

# Index

## Symbols

$\varepsilon$ -E, 263  
 $\varepsilon$ -ensemble, 263  
 $\mu$ -P-T-E, 134  
 $\sigma$ -E, 270  
 $\sigma$ -ensemble, 270

## A

Absolute energy fluctuation, 100  
Absolute fluctuation, 78  
Action of free energy, 143  
Annealed disorder, 281  
Anomalous dimension, 490  
Antiferromagnetic phase, 208, 213  
Approach of a single survivor, 377  
Approach of representation, 386, 387, 407  
Attractor, 392, 394  
Autocorrelation function, 290  
Autocovariance function, 290  
Avalanche, 277  
Avogadro constant, 55

## B

Bethe lattice, 237  
Binodal curve, 171, 179  
Bipartite lattice, 207  
Blume-Capel model, 377  
Boltzmann's entropy, 66, 96, 117  
Bond percolation, 226  
Boundary conditions, 56  
Box counting, 4  
Branch, 2

## C

Canonical ensemble, 91  
Canopy, 16  
Canopy dimension, 16  
Cayley tree, 237  
CE, 91  
Cluster, 177, 195

Cluster size distribution, 230  
Coarse-graining, 368, 369  
Coexistence curve, 171, 179  
Continuous FBM, 281  
Continuous phase transition, 188  
Corrections to scaling, 462  
Correlation function, 290, 328  
Correlation length, 303, 304, 325, 328  
Coupling constant, 369  
Critical cross-over index, 427, 453, 468, 470  
Critical curve, 214  
Critical fixed point, 381, 393  
Critical flow curve, 381  
Criticality, 174  
Critical manifold, 381  
Critical nucleus, 198  
Critical opalescence, 289  
Critical point, 163, 170  
Critical region, 322  
Critical temperature, 170  
Cross-over effect, 464  
Cross-over temperature, 465, 469

## D

Damage, 260  
Dangerous coupling constant, 475, 489  
Daughter branch, 4  
Daughter iteration, 4  
Decimation, 370, 375  
Degeneracy of energy level, 57  
Degenerate, 57  
Democratic FBM, 262  
Density of microstates, 106  
Developed fractal, 4  
DFBM, 262  
Dimension, 8  
Domain, 177, 195

## E

Effective canonical ensemble, 345  
Effective-canonical ensemble, 265  
Effective temperature, 39, 345

Energy fluctuation, 96  
 Energy level, 57  
 Energy spectrum, 57  
 Ensemble, 57  
 Entropy maximization principle, 81  
 Entropy of fluctuation, 72, 96  
 Entropy of MCE, 66  
 Equation of equilibrium macrostate, 97  
 Equation of state, 103, 170  
 Equilibrium distribution of probabilities, 70, 76  
 Equilibrium macrostate, 76  
 Equilibrium state, 76  
 Ergodic hypothesis, 57  
 Extensive parameter, 56  
 External fields, 56

**F**

Factorization of partition function, 158  
 FBM, 261  
 Ferromagnetic phases, 176  
 Fiber-bundle model, 261  
 Finite-size effect, 428  
 First order phase transition, 188  
 Fisher exponent, 244  
 Fisher inequality, 317, 453  
 Fixed point, 392  
 Fluctuating parameter, 56  
 Fluctuation-dissipation theorem, 298, 310, 312  
 Fluctuation foam, 366, 490  
 Fractal, 4, 9  
 Fractal tree, 14  
 Free energy, 81  
 Free energy minimization principle, 81, 88, 124  
 Free energy potential, 81, 123, 133, 136  
 Frozen disorder, 281

**G**

GCE, 134  
 General homogeneous function, 475  
 Generating function, 49  
 Geometrical frustration, 218  
 Geometrical support, 19  
 Ghost field approach, 347  
 Gibbs-Bogolyubov-Feynman inequality, 203  
 Gibbs entropy, 66  
 Gibbs probability distribution, 98  
 Gibbs-Shannon entropy, 47, 66  
 Ginzburg criterion, 318  
 Ginzburg-Landau-Langevin equation, 175  
 Global minimum, 174  
 Grand canonical ensemble, 134

Griffiths inequality, 447, 457

## H

Hausdorff-Besicovitch measure, 6  
 Heat bath, 90  
 Heat reservoir, 90  
 Heat susceptibility, 325, 328  
 Helmholtz energy, 118, 121, 123  
 Hyperbolic (saddle) fixed point, 392, 393  
 Hyper-scaling relation, 320, 338, 454  
 Hysteresis loop, 178

## I

Ideal gas, 56  
 Ideal system, 56  
 Intensive parameter, 56  
 Irrelevant eigen-value, 480  
 Isolated system, 56

## K

Koch island, 1  
 Koch snowflake, 1  
 Koch star, 1

## L

Lattice animals, 234  
 Law of conservation of probability, 231  
 Liouville – von Neumann equation, 82  
 Lipschitz-Hölder exponent, 24, 42  
 Local minimum, 174  
 Logarithmic accuracy, 26, 31, 61, 68  
 Long-range interactions, 151  
 Long-range order parameter, 155  
 Long-wave approximation, 301, 306, 307

## M

Macrostate, 95, 127  
 Magnetic susceptibility, 163, 180  
 Magnetization, 60, 154  
 MCE, 63  
 Mean-field, 166  
 Measure of set, 8  
 Metastable state, 174, 176  
 Method of sources, 305  
 Method of steepest descent, 108  
 Microcanonical ensemble, 63  
 Microconfiguration, 151  
 Microstates, 57  
 Moment, 48  
 Most probable macrostate, 76  
 Multifractal, 23

**N**

Nearest neighbors, 151  
 N.n. Ising model, 151  
 Noise, 85, 262, 277, 281  
 Non-equilibrium distribution of probabilities,  
 70, 72  
 Non-equilibrium fluctuation, 71, 95, 127  
 Non-equilibrium macrostate, 71  
 Normalized cluster number, 230

**O**

Omori's law, 280  
 Order parameter, 56

**P**

Pair connectedness, 328  
 Paramagnetic phase, 176, 214  
 Parent branch, 4  
 Parent iteration, 4  
 Partial partition function, 123, 133  
 Partition function, 49, 98  
 Partition function of the MCE, 135  
 Percolating cluster, 228  
 Percolation, 226  
 Percolation threshold, 228  
 Perimeter, 230, 234  
 Potential barrier, 174, 198  
 Pre fractal, 4  
 Principle of equivalence, 117  
 P-T-E, 134  
 P-T-ensemble, 134

**Q**

qth-order generalized dimension, 49  
 Quenched disorder, 219, 262, 281

**R**

Radius of gyration, 329  
 Relative energy fluctuation, 100  
 Relative fluctuation, 78  
 Relevant eigen-value, 480  
 Renormalization group, 368  
 Repeller, 381, 393, 394  
 RG flow curve, 380  
 Rule of invariant partition function, 373  
 Rule of invariant probabilities, 371  
 Rushbrooke inequality, 184, 446, 456

**S**

Saddle-point method, 108  
 Scale factor, 370  
 Scale invariance, 2  
 Scaling function, 423, 449

Scaling parameter, 423, 424, 449  
 Schrödinger's equation, 84  
 S-cluster, 228  
 Self-affine fractal, 16  
 Self-organization, 171, 208  
 Self-similarity, 4  
 Short-range interactions, 151  
 Short-range order parameter, 166  
 Sierpinski carpet, 1  
 Single survivor approach, 370, 375  
 Sink, 392  
 Site percolation, 226  
 Sliding (moving) time averaging, 86  
 Slowing-down, 192  
 Specific magnetization, 60, 154  
 Spin -1 model, 377  
 Spinodal, 175  
 Spinodal curve, 179  
 Spinodal slowing-down, 277, 279  
 Spontaneous magnetization, 163, 169  
 Spontaneous symmetry breaking, 169  
 Stable state, 175, 176  
 Staggered magnetization, 215  
 Statistical sum, 49, 98  
 Statistical weight, 62  
 Statistical weight of CE, 117  
 Statistical weight of fluctuation, 71  
 Statistical weight of MCE, 64  
 Stat-weight, 62, 64  
 Strict isolation, 63  
 Stroboscopic approximation, 92, 127  
 Superseding correction, 463  
 Susceptibility, 311

**T**

Thermal noise, 282  
 Thermal reservoir, 90  
 Thermodynamic limit, 56, 150, 229  
 Thermostat, 90  
 Tip set, 16  
 Tip set dimension, 16  
 Transfer matrix, 160  
 Tripartite lattice, 217  
 Trivial fixed point, 392  
 Two-level system, 58, 151, 155

**U**

Universality class, 371, 372, 378, 379, 380  
 Unstable state, 177  
 Upper critical dimension, 320

**V**

Virtual isolation, 92, 127  
 Von Neumann entropy, 66