
Index

- acceptor 341
- actin 17–24, 41–59, 142–145, 385–398
- active transport 367–380
- actomyosin 19, 23, 47–49, 384, 386, 392–395, 397, 398, 400
- actuator 340
- adhesive finger 145
- alginate 163
- antagonistic motor 141, 153–155
- anterograde 67
- APP-YFP 68
- aptamer 343
- area difference elasticity (ADE) model 148
- atomic force microscopic (AFM) 54, 56, 163, 171, 172, 241–244, 260
- ATP 15–17
- ATP hydrolysis
 - chemistry 15, 16
- autonomous walker 345
- axon 65

- bending rigidity 146, 150, 152
- biological random motion 191
- biomolecular motors 367–380
- BioNEMS 244, 258, 261–267
 - coupled, multiple cantilever devices 265
 - single cantilever devices 262
- biotin 373, 374
- branch point 338
- Brownian motion 181
- Brownian motion in a fluid 185

- caged-ATP 374–376
- capillary assay 3
- cargo 67
- catalyst 344
- cell trajectories 1
- cell wall 1
- cell-type-specific motility models 181
- cellulose microfibril 167, 174
- chemical force spectroscopy 242
- chemoreceptor 7
- chemotaxis 1
- chitosan 165, 166
- chloroplast 141
- cilium 144
- complementary 332
- convection-diffusion-reaction 73
- cooperative activity 152–153
- cytoskeletal filament 146
- cytoskeleton 141–145

- deoxyribonucleic acid 332
- displacement 247
- displacement response function 249
- DNA 331
- DNA walkers 343
- DNA-based machines 331
- DNA-based motors 334
- DNA-based nanodevice 333
- DNA-based nanotechnology 331
- DNA-crosslinked gels 343
- donor 341
- dose-response curve 10
- double-stranded DNA 332

- dye molecules 341
 dynactin 67, 68
 dynein 41–44, 46, 67, 70–72, 74, 101, 102, 119, 142, 143, 162
- Einstein 182
 Einstein-Ornstein-Uhlenbeck theory of Brownian motion 183
 electron beam lithography 395, 399
 endoplasmic reticulum (ER) 141, 143, 144
 enzymes 344
 Escherichia coli 1, 2
- Förster distance 341
 filopodium 144
 flagellar motor 5, 6, 11
 flagellum 2, 5, 144
 fluctuation-dissipation theorem 182, 258
 fluid loading 249
 fluorescence resonance energy transfer (FRET) 9, 341
 force – nyquist formula 247
 force barrier 150, 154
 force meter 377–379
 free energy 146–150
 free-running motors 339, 344
 fuel 335
 fuel complex 344
 fuel strand 338
- G-proteins
 comparison with myosin molecular switches 28
 Gaussian curvature 147
 generalized bilayer-couple model 148
 giant unilamellar vesicle (GUV) 152
 Golgi apparatus 141, 143, 144
 GTP hydrolysis 29
- Helfrich-Canham free energy 146, 147
 hinge 335, 341
 hybridization 332
 hybridization motor 339
 hydrodynamic flow 145
- impulse response 4, 5
 in vitro motility assay 44–46, 385–400
- kinesin 31–36, 41–46, 50–55, 66–68, 85–119, 142, 143, 152–155, 369–380
 kinetic cycle 32
 molecular motors 31
 molecular structures 34
 structural similarity to myosin 35
 superfamily 31
 kymograph 71
- Lagrange multiplier 146, 147
 Langevin’s equation 183
 Laplace pressure 145
 lifetime 377
 linear electric motors 340
 lipid 141, 146–148, 150, 152
- machine cycle 338
 magnetic tweezer 123–127, 129, 136, 137, 145
 Marangoni flow 145
 mathematical modeling 72
 mean curvature 146, 148, 150
 membrane 141–155
 membrane compartment 142, 144, 151
 membrane nanotube 141–155
 membrane protein 142, 148–150
 membrane tension 145–147
 microtubule 32–36, 41–46, 50–57, 66–75, 86–119, 142, 153, 154, 175, 367–380
 microtubule (MT) 142–145, 152–155
 mitochondrion 141
 molecular motors 367–380, 385, 396
 molecular ruler 341
 Monte Carlo simulation 167, 171
 motile behavior 1
 motility models 181
 motor domain 340
 motor protein 145, 150, 155
 motor proteins 367–380
 motorized DNA tweezers 334
 muscle 385–388, 391
 muscle sarcomere 397, 399, 401
 myosin 15–36, 41–59, 104, 119, 142, 385–400
 active site 24
 catalytic mechanism 24
 conformational states 21
 heavy meromyosin 54–58, 387–400

- HMM 54–58, 387–400
- kinetic cycle 17
- molecular model for motility 22
- nucleotide hydrolysis 24
- proton release 26
- S1 21, 35, 54, 387–390
- stability of the metastable state 26
- structural similarity to kinesin 35
- subfragment 1 21, 35, 54, 387–390
- X-ray structures 19
- myosin II 21–23, 27, 46, 387, 391, 398, 401
- myosin IX 50
- myosin motors 14
- myosin V 19, 21–23, 50
- myosin VI 23, 50
- nanoinprint lithography 399
- nanomotor 367–380
- nanoshuttles 367–380
- nanotube network 143–145
- ncd 143, 152, 154
- neuron 65
- Noise – $1/f$ 255
- optical tweezer 187–189, 378, 391, 398
 - calibration of 189
- organelle 141–143, 151, 153, 155
- Ornstein-Uhlenbeck process 183
- overhang 335, 338
- P-loop 23–28, 34–36, 42–47
- particle tracking 71
- pearling 150
- persistence length 334, 372
- Poiseuille flow 145
- polyacrylamide 343
- polymerizing filament 141, 144, 145, 150
- polysaccharide 161–163, 165, 168
- power spectral density 247
- power-law tails 188
- processive (motor) 31, 32, 34, 104–107, 143, 152, 153
- processive enzyme 162, 164, 166
- quality factor – fluid damped cantilever 249
- quantum dot 396, 398
- random walk 338
- receptor cluster 11
- reset strands 342
- retrograde 67
- RNA polymerase 336
- rocket motor 340
- rotary motor 5
- runs 3
- sarcomere 387, 388, 390, 397
- set strands 342
- signal transduction pathway 7, 8
- simulation 72, 78
- sphere 247
- spiders 344
- spontaneous curvature 146, 149–151
- spontaneous curvature (SC) model 146
- spring constant – 2 legged cantilever 263
- stall force 335
- stepper motors 340
- stochastic dynamics of fluid-coupled nanocantilevers 257, 263
- stokes friction for a sphere in harmonic rectilinear motion 184
- strand displacement 337
- streptavidin 373, 374
- surface imaging 377, 378
- surface tension 145–147, 150
- surface-stress sensor 243
- switch I 23–28, 34–36, 111–118
- switch II 23–28, 34–36, 111–118
- synthetic motors 368
- system response 75
- TAMRA 342
- TET 342
- tethered cell 4
- three-state machine 340
- thrombin 343
- toehold 338
- topoisomerases 124–132
- torque-speed curve 6
- tracking *E. coli* 3
- transport 65
- transport defect 70, 78
- tube force 149, 150
- tube radius 149, 150
- tumbles 3
- tweezers 335
- vesicle 66, 68

Lecture Notes in Physics

For information about earlier volumes
please contact your bookseller or Springer
LNP Online archive: springerlink.com

- Vol.665: V. Martinez (Ed.), Data Analysis in Cosmology
- Vol.666: D. Britz, Digital Simulation in Electrochemistry
- Vol.667: W. D. Heiss (Ed.), Quantum Dots: a Doorway to Nanoscale Physics
- Vol.668: H. Ocampo, S. Paycha, A. Vargas (Eds.), Geometric and Topological Methods for Quantum Field Theory
- Vol.669: G. Amelino-Camelia, J. Kowalski-Glikman (Eds.), Planck Scale Effects in Astrophysics and Cosmology
- Vol.670: A. Dinklage, G. Marx, T. Klinger, L. Schweikhard (Eds.), Plasma Physics
- Vol.671: J.-R. Chazottes, B. Fernandez (Eds.), Dynamics of Coupled Map Lattices and of Related Spatially Extended Systems
- Vol.672: R. Kh. Zeytounian, Topics in Hypersonic Flow Theory
- Vol.673: C. Bona, C. Palenzuela-Luque, Elements of Numerical Relativity
- Vol.674: A. G. Hunt, Percolation Theory for Flow in Porous Media
- Vol.675: M. Kröger, Models for Polymeric and Anisotropic Liquids
- Vol.676: I. Galanakis, P. H. Dederichs (Eds.), Half-metallic Alloys
- Vol.677: A. Loiseau, P. Launois, P. Petit, S. Roche, J.-P. Salvetat (Eds.), Understanding Carbon Nanotubes
- Vol.678: M. Donath, W. Nolting (Eds.), Local-Moment Ferromagnets
- Vol.679: A. Das, B. K. Chakrabarti (Eds.), Quantum Annealing and Related Optimization Methods
- Vol.680: G. Cuniberti, G. Fagas, K. Richter (Eds.), Introducing Molecular Electronics
- Vol.681: A. Llor, Statistical Hydrodynamic Models for Developed Mixing Instability Flows
- Vol.682: J. Souchay (Ed.), Dynamics of Extended Celestial Bodies and Rings
- Vol.683: R. Dvorak, F. Freistetter, J. Kurths (Eds.), Chaos and Stability in Planetary Systems
- Vol.684: J. Dolinšek, M. Vilfan, S. Žumer (Eds.), Novel NMR and EPR Techniques
- Vol.685: C. Klein, O. Richter, Ernst Equation and Riemann Surfaces
- Vol.686: A. D. Yaghjian, Relativistic Dynamics of a Charged Sphere
- Vol.687: J. W. LaBelle, R. A. Treumann (Eds.), Geospace Electromagnetic Waves and Radiation
- Vol.688: M. C. Miguel, J. M. Rubi (Eds.), Jamming, Yielding, and Irreversible Deformation in Condensed Matter
- Vol.689: W. Pötz, J. Fabian, U. Hohenester (Eds.), Quantum Coherence
- Vol.690: J. Asch, A. Joye (Eds.), Mathematical Physics of Quantum Mechanics
- Vol.691: S. S. Abdullaev, Construction of Mappings for Hamiltonian Systems and Their Applications
- Vol.692: J. Frauendiener, D. J. W. Giulini, V. Perlick (Eds.), Analytical and Numerical Approaches to Mathematical Relativity
- Vol.693: D. Alloin, R. Johnson, P. Lira (Eds.), Physics of Active Galactic Nuclei at all Scales
- Vol.694: H. Schwoerer, J. Magill, B. Beleites (Eds.), Lasers and Nuclei
- Vol.695: J. Dereziński, H. Siedentop (Eds.), Large Coulomb Systems
- Vol.696: K.-S. Choi, J. E. Kim, Quarks and Leptons From Orbifolded Superstring
- Vol.697: E. Beaurepaire, H. Bulou, F. Scheurer, J.-P. Kappler (Eds.), Magnetism: A Synchrotron Radiation Approach
- Vol.698: S. Bellucci (Ed.), Supersymmetric Mechanics – Vol. 1
- Vol.699: J.-P. Rozelot (Ed.), Solar and Heliospheric Origins of Space Weather Phenomena
- Vol.700: J. Al-Khalili, E. Roeckl (Eds.), The Euroschool Lectures on Physics with Exotic Beams, Vol. II
- Vol.701: S. Bellucci, S. Ferrara, A. Marrani, Supersymmetric Mechanics – Vol. 2
- Vol.702: J. Ehlers, C. Lämmerzahl, Special Relativity
- Vol.703: M. Ferrario, G. Ciccotti, K. Binder (Eds.), Computer Simulations in Condensed Matter Systems: From Materials to Chemical Biology Volume 1
- Vol.704: M. Ferrario, G. Ciccotti, K. Binder (Eds.), Computer Simulations in Condensed Matter Systems: From Materials to Chemical Biology Volume 2
- Vol.705: P. Bhattacharyya, B.K. Chakrabarti (Eds.), Modelling Critical and Catastrophic Phenomena in Geoscience
- Vol.706: M.A.L. Marques, C.A. Ullrich, F. Nogueira, A. Rubio, K. Burke, E.K.U. Gross (Eds.), Time-Dependent Density Functional Theory
- Vol.707: A.V. Shchepetilov, Calculus and Mechanics on Two-Point Homogenous Riemannian Spaces
- Vol.708: F. Iachello, Lie Algebras and Applications
- Vol.709: H.-J. Borchers and R.N. Sen, Mathematical Implications of Einstein-Weyl Causality
- Vol.710: K. Hutter, A.A.F. van de Ven, A. Ursescu, Electromagnetic Field Matter Interactions in Thermoelastic Solids and Viscous Fluids
- Vol.711: H. Linke, A. Månsson (Eds.), Controlled Nanoscale Motion