

PREFACE

Volume 5 in the series *Advances in Structural Biology* is based upon a selection of articles presented at the Workshop on Molecular Biophysics of the Cytoskeleton: Microtubule Formation, Structure, Function, and Interactions. This workshop took place from August 18–22, 1997 at the Banff Conference Centre in Banff, Alberta, Canada.

The meeting provided a fruitful multidisciplinary forum for discussions on the biophysics of the cytoskeleton. In addition to lectures and communications given by leading molecular and cell biologists, biophysicists, applied mathematicians, experimental physicists, and representatives of other disciplines, there were contributed talks and posters presented by other participants. We believe that our goal of bringing about a substantial level of cross-fertilization to the research activities in this very dynamic and important field of biophysical inquiry has been achieved.

The main objective of the workshop was to review the state-of-the-art of the field and stimulate a multidisciplinary investigation into the molecular biology of the cytoskeleton, which is amply manifested in the articles selected for publication in this volume.

The key research topics discussed at the workshop were as follows:

1. The structure of tubulin and functional differences between tubulin isoforms (Downing, Ludueña).

2. Physical models of microtubule assembly, disassembly, and nucleation; the mechanism of assembly synchronization in ensembles of microtubules (Bayley, Flyvbjerg, Bolterauer, Betts, Grabowski).
3. Interactions of MTs with other molecules such as colchicine (Engelborghs).
4. In vivo restructuring of microtubules and participation in cell functions, for example, pigment transport (Salmon, Wallin, Wolf).
5. The elastic and structural properties of the MTs; the existence of defects (Janosi, Chretien).
6. The functioning of motor proteins. Types of motors (kinesin, dynein, myosin), their properties, and physicochemical models explaining their mechanisms (Mehta, Hodges, Vallee, Wade, Gee, Unger).
7. The involvement of microtubules in mitosis and cell motility; relationship to other structures in the cell (Maniotis, Wolf).
8. Charge and dipole distribution on the surface of an MT. The question of dielectric polarization; potential for ferroelectricity (Sackett, Trpisova, Zioutas).
9. Models of electronic and protonic conduction along microtubule's protofilaments. Related biological manifestations (effects of electric and magnetic fields, photoconduction phenomena) (Insinna, Zioutas).
10. Mathematical models of filamentous networks such as actin (Keshet, Bottino); actin filaments in plant cells (Malec).
11. Experimental techniques involved in studying proteins and their polymers (Patkowski, Chretien, Unger).
12. Information processing in microtubules. Information capacity, cellular automata simulation, MTs, and signaling (Hameroff, Mavromatos, Wyller).

Acknowledgments:

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The local organizing committee was composed of the following individuals:

1. D. Begg, Department of Anatomy and Cell Biology
2. F.C. Khanna, Department of Physics
3. S. Malhotra, Department of Biological Sciences
4. Y. Tam, Department of Pharmacy and Pharmacology
5. J.A. Tuszyński, Department of Physics

and the international organizing committee comprised the following individuals:

1. P. Bayley, NIMR, London, UK
2. D. Chretien, EMBL, Heidelberg, Germany
3. Y. Engelborghs, University of Leuven, Belgium
4. A.C. Scott, DTU Denmark and University of Arizona, USA
5. J.A. Tuszyński, University of Alberta, Canada

We gratefully acknowledge their assistance, advice, and expertise, which were indispensable in making the Workshop possible.

Last but certainly not least, a huge debt of gratitude is hereby acknowledged to our hard-working staff, namely the conference secretary Lee Grimard, the conference accountant Patty Chu, and our student volunteers Andrew Brown and David Sept. Without their selfless dedication to every aspect of organizing this Workshop, we could not have possibly got off the ground. We also wish to thank the Banff Conference Centre and its staff for providing us with such an impressive venue. We wish to thank Monica Malhotra for her valuable assistance with the preparation of this volume.

S.K. Malhotra and J.A. Tuszyński
Editors