattering 523, 990, **1705**
 - wavelengths 1714
- neutron-induced reactions 1794
- neutron diffraction 517
- neutron drip point 1724
- neutronization 2530
- neutron optics 1717
- neutron stars 124, 204, 929, 1415, **1721**, 2070, 2106, 2499, 2528, 2530
- Newman diagram 1138
- Newton’s constant of gravitation 385
- Newton’s law 983, 2771
- Newton’s law of gravity 922, 923, 938
- Newton’s laws *see* equations of motion, Newton
- Newton–Raphson method 2522
- Newtonian space and time 2495
- Nicol prism 1849, 2001
- Nielsbohrium 2594
- Nilsson levels 1818, 1819
- Nilsson model 1818
- Nipkow disk 1504
- Nitrox process 1174
- no-interaction theorem 1217

- Noether's theorem 800, 946, 1127, 1129, 1308, 2102, 2312, 2313, 2643
- noise 1271
- acoustical **1728**
 - pink 1728
 - white 1728
- noise dose meter 1729
- noise equivalent power 107
- nomenclature, physical **2619**
- noncrossing rule 329
- nondispersive media 2894
- nonequilibrium process 1903
- nonequilibrium state 1912, 1914
- nonmetals 208, 453, 856, 1336, 1477, 1929
- electrical conductivity 1477
- nonorthogonality problem 1603
- Nordheim's rules 1817
- normal-mode approximation 1435
- normal coordinates 1098, 1286
- North Atlantic Oscillation 1489
- nuclear bulge 1520
- nuclear chemistry 2200
- nuclear fission 1724, **1739**, 1756
- criticality problem 1639
 - neutron-induced 1798
 - spontaneous 1786
- nuclear fission reactors *see* nuclear reactors
- nuclear forces **1751**, 1793, 1807, 2158, 2182, 2499, 2551, 2738
- nuclear fusion 1090, **1756**, 2593
- cold 2593
 - inertial **1090**
 - muon-catalyzed 2738
- nuclear fusion reactor 1965, 1971, 1977, 2183
- operating conditions 1759
 - tokamak 1761
- nuclear fusion reactors
- tokamak 1965
- nuclear magnetic resonance 990, 1381, **1766**, 2205, 2213
- nuclear magneton 1386
- nuclear matter 2584
- nuclear medicine 2205, 2212
- nuclear moments **1771**
- nuclear physics 2737
- nuclear properties **1778**
- nuclear quadrupole resonance **1788**
- nuclear radiation 332, 333, 347, 1784
- angular correlation **76**
 - multipolarity 80
- nuclear reactions 268, **1792**
- nuclear reactors **1798**, 1799
- control 1802
 - natural 1798, 2779
- nuclear shape 1781, 1812
- nuclear spin 185, 639, 811, 1003, 1006, 1153, 1251
- entropy 1361
- nuclear states 1646, **1807**
- intermediate 77
- nuclear structure **1810**, 2591
- nucleation 456, 535, 1914, 1915
- length 2699
- nuclei 956
- double-magic 1742
 - doubly magic 2592
 - isomeric **1150**
 - magic 2592
 - quadrupole moments 556
 - rare-gas configurations 2591
- nucleon 180, 367, 671, 1072, 1147, 1155, 1157, **1820**, 2551
- nucleophilic center 301
- nucleosynthesis 1125, 1192, **1822**, 2526, 2529
- nuclides 1151, 1176, 1178, 1192, 2622
- α -emitting 67
 - half-lives 2774
 - radioactive half-lives 886
- number operator 2321
- Nusselt number 985
- nutaton 1767, 2059
- Nyquist relation 2722
- O-rings 2840
- oblique rotator model 1402
- observation 2147
- observatories, astronomical 102
- observer 2257, 2258, 2260
- inertial 2252, 2253
- oceanography 2345
- octahedron 299
- octet rule 301, 1621
- Ohm's law 742, 1691, 2283, 2769
- Ohmic heating 85
- Oklo reactor 2779
- Onsager hypothesis 816
- Onsager relations 2694
- Oort cloud 2452

- open systems 2691
- operator algebra 792
- operators **1829**, 2119
 - Hermitian 2119
 - linear 547, 1458
 - momentum 2119
 - particle-density 1430
 - resolvent 1607
 - scattering 2089
 - shift 2317, 2327
 - transition 2292
 - transverse electric 2293
 - transverse magnetic 2293
- opposed-anvil apparatus 2810
- opposed beveled diamond anvil device 2804
- optical activity **1832**
 - magnetic 1356
- optical bistability 1845
- optical couplers 657
- optical elements 1849
 - holographic 1046, 1049
 - nonlinear 1279
 - tuned 1318
- optical fibers 2230
 - coherent bundles 780
 - graded-index 780
 - step-index 779
- optical forces 157
- optical molasses 158, 1248
- optical parametric oscillation 1281, 1282
- optical pulses, ultrashort **2816**
- optical pumping 1256, 1261, 1263, 1268, **1834**
- optical theorem 530, 1089, 1896
- optical tweezers 159
- optics
 - charged-particle **281**
 - geometrical 255, **1838**
 - nonlinear 1259, 1281, 1282, **1841**
 - paraxial 283
 - physical **1846**
 - statistical **1852**
- optoelectronic devices 2481
- optoelectronics 2786
- orange oxide 2202
- orbital functional theory 138
- orbitals 716, 1351, 1619
 - atom-centered 301
 - atomic 143
 - bonding 300
 - energies 330
 - relativistic 154
 - linear combination 627
 - localized molecular 295, 300
 - molecular 143, 303
 - muffin tin 627
 - nonorthogonal 154
 - positive-energy 154
 - relativistic 154
 - spin 141, 142, 1602
 - traveling 329
 - valence-shell molecular 302
- order–disorder phenomena **1857**
- order parameter 442, 1858, 1905, 1909, 2462, 2584
 - competing 442
- Orion Nebula 835, 836
- Ornstein–Uhlenbeck equation 2536–2538
- orthogonalized plane wave method 66, 146
- orthonormalization 1606
- oscillator 2472, 2854, 2856
 - coupled 1429
 - damped harmonic 529
 - harmonic 1926
 - mechanical 2285
 - nonlinearly damped anharmonic 2475
- oscillator strength 342
 - calculation 140
- oscilloscopes **1877**
- osmosis, reverse 507
- osteoporosis 2212
- Otto cycle 979, 981
- overlayer 2609, 2611
- overpotential 565
- Ovonic threshold switch 2480
- oxidation reaction 565
- oxygen sensors 2230
- Pacific Decadal Oscillation 1489
- pair production 875, 2092, 2178, 2192
- pairwise superposition approximation 1341
- pants diagram 2542
- parallel-axis theorem 1628
- parallelogram law 2312
- paramagnetism 508, 1006, **1881**, 1908
- Paris equation 745
- Pariser–Parr–Pople method 1611
- parity 1128, **1882**
 - conservation 368

- nonconservation 368, 677, 2904
 - violation 680, 2909
- Parseval's theorem 841
- partial conservation of axial vector currents 490
- partial waves **1895**
- particle production 1089
- partition function 1341, 1910, 1911, 1918, 2136
 - grand canonical 2136, 2516
 - microcanonical 2514
- parton 689, 690, **1899**, 2554
- Paschen's law 84
- Paschen-Back effect 2928
- Paschen series 178, 216
- passivated implanted planar silicon detectors 68
- passivation layer 308
- past 2741
- pasta nuclei 1724
- Pati-Salam group 914
- Pati-Salam model 914
- pattern formation 1920
- Patterson function 481, 482
- Pauli blocking 2802
- Pauli exclusion principle 142, 166, 222, 716, 747, 748, 772, 1601, 1619, 1620, 2585
- Pauli matrices 150, 879, 2315
- Pauli paramagnets 998
- Pauli susceptibility 988
- Paul trap 311
- Peierls distortion 277
- Peierls stress 499
- Peierls transition 1861, 1864
- Pelletron 17
- Peltier coefficient 866, 2702
- Peltier effect 2702
- penetration depth 2355, 2567
- Penning ionization 1142
- Penning trap 311, 375
- Penrose theorem 204
- pentaquarks 692
- pentodes 648
- percolation 2470
- percolation transition 1919
- period doubling 275
- Periodic Table 298, 714, 715
 - limits 2591
- Permalloy 1369, 1370, 1381
- permeability 1, 776, 909, 1120
 - free space 584
 - magnetic 1310, 1381
- permittivity 1846, 1996
 - complex 1, 2074
 - free space 584, 646
- perovskite 761, 768, 869, 2565, 2566, 2732
 - structure 2568
- perpendicular-axis theorem 1630
- perturbation expansion 2544
- perturbation theory
 - coupled-cluster many-body 1608
 - Hamilton-Jacobi 546
 - Møller-Plesset 1607
 - renormalized 1912
 - Wigner-Brillouin 2009
- Petschek mechanism 1404
- Pfund series 178, 216
- phase-locked loops 657
- phase angle 2854
- phase conjugation 1282, 1844
- phase diagram 455, 1483, 1901, 1910, 1912, 2683
 - ferromagnets 1902
 - triple point 1901
- phase retarders 2002
- phases 1901, 1917
 - canonic 1328, 1331
 - cholesteric 1332
 - coexisting 1913, 1914
 - columnar 1328
 - commensurate 1918
 - incommensurate 1918
 - mesomorphic 1325
 - nematic 1325
 - paraelastic 761
 - paramagnetic 1902
 - smectic 1327
 - superfluid 1902
 - supersolid 1902
- phase separation 259, 1913-1915
- phase shift 652, 686, 1895, 2286
- phase space 2512
- phase stability 2650, 2655
- phase transitions 254, 256, **1901**, 2465
 - Anderson 1480
 - continuous 1904-1906
 - continuous quantum 1917
 - deconfinement 1919
 - dynamics 1912
 - electroweak 707, 1919
 - enthalpy measurement 235

- exciton–plasma Mott 634
- extraordinary 1917
- first-order 766, 1904–1906, 1908, 1912, 1916
- helium 992
- in thin films 58
- liquid–glass 907
- liquid–gas 1906
- metal–insulator 1103, 1341, 1432, **1477**, 2466
- Mott 1480
- order–disorder 65
- paramagnetic–antiferromagnetic 1006
- quantum 1910, 1912, 1917
- quasiperiodic 275
- roughening 1917
- scaling 1907, 1913
- scaling function 1907, 1915
- scaling laws 1907
- second-order 441, 766, 1857, 1904, 1905
- structural 1905, 1906
- superfluid 1912, 1913, 1917
- superfluid–insulator 219
- superlattice 1857, 1858
- symmetry arguments 254
- theories 1859
- topological 58
- wetting 1917
- phase velocity 1731
- phasor 652, 1846
 - technique 651
- phonon 363, 446, 766, 996, 999, 1004, 1429, 1431, 1463, 1719, **1926**, 2356, 2463, 2611, 2766, 2768
 - analogy to photon 1926
 - ballistic 1929
 - mean free path 1928
 - momentum 1927, 1928
- phonon–defect scattering 1928
- phonon–phonon interactions 1928
- phonon–roton excitation spectrum 2353
- phonon bands 1287
- phonon modes 1100
- phonon scattering 364
- phosphorescence **1349**, 2705
- photinos 952
- photocells 649, 1958
- photochromism 1680
- photoconductivity 665, 1104, 1867, **1930**, 2393, 2406
- photoconductors 666
- photodarkening 2378, 2390
- photodetectors 211, 2129, 2576, 2861
- photodissociation 127, 850, 1124
- photodoping 2391
- photodynamic therapy 2210
- photoelastic effect **1931**, 1933, 1960
- photoelastic tensor 1931–1933
- photoelectric effect 214, 361, 875, 1930, 1933, 2112, 2113, 2178, 2192
- photoelectromagnetic effect 2406
- photoelectrons 1945, 2190, 2864
 - angular distribution 135, 151
- photoemission 2915
- photoemission electron microscope 619
- photoemissive tubes 649
- photoexcitation 171, 510, 631, 1320
- photoionization 84, 1014, 1052, 1139, 1143, 1565, **1942**
 - cross section 140
 - double-resonance 1557
 - efficiency 1560
- photolithography 308
- photoluminescence 1349, 2804, 2806
- photometry 2217
- photomultipliers 290, 2357, 2864
- photon 488, 673, **1944**, 2083, 2271, 2621, 2766
 - analogy to phonon 1926
 - γ rays 871
 - virtual 1946
- photon antibunching 1855, 1947
- photon bunching 1947
- photonic band gap *see* band gap, photonic
- photonic devices 2786
- photonics 767
- photonuclear reactions **1953**, 2292
- photopigments 2870
- photoreceptors 2386, 2391
- photoresist 308
 - inorganic 2391
- photosensitizer 1321
- photosensors 2386
- photosphere 852, **1956**, 2561, 2862
- photosynthesis 2424, 2439
- photosystem I 1679
- photovoltage 1958
- photovoltaic cells 2433, 2434

- organic 1867
- photovoltaic effect 1930, **1958**, 2406
- photovoltaic systems 2422, 2426, 2433
- physical biochemistry 198
- physics
 - classical 355
 - history **1024**, 1921
 - meaning 1921
 - philosophy 1034, **1921**
 - relation to other sciences 1922
 - theoretical vs experimental 1036
- physiology 198
- physisorption 57, 2609
- piezobirefringence 1931
- piezoelectric effect 1931, **1959**, 1960
 - secondary 1960
- piezoelectric field 56
- piezoelectricity 767, 1843, 1959
- piezoelectric plastics 23
- piezoelectric positioners 763
- piezoelectric resonator 1959
- piezoelectrics 2746
- piezoelectric stress tensor 1960
- piezoelectric transducers 551
- piezooptic effect *see* photoelastic effect
- piezoresistance gauges 2416
- pilot wave theory 2149
- pinches 1969
- pion 94, 367, 671, 911, 1299, 2158, 2621
 - decay 1700
- pion–nucleon interaction 683
- pion-induced reactions 1796
- pion condensation 2597
- Pirani gauge 183
- piston–cylinder apparatus 2804, 2812
- pitch drop experiment 2859
- Plancherel’s theorem 841
- Planck’s law 985, 2670
- Planck constant 371, 390
- Planck distribution 210, 222, 1926, 2218
- Planck length 931, 2256, 2540
- Planck mass 2540
- Planck scale 703
- planetesimals 125, 839
- planetquakes 2361
- planets 533, 572, 573, 845
 - extrasolar 125, 839
 - formation **835**
 - origin 427
- plasma 88, 615, 819, 1021, 1090, 1903, **1975**, 2357
 - confinement 1760
 - diagnostics 1983
 - dusty 2357
 - jets 1021
 - Langmuir–Tonks oscillations 1987
 - magnetically confined 1759
 - microinstability 1982
 - microturbulence 1964
 - oscillations 514, 1985
 - waves **1984**
- plasma confinement devices **1961**
- plasmopause 1417
- plasmoid 1419
- plasmon 514, 1431, **1991**, 2464
 - radiation 602
- plastic deformation 855, 1467
- plasticity 1467
- plastics 2043
- plastisols 2307
- Pluto 2452
- Pockels effect 1208, 1842
- Poincaré group 438, 792, 795, 2312
- Poincaré invariance 2334–2336
- Poincaré recursion time 1429
- Poincaré sphere 893
- Poincaré transformation 792, 799, 800, 1127, 2495
- point defects 451, 2399, 2461
 - observation 790
- point groups 459, 764, 2072
 - crystallographic 461
 - ferroelastic 761
 - holosymmetric 467
 - improper 464
 - monaxial 463
 - paraelastic 761
 - polyaxial 463
 - proper 463
 - Schoenflies symbols 459
- point lattice 464
- Poiseuille flow 1929
- Poiseuille profile 1064
- Poisson’s ratio 1469
- Poisson’s theorem 1129
- Poisson bracket 542, 543, 974, 1215
- Poisson distribution 2063, 2520
- Poisson equation 628, 2250

- Poisson process 2129
polar cap absorption event 173
polarimeter 1775, 1833
polariton 1290
polariton scattering 1844
polarizability 513, 556, **1995**, 2290, 2933
 electrical 1105
 electronic 513
 ionic 513
polarization 78, 508, 573, 763, 1846, 1848, **1998**
 activation 559
 concentration 559
 electric 512
 nuclear 1766, **1774**
 ohmic 559
 photon 1835
 rotation of plane 741
 tensor 1774
 vector 1774
polarization potential 138
polarization vector 1774
polarized light 1384
polarizing angle 2238
polaron 498, **2004**
pollution control 2230
polyblend 2030
polycondensation 2033
polyelectrolytes 2031
polymeric solution 1919
polymerization 2031
 degree 2043
polymers 1915, **2028**
 molecular weight 2038, 2041, 2043
polymorphism **63**
Pomeron trajectory 2248
population analysis 1603
population inversion 1254–1257, 1259, 1260,
 1262, 1265, 1270–1273, 1275–1277,
 1282, 1283
port 1688
positron 593, 1297, **2045**, 2046
 observation 187
 properties 2046
positron–electron colliding beams **2050**
positron annihilation 365, 490, **2047**, 2470
positron emission tomography 2212
positronium 374, 2047, **2055**, 2093, 2152, 2155
potential-energy curves 341
potential barrier 2783
potential energy surface 1551, 1569, 1608, 2593
potential flow equation 2607
Potts model 59
Pound–Josephson effect 1647
Poynting vector 569, 585, 586, 588, 2242
Prandtl mixing length 834
Prandtl number 832, 985, 1410
 magnetic 1406, 1408
pre-exponential factor 1227
precession **2059**
precession method 476, 478
precipitators 397
predissociation 1550, 1944
preionization 1944
premelting 58, 1339
pressure 2684
 fluctuations 21, 230
 measurement of oscillating 22
pressure manometers 183
pressure transducers 2416
primary structure 200
principle of indeterminacy 2830
principle of univariance 2870
prism 918, 2861
 dispersion 1313
 magnetic 284
prism spectrograph 2861
prism spectrometer 1313
probability **2061**
 conditional 2062
probability amplitude 2116
probability density 2122, 2347, 2831
 function 2520
probability distribution 487
probability rule 2145
probability theory 2061
projective space 2314
propagation reaction 2035
propagator 1435, 1607
proportional counters 293, 430, 479, 2189
 scintillating 437
proportional limit 1470
propulsion 819
 technology 2492
protein crystallography 2662
proteins 199, 201, 249, 474, 664, 1069, 1070,
 1087
proton 669, 911, 956, 1774, **2067**, 2621
 decay 912, 913, 915

- magnetic moment 371
 - mass 371
 - spin 2507
- proton–proton chain 2525
- proton capture 297
- proton scattering 2296
- proton synchrotron 493
- protoplanetary objects 2455
- protosolar nebula 2454
- protostar 838
- pseudopotential 147, 1334, 1337
- pseudopotential method 66, 143
- pseudopotentials 146
- pseudopotential theory 146
- Ptolemy’s model 920
- pulsars 114, 1415, 1721, **2068**
- pumping speed 2838, 2839
- Purex process 2202
- Putley detector 739
- pyroelectric coefficient 2072
- pyroelectric effect 764
- pyroelectricity 763, **2072**
- pyrometer 2721, 2723
 - absolute 2722
 - optical 2670
- Q* switching 1276, 1277
- Q* switching 1261
- quality factor 1444, 1470, 2855
- quantum–collision regime 2800
- quantum beats 1835
- quantum chromodynamics 682, 691, 880, 911, 951, 1919, 2084, 2103, 2279, 2553, 2614, 2618
 - perturbative 193
- quantum communication 2080
- quantum computing 317, 1476, 2080, 2082
- quantum criticality 991
- quantum cryptography 2080
- quantum defect theory 135
- quantum degeneracy 2800, 2801
- quantum dots 1232, 1476, 2139
- quantum electrodynamics 580, 674, 777, 796, 878, 1946, 2046, 2051, **2083**, 2095, 2152, 2552, 2908
 - development 809
 - renormalized 581
 - tests 488, 582, 808, 2055
- quantum field theory 791, 795, 912, 2083, **2095**
 - algebraic approach 792
 - constructive 792, 797
 - interaction picture 2089
 - relativistic 792
 - renormalization 2090
- quantum fluids **2105**
- quantum mechanics 165, 256, 354, 547, 1910, 2084, **2111**
 - Born interpretation 2147
 - Copenhagen interpretation 356, 1924, 2147
 - emergence 1033
 - tests 446
- quantum optics **2128**
- quantum oscillations
 - giant 1398
- quantum phase, geometric **892**, 1198
- quantum solid 1003
- quantum spin chains 1720
- quantum states, macroscopic 218
- quantum teleportation 2080, 2082
- quantum weak dynamics 2908
- quantum well 2138
- quark–gluon plasma 694, 1296, 1797, 1919
- quarkonium 698, **2152**, 2555
- quarks 179, 672, 687, 911, 912, 950, 957, 1072, 1298, 1391, 1473, 2067, 2153, **2158**, 2159, 2552, 2554, 2599, 2617
 - bottom 698, 950
 - charm 697, 950
 - constituent masses 696
 - current masses 696
 - masses 914
 - sea 690
 - top 682, 698, 950
 - valence 690
- quasars 107, 125, 865, **2163**
- quasi-adiabatic approximation 328
- quasicrystals 65, 2461
- quasideuteron effect 1955
- quasiparticle–quasihole pairs 747
- quasiparticles 990, **2168**, 2463
- qubit 2079
- quenched state 1914
- quenching 1353
- quintessence 246
- Rabi frequency 159
- Racah–Legendre inversion 2558
- Racah coefficients 2328, 2329, 2558

- radar **2171**, 2339, 2345
radar altimeters 940
radial distribution function 1341
radiance 2219
radiated power 132
radiation
 damping 2054
 damping time 2052
 detection **2187**
 field 2083, 2131
 measurement 2217
 pressure 2801
 protection 1054
radiation belts **2174**
radiation chemistry **2177**
radiation damage 909
 in solids **2181**
radiation gauge 2087
radiation protection 2216
radiation therapy 2205, 2206
radiative corrections 374
radiative force 158–160
radioactivity **2196**, 2200, 2784
 table of half-lives 886, 2774
radioastronomy 845
 hydrogen 21-cm line 809
radiochemistry **2200**
radiofrequency size effect 625
radio galaxies 107
radioimmunoassay 2212
radiological physics **2205**
radioluminescence 2705
radiometer 106, 183, 2220
radiometer formula 106
radiometry 104, **2217**, 2660
radiopharmaceuticals 1164
radiosurgery 2207
radiotherapy 2207
radiotracers 1164
rainbow 2245
Raman effect 1524, 2221, 2226
 resonant 1241
Raman scattering 1318, 2194, 2804, 2806, 2815
 coherent anti-stokes 1506
 first-order 1209
 stimulated 1094, 1281, 1282, 1841, 1844
 surface-enhanced 1582
 surface-enhanced resonance 1582
Raman shift 2225
Raman spectroscopy **2221**
 coherent anti-Stokes 1529
 inverse 1529
 selection rules 1549
 stimulated 1529
Randall–Wilkins equations 2709
random-phase approximation 1431
random event 2061
random variables 2062, 2520
random walk 2533
Rankine–Hugoniot relation 828
Rankine cycle 980, 2438
Rankine scale 1015
Raoult’s law 2848
rare earth metals **2227**, 2756
rare gases **2231**
rate-equation model 1272
rate constants 1227
 isotope effects 1161
Rayleigh’s criterion 1499
Rayleigh’s theorem 1290
Rayleigh–Bénard instability 1901, 1920
Rayleigh–Brillouin triplet 231
Rayleigh–Jeans law 104, 1463, 1945
Rayleigh–Sommerfeld diffraction theory 1850
Rayleigh–Sommerfeld region 1850
Rayleigh–Taylor instability 1981, 1982
Rayleigh disk 25
Rayleigh interferometer 1112
Rayleigh line 2225
Rayleigh number 1409
 critical 2697
 modified 1410
Rayleigh scattering 1318, 1851, 2226, **2235**
 stimulated thermal 1844
Rayleigh surface wave 2894
Rayleigh waves 1292, 2611
Rayleigh wing scattering 1844
ray tracing 2242
R center 334, 343, 345
reactance theorem 1686
reaction channels 2340
reaction dynamics 1838
reaction mechanism 1227
reaction molecularity 1227
reaction operator 1608
reaction order 1227
reaction rate 1227
real-space renormalization 1911

- receiver systems, distributed 2431
- reciprocal space 749
- reciprocity relations 2694
- reciprocity theorem 1692
- recoil limit 2801
- rectilinear power manipulator 1056
- redshift 1057, 1059, 2164
 - gravitational 926, 1647, 2797
 - periodicity 2164
- reduction reaction 565
- reference frame 1213, 1344, 2310
 - inertial 2310
 - noninertial 2313
- reflectance 2220, 2500
- reflection 1311, **2236**, 2242, 2414
 - internal 2238
 - total 2238
- reflectivity 2237
 - metallic 1334
 - optical 504
- refraction 1311, **2241**
- refractive index 1312, 1313, 1838
 - gradient 2416
- regulation 1086
- Regge behavior 2335
- Regge family 2247, 2248
- Regge model 1089
- Regge poles **2247**, 2335, 2553
- Regge residue. 2247
- Regge theory 2247, 2248
- Regge trajectory 196, 686, 1473, 2247
- regression, linear 2066
- regression of fluctuations hypothesis 816
- relativistic speed 2045
- relativity 584, 2796
 - Galilean 2251, 2258
 - Galilean or Newtonian 2258
 - general 703, 798, 1057, 1355, 1727, **2249**, 2496, 2540
 - philosophical implications 1923
 - special 806, 923, 1028, 1345, 1448, 2084, **2257**, 2495
- relativity group 943, 1216
- relativity postulate 2257, 2259, 2260
- relaxation 1767, 1912, 1913, 2402
 - electronic 75
 - grain-boundary 75
 - magnetic 75
 - point-defect 75
 - spin–lattice 1767
 - transverse 1767
- relaxation dynamics 1834
- relaxation methods 201
- relaxation oscillations 1275, 1282, 1283
- relaxation phenomena **2274**
- relaxation rates 1913
- relaxation shifts 1938
- relaxation strength 1121
- relaxation time 637, 1913, 2274
- relaxation time approximation 2769
- relaxed modulus 1470
- remote handling **1054**
- remote sensing 129
- renormalizability 675, 697, 699, 1912, 2090, 2553
- renormalization 581, 675, 2085, 2090, **2278**
 - multiplicative 2086
- renormalization-group theory 594, 1905, 1907, 1911
- renormalization group method 254, 442, 912
- reparametrization 952
- representation
 - adjoint 950
 - irreducible 949, 1131, 1606
- representation of groups 942–943
- reptation 664, 1343, 2307
- resistance **2283**
 - negative 1444
 - thermal 1929
- resistivity 866, 2284
- resistivity tensor 1413
- resistor 1686, 1688
- resolution
 - atomic 785
 - diffraction limit 2897
- resolvent equation 1830
- resonance energy 1622
- resonance frequency 2854
- resonances 672, 2247, **2285**
 - dipole isovector 2292
 - giant 1149, **2291**, 2558
 - giant electric dipole 1809
 - giant photonuclear 1954
 - isobaric analog 1795, 2296
 - mechanical 2854
 - open-orbit 1397
- resonance structures 1622
- resonant tunneling device 2474, 2480

- resonators 2288
 - electrical 2288
 - mechanical 2285
- response frequency spectrum 2855
- response theory 2464
 - linear 1100
- rest frame 262, 2267
- rest mass 2267
- Reststrahlen 738, 739, 1290
- Reststrahl frequency 2194
- retardation coefficient 663
- retarded potentials 586, 587
- retarding-potential experiment 2915
- reverberation 2486
- reverse-field pinch 1970
- Reynolds number 223, 830, 831, 985, 1063, 1064, 2300, 2358
 - critical 2697
 - magnetic 1403
- Reynolds stress 833
- rheology **2298**
- rheometry 2306
- rheon 240
- ribonucleotides 199
- Ricci curvature tensor 925
- Richard's equation 2420
- Richardson–Schottky equation 2680
- Richardson equation 2678
- Richardson line 2681
- Richardson number 224
- Richards transformation 1515
- Riemann–Christoffel tensor 2849, 2853
- Riemann curvature tensor 2497
- Riemannian metric 803, 1355, 2253, 2549
 - tensor 2253, 2796
- Riemann surface 2543
- Rietveld refinement 479, 486, 1709
- rigid-band approximation 66
- rigid-rotor model 1548
- rigid body 1213
- rippplons 2010
- ripplopolarons 2010, 2014
- Ritz principle 2865
- Robertson–Walker metric 1131
- roll pattern 1920
- Röntgenium 2594
- Roothaan scheme 1603
- rotation 910, 1100, **2310**, 2314
 - generators of infinitesimal 2312
 - improper 458, 459
 - internal **1132**
 - proper 458, 462
- rotation–vibration interaction 1161
- rotational constant 1547
- rotational envelope 1100
- rotation group 1309, 2314
 - irreducible representations 2317
 - quantum-mechanical 2317
 - unitary representation 2316
- rotoinversions 459
- roton 996, 999, 1435, 1463, 1719
- rotooptic effect 1933
- rotorefections 459
- Rowland circle 2921
- row vector 1454
- RSA encryption 2082
- Runge–Lenz vector 1129, 1207
- Russell–Saunders coupling 132, 151, 2506
- Rutherford atomic model 1601
- Rutherford backscattering 268, 270, 2728
- Rutherford scattering 1793
- rydberg 166
- Rydberg constant 178, 179, 216, 371, 390
- Rydberg states 153, 1536, 1557, 1561, 1562
- saccharimeter 1834
- Salpeter equations 195
- sandwich structure 1198
- satellites 2164, 2172, 2173, 2177, 2181, 2345, 2408, 2434, 2451, 2453, 2488–2491, 2493, 2563, 2564, 2735, 2750
- saturable absorber 2817
- Saturn 839, 1415, 2452
 - x-ray emission 112
- scalar 2848
- scalar product 2849
- scaling hypothesis 1089
- scaling laws 2588
- scattered-wave formalism 153
- scattering 1851
 - acoustic 2345
 - α particle 317
 - cross section 2340
 - deep inelastic 690, 2554
 - elastic 1, 2339, 2341, 2739
 - nuclear **1804**
 - optical model 2344
 - potential 2342

- quantum-mechanical formulation 2339
- radar 2345
- sound 36
- scattering angle 320
- scattering chamber 322
- scattering chambers 289
- scattering length 161
- scattering matrix *see* *S* matrix
- scattering mechanisms 2403
- scattering probability 2769, 2770
- scattering theory 531, **2339**
- scattering transform, inverse 2484
- scatter propagation 1144
- Schiff–Fairbank experiment 1628
- Schlieren method 2416
- Schmidt limits 1813
- Schoenflies notation 459, 461
- Schottky anomaly 977
- Schottky barrier 306, 787, 788, 2372, 2477, 2612, 2748
- Schottky contacts 2406
- Schottky effect 2677, 2680
- Schottky emission 784
- Schottky line 2681
- Schrödinger equation 136, 151, 579, 1637, 2315, 2335, **2347**, 2737
 - electronic 1601
 - nonlinear 2483
 - time-dependent 2121
 - time-independent 131, 1600, 2121
 - tunneling electron 782
- Schrödinger evolution 2145
- Schrödinger picture 973, 2122
- Schrödinger representation 2122
- Schwartz limits 1813
- Schwarz inequality 2830
- Schwarzschild radius 114, 204, 927, 928
- Schwinger–Dyson equations 2097
- Schwinger model 2084
- scintillation 875, 1349, 2068
- scintillation counter 290, 479, 875, 876, 1645, 1717, 1792, 2190, **2348**
- scintillators 289, 437, 1349, 2349
 - inorganic 2191
 - organic 2190
 - plastic 291, 293
 - properties 2350
 - saturation 2350
- scission point 1739
- screened-exchange plus Coulomb hole approximation 146
- screening cloud 1334
- screening length 1475
- screw dislocations 2913
- S* duality 2546
- sea of instability 2592
- seaquakes 2361
- secondary structure 200
- second harmonic generation 1281–1283, 1842
- second quantization 2085
- second sound **2353**
- secular variation 890
- sedimentation 2039, **2357**
- Seebeck effect 2406, 2701
- seeing, astronomical 102, 1956
- segregation 2609
- seismicity 2367
- seismology **2361**
- seismometry 2363
- selection rules 1096, 1097
 - electric-dipole 133
 - radiationless transitions 171
 - rotational Raman spectra 1549
- selective odorant measurement multisensor array technique 661
- self-adjointness 1831
- self-conjugate particles 81
- self-consistent field approximation 143, 1602
- self-consistent phonon theory 1004
- self-focusing 1841, 1845
- self-gravity 837, 839
- self-induction 742
- self-interaction corrections 145, 146
- self-organization 1682, 2139
- self-similarity 2700
- semi-*ab initio* calculations 1601
- semiconductor-controlled rectifier 2749
- semiconductor heterostructures 2480
- semiconductor photodiodes 2864
- semiconductor radiation detectors **2369**
- semiconductors 2356, 2460, 2766
 - amorphous **2377**
 - crystalline **2393**
 - direct-bandgap 634
 - electrical conductivity 1477
 - indirect-bandgap 633
 - nondestructive testing 55
 - organic **1866**

- semiempirical calculations 1601
- semimetals 278
- separable expansion 2739
- separation factor 2201
- separation nozzle 1164
- servomechanism **2410**
- Seyfert galaxies 2163
- shake-up effect 2919
- Shannon's interpolation formula 845
- Shannon's sampling period 844
- Shannon–Nyquist theorem 843
- shearing motion 2300
- shear modulus 550
- shear rate 2858
- shear stress 2856
- shock waves 826, **2411**
- short-range order 1089
- Shubnikov–de Haas effect 504, 506, 1865, 2406
- SI base units 2622
- signal-to-noise ratio 106, 653
- signal repetition rate 1878
- simultaneity 2264, 2495
 - absolute 2251
- Sine–Gordon equation 1733
- Sine–Gordon theory 796
- sine waves 43
- single-collision regime 321
- single-electron memory cell 2142
- singularities 250–256, 1903, 1905, 2735
 - essential 1909, 2735
- sintering 1381, 1383, 1683
- size-extensiveness 1608
- size quantization 2138
- Slater determinant 138, 142, 1602
- slowly varying amplitude approximation 2242
- Smakula's formula 342
- S* matrix 531, 1127, 1686, 2090, 2343
 - theory 686, **2333**
- smectic phase 1327
- Snell's law 2243, 2245
- Sobolev inequality 2830
- soccer ball 858
- soil physics **2418**
- solar cells 1958, 2408, 2750
 - bioelectronic 1679
- solar electric conversion 2426
- solar energy **2421**
- solar flux 128
- solar neutrino paradox 700, 2442, 2563
- solar neutrino unit 2442
- solar physics 2488
- solar system **2451**
- solar thermal conversion 2426
- solar wind 1415, 2175, 2453, **2456**, 2564
- Soleil compensator 1849
- solid-state physics **2459**
- solid-state switching **2472**
- solidification 455, 1901, 1903, 1904
 - rapid 1380, 1383
- solidus temperature 65
- solitary waves 2608
- solitons 1293, 1391, 1720, 1732, **2483**, 2899
- Sommerfeld approximation 2679
- Sommerfeld coefficient 988
- sonar 36, 2486
- sone 31
- sonobuoys 2486
- sosus 2486
- sound
 - attenuation coefficient 504
 - insulation 34
 - intensity 43
 - interference 36
 - measurement 22
 - pressure 45
 - propagation 35
 - reception 31
 - reflection 36
 - refraction 36
 - transducer 2823
 - transmission 30
 - transmission class 34
 - underwater **2485**
 - velocity 504
- sound waves 30, 1913
 - standing 37
- space
 - absolute 1355
 - curvature 424
- space–time continuum 2264
- space-charge effects 55, 783
- space groups 459, 475, 942
 - Hermann-Mauguin symbols 470
 - Schönflies symbols 470
 - symmorphic 469
- space science **2488**
- space stations 2493
- spacetime 800, 801, 1355, 2251, 2313, **2494**

- 'a' spacetime vs 'the' spacetime 2497
- coordinate grid 2258
- coordinates 2498
- curvature 935, 2496
- geometry 922, 925
- hyperbolic 2497
- metric 2254, 2495, 2496
- singularities 124, 204, 2498
- spacetime event 2263
- spacetime framework 2257
- spallation 400, 1708
 - sources 8, 475, 496, 1708, 1714, 1734
- spark chamber 2191
- spark counter 429
- sparks **84**, 670
- spatulae 1678
- specific heat 231, 442, 446, 747, 822, 988, 996,
1146, 1287, 1463, 1905–1907
 - at low temperatures 1927
 - constant magnetization 816
 - constant pressure 832
 - constant volume 363
 - contributions 627
 - helium 1003
 - magnetic 1007
 - temperature dependence 997
- specific rotation 1833
- spectral analysis 840
- spectral profile 1100
- spectral representation 1831
- spectral theorem 1831
- spectrochemical analysis 2860
- spectrographs 918, 2863
- spectrometers 281, 1097, 2861
 - dispersive 1525
 - germanium 2373
 - laser 1525
 - magnetic 290
 - Stark modulation 2934
- spectrophotometers 2861–2863, 2865
- spectrophotometry **2500**
- spectropolarimeter 1833
- spectroradiometers 2500
- spectroreflectometers 2500
- spectroscopic frequencies 1523
- spectroscopic notation 131
- spectroscopy
 - angle-resolved photoelectron 1348
 - atomic **130**, 160
 - Auger electron 604, 719, 2610, 2728
 - bremsstrahlung isochromat 990, 1939
 - cavity ring-down 1575
 - charged-particle **286**
 - deep-level transient 2381
 - Doppler 1642
 - Doppler-broadening coincidence 2049
 - Doppler-free 533, 1252, 1527
 - double-resonance 1834
 - electronic 1536
 - electronic absorption 1557
 - ellipsometric 719
 - femtosecond 1563
 - fluorescence correlation 1507
 - Fourier-transform 737, 1097, 1525
 - helium nanodroplet isolation 1571
 - infrared **1096**
 - intracavity laser absorption 1575, 1577
 - ion-scattering 604
 - Lamb-dip 533
 - laser 319, 325, **1239**, 1524
 - laser-induced breakdown 2862
 - laser-induced fluorescence 1567
 - laser magnetic resonance 1565
 - liquid helium droplet 1566
 - luminescence 2863
 - magnetic resonance 2214
 - matrix-isolation 1566
 - matrix isolation 1566
 - molecular 1132, **1522**, 1525
 - Mössbauer 1655
 - neutron **1714**
 - nuclear 80
 - optogalvanic 1240
 - photoacoustic 1240, 2827
 - photoassociation 160
 - photoelectron 990, 1560, **1933**
 - photoemission 2728
 - photoionization 1560
 - photoionization threshold 1560
 - photothermal deflection 2381
 - positron lifetime 2048
 - Raman *see* Raman spectroscopy
 - Raman gain 1529
 - saturation 533, 1241
 - single-molecule 1582
 - sub-Doppler 1527
 - Terahertz 1582
 - two-photon 1253, 1557

- ultraviolet **2860**
- ultraviolet photoelectron 628, 1934
- vibrational 1540, 2226
- visible **2860**
- wavelength-based 1533
- x-ray **2917**
- x-ray photoelectron 1934
- zero electron kinetic energy 1560
- spectrum
 - electromagnetic 1096
 - of operators 1830
- spectrum function 843
- spherical top rotor 1510, 1548
- spin 1384, 2314, **2502**
 - electronic 637
- spin–lattice relaxation 1929
- spin–orbit interaction 132, 808
- spin–orbit splitting 150, 151, 154
- spin–spin interaction 808
- spin-density waves 278, 2469
- spin-flip effect 2277
- spin-statistics theorem 2598
- spin anisotropy 1907
- spin echo 1767
- spinel structure 1381
- spin glasses 2466
- spin Hamiltonian 639
- spinodal curve 1915
- spinodal decomposition 535, 1915
- spinons 2468
- spinor 878, 1752
- spinor condensates 2802
- spinor fields 880
- spinorial functions 2322
- spin polarization 146
- spin statistics theorem 438, 2800
- spintronics 1384, 1395
- spin valve 1384
- spin waves 1720, 1913, 1916, 2464
- spiral galaxies 1057
- spot diagram 1839
- spreading width 1148
- sputter cleaning 604
- sputter etching 604
- sputtering 600, 603, 1384, 2754
- squeezed state 2133
- St. Elmo's fire 394
- stability conditions 2686
- Stabler–Wronski effect 2383, 2385, 2386
- stacking faults 451, 2399, 2462
- standard candles 124
- standard deviation 2063
- standard hydrogen electrode 564
- standard model 89, 418, 441, 877, 911, 914, 950, 951, 1890, 2084, 2162, 2547, 2602, 2904
- starburst galaxies 116, 117
- Stark effect 220, 1527, 1836, 2757, **2927**
 - intramolecular 447
 - quadratic 1836
- Stark lobes 1511
- stars
 - energy sources **2524**
 - evolution **2524**
 - formation **835**
 - formation rate 108
 - origin 427
 - structure 124
 - variable 863
- state function 547, 548, 975, 2692
- state space 547
- state variable 250
- state vector reduction 2145
- statics **2509**
- stationary state 1912
- statistical heating 1250
- statistical mechanics 534, 536, 1028, 1910, **2511**, 2684
 - quantum **2134**
- statistical reactions 1795
- statistical thermodynamics 2511
- statistics 2061, **2519**
- Staudinger constant 2039
- Staudinger equation 2040
- steam engine 241
- steam turbine 978
- Stefan–Boltzmann constant 211, 390, 2218
 - for photons 2218
- Stefan–Boltzmann law 209, 210, 985, 2218
- stellarators 1970
- stepped leader 1322, 1323
- stereochemistry 297
 - dynamical 1137
- stereocopolymers 2031
- stereoisomerism 1833
- Stern–Gerlach experiment 1774, 2504
- Stern–Gerlach magnets 311
- Sternheimer shielding 1650

- sticking coefficients 719
- stiction 857
- stiffness tensor 1960
- Stirling cycle 2432
- stochastic cooling 959
- stochastic processes 2128, **2531**
- Stokes' law 2300, 2358
- Stokes' theorem 568, 893
- Stokes shift 1263
- Stokes waves 1731
- Stone's theorem 1831
- storage rings 285, 573, 2051, 2659
- Stosszahlansatz 956
- strain 1078
 - dielastic 1121
 - internal 501
 - paraelastic 1121
- strain annealing 455
- strain energy 2139
- strain gauges 26
- strangelets 1075
- strangeness 180, 684, 949, 957, 1072, 1076, 1474, 2552
 - conservation 367
- Stranski–Krahanow growth 2139
- stratopause 127
- stratosphere 127
- stress 1078, 1281, 1370, 1399, 1406, 1421
 - ultimate 1471
- stress–strain relation 1121
- stress tensor 1215, 1467
- string theory 687, 952, **2539**
- stroke 1322, 1323
- strong *CP* problem 703
- strong focusing 2655
- strong interaction 418, 579, 682, 956, 1820, 2158, **2551**, 2642
 - theory 1474
- structure factor 480
 - dynamic 817, 1913, 2559
 - normalized 483
- Student *t* distribution 2521
- sublimation 1904
- substorm 174
- sum-frequency generation 1282
- sum rules 490, 515, 2292, 2293, **2556**, 2557
- Sun 2451, **2560**
 - activity cycle 1405
 - chromosphere 2561
 - convection zone 1402, 2561
 - core 2561
 - corona 1415, 2456, 2561
 - flares 2564
 - fusion process 2562
 - magnetic field 2453
 - oscillations 2563
 - photosphere 2561
 - radiative zone 2561
 - solar neutrino 2562
 - sunspots 2561
- sunspots 1402, 1956
- superbatteries 1624
- supercharges 2601
- superclusters 863, 2833
- supercomputers 1294
- superconducting energy storage device 1377
- superconducting materials 1384, **2565**
- superconducting supercollider 1377
- superconductive devices **2571**
- superconductivity 443, 446, **508**, 762, 1910, 2467
 - critical field 2580
 - critical temperature 2580
 - glassy metals 909
 - high-temperature 1709, 2580
 - isotope effect 2588
 - metallic 220
 - order parameter 2589
 - type I 2582
 - type II 2582
- superconductivity theory **2580**
- superconductors 363, 442, 444, 1906
 - classical 2565
 - high-temperature 2567
 - organic **1861**
- superconformal algebra 2602
- superdeformed shapes 1819
- superdiamagnetism 510, 511
- superexchange 1393
- superfluidity 58, 161, 218, 317, 446, 999, 1062, 1910
 - transition temperature 58
- superfluids 442, 1906, 1909, 2353, 2354
 - density 1907
- supergravity 707, 916, 952, **2598**
 - theory 805
- superheavy elements **2591**
- superheavy nuclei 1787, 1816, 2593

- superheterodyne detection 2749
- superlattice 498, 1857, 2241, 2471, 2729
- superlattice model 1860
- superluminal tunneling 2787
- superluminal velocities 2166
- Supermalloy 909
- supernovae 82, 124, 427, 864, 928, 1126, 1721, 1792, 1797, 1826, 2165, 2833
 - galactic 91
 - theory 915
- supernova remnants 114
- supernova shock acceleration model 406
- superparamagnetism 1654
- superpartner 705, 707
- superposition 517, 1846, 2079
 - electromagnetic waves 1313
 - linear 2066
- superposition postulate 2314
- superposition principle 2117, 2895
- superselection rules 796, 797
- supersolid 1008
- supersonic nozzle 826
- superstrings 418, 708, 916
- superstring theory 915, 2553
- supersymmetry 705, 707, 914–916, 952, 1131, 1132, 2539, **2598**, 2643
- superweak interaction 699
- surface-extended x-ray absorption fine structure 2610
- surface acoustic waves 55, 2827
- surface barrier 2355
- surface configuration 2418
- surface defects 451
- surface effects 1911, 1915, 1916
- surface flashover 1105
- surface gravity 206
- surface modes 2611
- surface polariton 2898
- surfaces 718, 1911, **2609**, 2688
 - reconstruction 2610
- surface tension 259, **2605**, 2607
- surface topography 2780
- surface vibrations
 - electromechanical pickup 25
 - optical measurements 26
- surface waves
 - breaking 2608
 - on fluids **2607**
 - free 2607
- tsunami 2608
 - wind-generated 2608
- susceptibility 513, 1905, 1906, 1909, 1915, 1916, 1996
 - magnetic 509, 1358, 1881
 - nonlinear optical 1843
 - van Vleck paramagnetic 511
- susceptibility meters 868
- Sverdrup relation 225
- swallowtail catastrophe 253, 256
- switches
 - contactless 868
 - magneto-resistive 2481
- symbols, physical **2619**
- symmetric top rotor 1510, 1548
- symmetry 1096, 1127
 - broken continuous 1916
 - chiral 695
 - continuous 1906, 1908, 1909
 - discrete 1908
 - global 684
 - grand unified 914
 - hidden dynamical 945
 - internal 682
 - mirror 2545
 - site 472
 - time-reversal 991
 - translational 1909
- symmetry breaking 684, 1908, 1919, 2697
 - spontaneous 256, 679, 910, 916, 951, 1131, 1908, 1909, 2102, 2551, **2642**
- symmetry element 458
- symmetry operation 458, 942
- symmetry transformations 459
- symplectic manifold 541
- synchrocyclotron 493, 2656
- synchrotron 288, 490, 524, 573, **2650**, 2659
- synchrotron emission 107
- synchrotron radiation 82, 227, 523, 573, 2052, **2659**
 - natural beam size 2052
- Szilard–Chalmers reaction 1053
- tachyons 268, 2261, 2553, **2667**
- tacticity 2030
- tandem mirror machine 1971
- Tandetron 17
- tau 671, 1297, 2621
- tautomerism 1616

- Taylor–Proudman theorem 1410
 T duality 2545
 temperature 853, **2668**, 2684, 2686
 ambient 1016
 high **1015**
 measurement of oscillations 24
 negative 1020, 1445, 2688
 scales 1015, 2669
 thermodynamic 2720
 temperature–entropy diagram 243
 temperature-independent paramagnetism 509
 tensor analysis **2848**
 termination 2036
 terrestrial radiation 128
 tertiary structure 200
 theory of everything 1925, 2553
 thermal analysis **2671**
 thermal disorder 1335
 thermal efficiency 978
 thermal expansion 446, **2674**
 thermal field emission 784
 thermal lensing 1281
 thermal radiation 208
 thermal wavelength 1002
 thermistors 2725
 thermocouples 238, 1019, 1524, 2670, 2702,
 2704, 2725, 2744, 2760
 multijunction 237
 thermodiffusion 2694
 thermodynamic data **2682**
 thermodynamic limit 2466, 2516
 thermodynamic path 1904
 thermodynamic potential 853, 2687
 of noninteracting fermions 747
 thermodynamics 2688
 emergence 1028
 equilibrium 85, **2684**
 first law 975, 978, 1028, 2686
 nonequilibrium **2689**
 second law 975, 978, 1028, 2686
 third law 2688
 thermodynamic stability 2686
 thermodynamic state 725
 thermoelectric effect 866, 967, 2691, **2701**, 2766
 thermoelectric power 504, 866
 thermography 2205, 2215
 thermogravimetry 2671, 2672
 thermoluminescence 1350, **2705**
 thermomagnetic effects 866
 thermometers 236, 237, 444, 2670, 2720–2726
 thermometry 236, 2704, **2720**
 thermopiles 183
 thermopower 2702–2704
 thermoscope 2720
 thermosphere 128
 Thevenin’s theorem 1692
 thin films 718, **2727**
 Thirring model 796
 thixotropy 2302, 2367
 Thomas–Fermi edge 219
 Thomas–Fermi method 1430
 Thomas–Fermi screening radius 270
 Thomas–Reiche–Kuhn sum rule 2558
 Thomas factor 593, 808
 Thomson–Reid experiment 617
 Thomson coefficient 2703
 Thomson cross section 361
 Thomson effect 2702
 Thomson relation 360
 three-body continuum 2738
 three-body force 2737
 three-body problem 1428
 gravitational **2734**
 hadronic 2739
 quantum mechanical **2737**
 three-halves power law 646
 threshold of pain 38
 thunder 828, 2412
 thunderstorm 1321, 1488
 thyatron 649, 2479
 thyristor 2408, 2479, 2749
 tillage 2418
 time 2257, **2741**
 dilation 533, 2262
 reversal 1128
 standard 185
 Titan 1081, 2453
 Titchmarsh theorem 530
 tomotherapy 2207
 Tonk’s gas 1429
 topological order 58
 torque 536
 torsion balance 922
 touch-tone telephones 265
 traffic flow 1920
 transducers 25, 767, 2486, **2744**
 magnetostrictive 1400
 transfer function 1692

- transformations
 - boost 1214
 - canonical 1212
 - Lie groups 1308
 - normal-coordinate 1285
- transformation theory 542, 545
- transformer 774, 1686, 1689
- transistor 306, **2746**
 - avalanche 2478
 - bipolar 306
 - bipolar junction 2473
 - field-effect 306, 608, 651, 2408, 2479
 - field-effect metal-oxide 1476
 - floating-gate field-effect 2479
 - insulated-gate field-effect 2479
 - junction 2478
 - metal–semiconductor field-effect 2400
 - metal-oxide–semiconductor
 - field-effect 2479
 - organic field-effect 1867
 - single-electron 1232
 - thin-film 2386
 - unijunction 2479
- transistor–transistor logic 656
- transition elements **2756**
- transition frequency 1254
- transition probability 170
- transition rates 132
- transitions
 - allowed 2902
 - displacive 766
 - electric-dipole 132
 - Fermi 2294, 2902
 - forbidden 188
 - Gamow–Teller 2294, 2902
 - luminescent 576
 - radiationless 169, 1353
 - rotational 1508
 - spectroscopic 1523
 - vibrational 1508
- transition value 1607
- translation groups 464
- transmission-line equations 1513
- transmission lines 1513, 1516, 1517, **2760**
- transmissometers 2500
- transmittance 2219, 2220, 2500
- transport effects 866
- transport equation 2771–2773
- transport phenomena 2299
- transport properties **2766**
 - measurement 235
 - of thin films 2730
- transport theory **2771**
- transuranium elements 2202, 2756, **2774**
- transverse-electromagnetic waves 1513
- transverse-traceless gauge 935
- transverse waves 35
- Trapezium 835
- traps
 - in insulators 1104
 - magnetic 160, 218, 2802
 - magneto-optical 160, 1249
 - optical 160
 - optical dipole 2802
- traveling-salesman problem 357
- traveling-wave tube **1228**, 1381
- triac 2478, 2749
- tribochemical reactions 2782
- triboelectric effect 670
- triboelectricity 670
- triboelectrification 667
- tribology **2780**
- triboluminescence 1350
- tribophysics 2299
- Trichel pulse 395
- trichromacy 2871
- tricritical point 442, 1918
- trigonal bipyramid 299
- triode 646
- triple-alpha reaction 2526
- triple point 2847
- triplet state 642
- Triton 2453
- triton 1774, 2621, 2738, 2740
- tropopause 127, 1487
- troposphere 127, 1487
- Trouton’s coefficient 2300
- Trouton’s rule 1066
- Troyon formula 1966
- Troyon limit 1763
- truthonium 2153
- T Tauri stars 839
- t-test 2523
- tune resolution 432
- tune shift limit 2052
- tunneling 785, 1003, **2783**
 - single-electron 1476
- turbidity 2038

- turbine engines 2230
- turbulence 835, **2789**
 - aerodynamic 354
 - helical 1403
 - magnetohydrodynamic 1405
- turbulent heating 1982
- Turing machine 258
- turn-on time 2477
- turnover frequency 247
- twin boundary 2462
- twin paradox 2263, **2796**
- two-electron spectra 133
- two-level atom 158
- two-level systems 2462
- two-photon absorption 1241, 1841, 1842, 1845
- Tyndall effect 2235

- ultrahigh-pressure techniques **2803**
- ultrasonic attenuation 1396, 1929
- ultrasonics **2822**
- ultrasonography 2215
- ultrasound 2215, 2820
 - toxicity 2820, 2821
- ultraviolet divergences 1912
- umbilic catastrophe 253
- umbral calculus 2325
- umbrella inversion 1135
- Umklapp processes 1928
- uncertainty principle 123, 354, 355, 443, 746, 1034, 2113, 2120, 2473, 2742, 2770, **2829**
 - asymmetry between position and momentum 2334
- undercooling 457
- undulators 573, 1381, 2663
- unification scale 912
- unified coupling 912
- unitary group approach 1606
- units, physical **2619**
- universality 1906, 1907, 1910–1913
 - two-scale factor 1907
- universality class 442, 1906, 1907, 1910, 1911, 1916, 1918
 - dynamic 1914
- Universe **2832**
 - antimatter content 81
 - cooling 122
 - expansion 421, 1057, 1059, 2741, 2834
 - inflation 707
 - unrelaxed modulus 1470
- Unsold's theorem 152
- upsilon family 950
- Uranus 839, 1415, 2452
- Urbach edge 2383
- Urey–Bradley field 1098

- vacancies 451, 453, 501, 563, 2183, 2399, 2461
 - concentration 452
- vacuum 679, 2096, 2355, 2541, **2837**
- vacuum energy 244
- vacuum evaporation 2754
- vacuum expectation value 2643
- vacuum permeability 770
- vacuum pumps 289, 2837–2844
- vacuum system 2840
- vacuum technology **2837**
- vacuum tubes 2482
- valence band 968, 2394
- valence bond method 1606
- valence fluctuations 1115
- valence force field 1098
- valence saturation 301
- valence stroke 296
- valence transitions 1119
- valley of nuclear stability 186, 1787
- van der Pauw's method 2405
- van der Pauw factor 2406
- van der Waals equation 725, 1338, 1342
- van der Waals interaction 1108, 1907, 1915, 1916
- van Hove relationship 1717
- van Hove singularities 627, 628
- vaporization 1904
- vapor pressure **2846**
- varactors 2749
- variance 2063
- variational collapse 153
- variational method, discrete 152
- variational principle 250, 255, 538, 1602
- varistor 264
 - metal-oxide 2481
- V center 335, 338
- vector 2849
- vector addition coefficients 2319
- vector analysis **2848**
- vector field 1911
- vector potential 673, 1465
- vector product 2849

- vector space 547
- velocity 1212
- velocity–shear instability 1990
- velocity addition 2260
- velocity pickups 25
- Veneziano model 2553
- Venus 839, 2452
- Verdet constant 741
- Verwey transition 1481
- vibrating-rotator model 1548
- vibration–rotation interactions 1138
- vibrations 2361
 - anharmonicity 1543
 - collective 2292
 - crystal lattice 1284, 1926, 2193
 - forced 2854
 - free 2855
 - harmonic 1543
 - mechanical **2854**
 - modes 2895
 - molecular 1096, 1132, 1617, 2225
 - normal modes 767, 1285, 1541, 1926, 2855
 - random 2856
 - torsional 1133
 - ultrasonic 2825
- Villari effect 1421
- Virasoro algebra 952, 1131
- virial coefficients 726, 1109
- virial expansion 726, 1339, 2516
- virial theorem 301, 1620, 2525
- virtual-crystal approximation 66
- virtual particles 2100, 2247, 2545
- viscoelasticity 1467, 2304, 2858
- viscometry 2306
- viscosity 820, 1225, 2299, 2771, **2856**
 - intrinsic 2039
 - kinematic 821, 2300
 - polymer molecular weight 2039
 - specific 2040
 - surface 2301
- viscosity coefficient 821
- visibility function 845
- vision **2866**
- Vlasov equation 1985
- Voigt effect 741
- Voigt element 2305
- volt–ampere relation 1686, 1689
- von Klitzing constant 375, 969
- von Kries adaptation 2877
- vortex lattice 219
- vortex rings 2888
- vortices 1720, 2467, **2884**
 - quantized 161
- vorticity 223, 831, 832, 2884
 - quantized 2109
- Wacker process 248
- wafers 308
- wakefield effects 5, 7, 1735, 2054
- Walden inversion 302
- Walsh transform 846
- Ward–Takahashi equation 2091
- Ward–Takahashi identities 2097
- Washburn equation 239
- watched-pot behavior 2147
- watchspring instability 1408
- water **2891**
 - heavy 1163
- wave–particle drag 54
- wave–particle duality 354, 360, 616, 1310, 1923, 2097, 2113
- wave equations 2128
 - Hartree equations 142
- wave front 1838
- wavefunction 1619, 2116, 2117, 2333
 - collapse 2145, 2150
 - confined states 2141
 - determinantal 142, 143, 300, 1430
 - many-electron 141
 - normalization 2117
 - spatial extent 316
 - spinor 593
 - superposition 2334
- waveguides 1512, 1845, 1951, 1993, 2239, 2899
 - acoustic 55
 - electron 1475
 - fiber-optic 578
 - optical 2828
- wavelet analysis 948
- wavelets 948
- wavenumber 1532
 - imaginary 2787
- wave packets 2783, 2830
- wave propagation, nonlinear **1731**, 1950
- waves **2893**
 - electromagnetic 1310
 - group velocity 1927, 2768
 - guided 2826

- standing 2855, 2895
- Waxman–Bahcall bound 95
- weak angle 680, 2910
- weak hypercharge 880
- weak interaction 489, 579, 594, 676, 910, 911, 957, 1701, 1778, 1892, 2198, 2294, 2642, **2900**
 - Lagrangian 489
 - range 911
- weak localization 1475, 2467
- weakly interacting massive particles 90, 99
- wear 2781
- weather forecasting 1486
- Wehnelt electrode 605
- weighing 1447
- Weinberg–Salam group 1131
- Weinberg–Salam theory 582, 583, 1890, 1891
- Weinberg mixing angle 680, 812, 2648, 2905
- Weissenberg method 477, 479
- Weiss model 1860
- Weltbild 1033
- wetting 59
- Weyl’s proof 2830
- Weyl–Heisenberg group 948
- whiskers 2788, **2913**
- white dwarf 124, 204, 1415, 1721, 2106, 2499, 2528
- Wiedemann effect 1421
- Wien displacement law 209, 210, 2218
- Wiener–Hopf technique 2773
- wigglers 573, 1381, 2663
- Wigner–Eckart theorem 946, 949, 950, 954, 2327, 2503
- Wigner–Seitz cell 466, 2393
- Wigner–Seitz theory 1485
- Wigner–Ville representations 843
- Wigner coefficients 2000, 2319, 2320, 2323, 2325–2330
 - Van der Waerden form 2326
- Wigner distribution 2148
- Wigner energy 2195
- Wigner lattice 2016
- Wigner symbols 2000
- winding mode excitations 2545
- wire chambers 289
- Wollaston prism 1849, 2001
- Wood–Anderson seismometer 2366
- Woods–Saxon potential 1793, 1816
- Woodward–Hoffman rules 1611
- work 241, 720, 975
- work content 853
- work function 853, 1945, 2678, **2914**
- work hardening 454, 1484
 - coefficient 1471
- working substance 241
- world line 1217, 2273, 2542, 2796
- world sheet 2542
- wormholes 207
- Wyckoff position 472
- x-ray absorption 524, 2728
- x-ray binaries 1722
 - compact 112
- x-ray diffraction 200, 517, 2728
- x-ray emission 268
- x-ray sources, galactic 112
- x-ray spectra **2917**
- X α approximation 145
- Xerography 670
- x rays 1032, 2917
- Yang–Mills theory 489, 679, 2103, 2549
- yellow cake 2202
- yield strength 499
- yield stress 1471
- Young’s double-slit experiment 1314, 2895
- Young’s modulus 550, 1469
- Young–Laplace equation 239
- Young equation 239
- yrast state 1819
- Yukawa potential 884
- Zeeman effect 212, 592, 1013, 1358, 1527, **2927**
- Zeeman energy 637
- Zeeman shift 1249
- Zeeman splitting 741, 1250, 1836
- Zeldovich–von Neumann–Doering theory 2417
- Zeldovich spectrum 427
- Zener breakdown 2477
- Zeno’s paradox 2147
- zero-phonon line 343
- zero-point energy 1161, 1926
- zero-point motion 2770
- zero differential overlap 1611
- zero sound 219
- Zitterbewegung 152
- zone refining 2753