

III. Conclusions and Recommendations

The problems in force transduction in biology, even the 'small' problems, are of such complexity that many different techniques and approaches are needed for progress. The challenge is assembling the right set of skills for a particular problem. However, once this is done, considerable progress can be expected. The NSF can play a very significant role in fostering the sort of interdisciplinary research to address these important problems.

The following comments summarize the major conclusions of the Workshop:

- Problems in the field of biological force transduction are not just a set of biochemical issues, but span the molecular to the macroscopic; thus, new engineering tools and models are needed.
- The study of force transduction has significant potential for development of new biomaterials, as mechanisms for force transduction are better understood.
- The mechanical issues in force transduction bear directly on issues inherent in the protein folding problem.
- The relation between the mechanical stress or shear state of a molecule and its functionality is still very poorly understood and represents an important challenge, and a great opportunity.
- The mechanical function of the cytoskeleton remains poorly understood and represents a significant challenge with a large reward once better understood.
- The complexity of the problems involved in force transduction demand extensive interdisciplinary interaction and will require the active collaborations among chemists, biologists, physical scientists and engineers.
- More collaboration between and theory and experiment is needed. Theoretical efforts lag experiment for the most part owing to issues of complexity. This represents a significant opportunity for new research.
- The "materials and mechanical" properties of biomolecules are major determinants in their biological function. This represents a new frontier for research, in which the NSF is ideally poised to make a major contribution.
- Because of the spread in possible impacts of research on biological force transduction, from fundamental science to clinical benefits, major opportunity exists for coordination and cooperation between NSF and NIH in jointly funding research programs.

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