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Christian Caron
Springer Heidelberg
Physics Editorial Department I
Tiergartenstrasse 17
69121 Heidelberg / Germany
christian.caron@springer.com

G. Franzese
M. Rubi (Eds.)

Aspects of Physical Biology

Biological Water, Protein Solutions,
Transport and Replication

Springer

Giancarlo Franzese
Universidad Barcelona
Fac. Fisica
Depto. Fisica Fonamental
Marti i Franquesa, 1
08028 Barcelona
Spain
gfranzese@ub.es

Miguel Rubi
Dept. Fisica Fonamental
Fac. Fisica
Marti i Franquesa, 1
08028 Barcelona
Spain
mrubi@ub.edu

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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

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