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Aspects of Physical Biology

Biological Water, Protein Solutions,
Transport and Replication

 Springer

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Preface

The application to Biology of the methodologies developed in Physics is attracting an increasing interest in the scientific community. The physics approach to the study of biological problems has created the new interdisciplinary field of Physical Biology. The aim of this field is to reach a better understanding of the biological mechanisms at the molecular and cellular levels. Statistical Mechanics plays an important role in the development of this new field.

For this reason, we selected as topic and title for the XX Sitges Conference on Statistical Physics “Physical Biology: from Molecular Interactions to Cellular Behavior.” As is by now tradition for the Sitges conferences, a number of lectures were subsequently selected, expanded and an updated for publication in the series “Lecture Notes in Physics” to provide both an introduction and an overview to a number of subjects of broader interest and to favor the interchange and cross-fertilization of ideas between biologists and physicists. This volume focuses on three main subtopics: biological water, protein solutions, and transport and replication, presenting for each of them the ongoing debates on the recent results. The role of water in biological processes, the mechanisms of protein folding, the phases and cooperative effects in biological solutions, and the thermodynamic description of replication, transport and neural activity are all subjects that in this volume are revised, based on new experiments and new theoretical interpretations.

The conference itself was held in Sitges (Barcelona, Spain) on 5–9 June, 2006, and was sponsored by several institutions that provided financial support: European Physical Society, Ministerio de Educación y Ciencia of the Spanish Government, Departament d’Universitats, Recerca i Societat de la Informació of the Generalitat de Catalunya, Universitat de Barcelona and the Centre Especial de Recerca (CER) Física de Sistemes Complexos. As in former editions of the conference, the city of Sitges allowed us to use the beautiful Palau Maricel as the lecture hall. We are also very grateful to M. Naspreda, whose contribution as member of the Local Organizing Committee was essential, and to M.-C. Miguel, D. Reguera and J. M. Vilar for their helpful suggestions. Last but not least, we would like to thank all the speakers and participants of the conference, for the high scientific quality of their contributions and for the pleasant atmosphere that they created, and in particular those

colleagues who agreed to the effort of providing tutorial accounts of their lectures that make up this exciting volume.

Barcelona,
December 2007

Giancarlo Franzese
Miguel Rubi

Contents

Part I Biological Water

Dynamics of Water at Low Temperatures and Implications for Biomolecules	3
P. Kumar, G. Franzese, S.V. Buldyrev and H.E. Stanley	
1 Introduction	4
2 Bulk Water	9
3 Hydrated Biomolecules	11
4 Other Evidences of Changes at the Widom Line	13
5 Relation Between Thermodynamics and Dynamics	14
6 Conclusions	19
References	20
Anomalous Behaviour of Supercooled Water and Its Implication for Protein Dynamics	23
J. Swenson, H. Jansson and R. Bergman	
1 Introduction	23
2 Apparent Fragile to Strong Transitions of Confined Supercooled Water	28
3 Relation Between Solvent and Protein Dynamics	32
4 Conclusions	38
References	39
Interactions of Polarizable Media in Water and the Hydrophobic Interaction	43
F. Bresme and A. Wynveen	
1 Introduction	43
2 The Origin of Strong Attraction Between Hydrophobic Surfaces ..	46
3 Computer Simulation Treatment of Polarizable Hydrophobic Solutes	51
4 The Influence of Solute Polarizability on the Hydrophobic Interaction	56

5	Outlook	59
	References	61

Part II Protein and Biological Solutions

Metastable Mesoscopic Phases in Concentrated Protein Solutions 65

P.G. Vekilov, W. Pan, O. Gliko, P. Katsonis and O. Galkin

1	Macroscopic and Mesoscopic Phases	66
2	Methods of Detection and Monitoring of Metastable Clusters	69
3	Intermolecular Interactions in Solutions of Lumazine Synthase and Hemoglobin	74
4	Lack of Liquid–Liquid Phase Separation in Solutions of Lumazine Synthase and Hemoglobin	75
5	Dense Liquid Clusters in Solutions of Lumazine Synthase and Hemoglobin	76
6	Monte Carlo Simulations of Formation and Decay of Clusters	87
7	Summary and Perspectives for Future Work	90
	References	91

Application of Discrete Molecular Dynamics to Protein Folding and Aggregation 97

S.V. Buldyrev

1	Introduction	97
2	Discrete Molecular Dynamics	98
3	Protein Folding	102
4	The One-Bead Go Model	102
5	Transition States of Realistic Proteins	107
6	The Two-Bead Go Model	110
7	The Two-Bead Model with Hydrogen Bonds: Studies of Protein Aggregation	112
8	The Four-Bead Model: Studies of the α -Helix-to- β -Hairpin Transition	114
9	Simulations of Amino Acid–Specific Interactions	120
	References	128

Cooperative Effects in Biological Suspensions: From Filaments to Propellers 133

I. Pagonabarraga and I. Llopis

1	Introduction	133
2	Semiflexible Filaments	135
3	Modeling Inextensible Semiflexible Filaments	135
4	Semiflexible Filaments Under External Forcing	138
5	Self-Propelling Particles	141
6	Short-Time Dynamics	143
7	Long-Time Dynamics	145
8	Conclusions	150
	References	151

Part III Transport and Replication

A Thermodynamic Description of Active Transport 155

S. Kjelstrup, J.M. Rubi and D. Bedeaux

1	Introduction	155
2	Energy Conversion in the Ca-ATPase	156
3	Towards a Thermodynamic Transport Theory	160
4	Mesoscopic Non-equilibrium Thermodynamics	163
5	Experimental Determination of Transport Coefficients	170
6	Conclusion	173
	References	173

Energy Interconversion in Transport ATPases 175

L. de Meis

1	Introduction	175
2	Concepts in Energy Transduction	177
3	Phosphate Compounds of High and Low Energy	177
4	Experimental Measurements	179
5	Energy Transduction by Enzymes: Conversion of Phosphate Bonds from High into Low Energy at the Catalytic Site of Enzymes	181
6	Energy Transduction and Heat Production in Transport ATPases . .	184
	References	185

A Novel Mechanism for Activator-Controlled Initiation of DNA

Replication that Resolves the Auto-regulation Sequestration Paradox . . . 189

K. Nilsson and M. Ehrenberg

1	Introduction	190
2	Analysis	198
3	Conclusions	210
	References	212

Activity-Dependent Model for Neuronal Avalanches 215

L. de Arcangelis

1	Introduction	215
2	Neurons, Synapses, and Hebbian Plasticity	217
3	Neural Avalanches and Networks: Experimental Results	219
4	The Model	220
5	Pruning and Neuronal Avalanches	222
6	Power Spectra	225
7	Conclusions	228
	References	229

Index 231

Index

- 1/ f noise, 227
- Φ values, 110
- β -amyloid, 114, 120, 121
- β -relaxation, 24

- action potential, 217, 218, 220, 221
- activation energy, 20
- activation energy, 7, 8, 10, 17, 18
- active transport, 156, 167
 - available energy, 157
 - work done, 157
- aggregate, 146–150
- alignment, 145, 150
- Alzheimer disease, 114, 121, 122
- Alzheimer's disease, 97, 113, 121
- amyloidogenesis, 119
- Arrhenius, 24
- Arrhenius behavior, 7–10, 12, 13, 17, 19
- atomic force microscopy, 48
- available work, 159

- ballistic, 145, 146, 148
- barnase, 104, 111, 112
- bead-on-a-string model, 102
- Berendsen barostat, 128
- Berendsen method, 126
- binary tree, 124
- biofilament, 135, 138, 151
- biological channels, 47
- biological relevance of water, 3
- biological water, 26
- bulk water, 6
- bulk water, 5
- bulk water, 6, 8, 9, 14, 17, 19

- Ca-ATPase, 156
- cavitation, 46

- chemical driving force, 166
- chemical reactions, 100
- cold denaturation, 101
- computer simulations, 51
- confined geometry, 26
- confined water, 6–9, 17–19, 29
- contact angle, 56
- cooperativity, 133, 135, 141, 143, 145, 150, 151
- coupling at the surface, 162
- Curie principle, 162

- dewetting, 110
- dielectric boundaries, 52
- dielectric spectroscopy, 28
- diffusion, 139, 145, 146, 148
- discontinuous molecular dynamics, 98
- driving force
 - chemical, 166, 170
 - osmotic, 166, 170
 - thermal, 166, 170
- drying, 46
- dynamic crossover, 8, 19
- dynamic crossover, 3, 4, 6–14, 16–18, 20

- EEG, 216, 224–226, 228, 229
- electrostatic potential, 52
- energy landscape, 27
- entropy production, 159
 - generalised friction, 159
 - in surface, 164
 - of a chemical reaction, 159
 - of active transport, 164
 - of the ATP hydrolysis, 159
 - ohmic heat, 159
- event-driven molecular dynamics, 98
- excess variables, 162

- excitatory, 219, 222, 223, 225, 227
 fibrils, 98, 112, 114, 119, 120
 flocking, 147, 148, 150, 151
 folding, 108
 folding nucleus, 104, 108
 folding pathway, 111, 112
 folding pathways, 107, 109, 111
 fragile, 25
 fragile-to-strong transition, 26, 28
 fragility, 25
 glass, 100, 101, 103, 119
 glass formers, 25
 Go model, 103, 107, 111
 heat capacity, 44
 heat production
 measurement, 165
 Hebb, 219, 229
 heteropolymer, 100, 102, 103
 heteropolymers, 102
 high-density liquid, 20
 Hill diagrams, 161
 homopolymer, 103
 Huntington disease, 114
 Huntington's disease, 113, 121
 hydration water, 13
 hydration shell, 27
 hydration water, 3, 6, 11–13, 19, 20
 hydrodynamic interactions (HI), 133, 135–141, 143–151
 hydrogen bond, 6, 15, 16, 20, 45
 hydrophobic interaction, 43
 hydrophobic surface, 46
 image charges, 52
 inextensible filament, 133, 135, 136, 151
 inhibitory, 219, 225, 227, 228
 interfacial water, 29
 Jagla model, 99
 Jagla solvent, 110
 lattice-boltzmann (LB), 141
 leakage, 227
 level flow, 167
 Leventhal paradox, 102, 104
 liquid–liquid critical point, 6
 liquid–liquid phase transitions, 99
 liquid-liquid critical point, 3, 5, 8–10, 16, 20
 local equilibrium, 163
 lost work, 159
 low density states, 57
 low-density liquid, 20
 Mad Cow disease, 97
 maximal valence model, 100
 maximum im response functions, 7
 maximum in response functions, 3, 10
 mean square displacement, 145, 146
 mobility, 138, 139
 molecular pump, 156
 slip, 156, 158, 168
 stoichiometric, 158
 molten globule, 105, 109, 119
 motility, 133, 142, 143
 myoglobin, 33
 nanobubbles, 46
 native state, 97, 102
 natural selection, 102
 nematic, 149, 150
 network, 215–217, 219–221, 223, 224, 226–228
 neuron, 215, 217–222, 229
 neuronal avalanches, 216, 219, 222
 neurotransmitter, 216, 219
 neutron reflectivity, 48
 No man's land, 26
 non-Arrhenius behavior, 7–10, 13, 16–19
 non-equilibrium thermodynamics
 classical, 156
 mesoscopic, 156
 non-linear flux-force relations, 156, 161
 Nuclear magnetic resonance, 44
 Onsager relations
 mesoscopic level, 166
 organism, 133, 134, 142, 146, 148, 151
 osmotic driving force, 166
 P-fold analysis, 108, 110, 112
 pair distribution function, 148
 persistence length, 135
 physical gels, 100
 Picasso, 102
 plasticity, 216, 217, 219–223, 228
 polarizability, 50
 polarizable solutes, 51
 polyalanine, 114, 117, 119, 120
 polyglutamine, 114, 119, 121
 polymer collapse, 99
 potential energy landscape, 102
 power spectra, 216, 225, 226
 PRIME model, 101, 115
 prion diseases, 97, 113
 propulsion, 134, 142, 143, 149

- propylene glycol, 28
- protein glass transition, 20
- protein aggregation, 97
- protein dynamics, 6
- Protein folding, 97
- protein folding, 44
- protein glass transition, 6
- protein glass transition, 3, 4, 13
- protein water interactions, 49
- pruning, 221, 223, 224, 228

- QENS, 28
- quasielastic neutron scattering, 28

- Ramachandran angles, 116, 117
- reaction kinetics, 161
 - the degree of reaction, 161
- refractory period, 218, 220, 221
- Reynolds number, 134, 135, 146, 149

- sedimentation, 137–141, 143
- self-propelling, 133, 135, 141–144, 146, 147, 149
- semiflexible filament, 133, 135, 136, 138, 140, 151
- SH3 domain, 104, 107, 109–111, 113
- singularity-free scenario, 5, 6, 16
- small world, 224, 226, 228
- SOC, 216, 220, 228
- specific heat, 9
- specific heat, 3, 5, 7, 10, 12
- spontaneous activity, 220, 221, 225
- staphylococcal protein A, 104
- static head, 167
- stochastic process, 161, 226

- stoichiometric pump, 167
- stress, 133, 135, 139–141, 146–148
- Sum frequency spectroscopy, 44
- supercooled water, 4, 6, 8, 26, 31
- surface
 - autonomous system, 162
- surface force apparatus, 48
- suspension, 133, 142–151
- symmetry break, 162
- synapses, 216–218, 220–223, 225, 227–229

- thermal driving force, 166
- thermal fluctuations, 58
- thermodynamic anomalies, 101
- thermogenesis, 156, 169
- thermogenesis coefficients, 172
- threshold firing, 220
- transition state ensemble, 108
- transition state ensembles, 107
- trp-cage miniprotein, 107, 120, 121

- Velasquez, 102
- velocity verlet, 137
- virial theorem, 127
- viscosity, 24
- Vogel-Fulcher-Tammann, 24

- water, 44
- water anomalies, 3–6, 8, 9, 20
- water dynamics, 26
- Widom line, 3, 4, 6–9, 12–14, 16, 20
- work, 159

- x-rays, 48