

# Stanford

Department of  
Chemistry

## 2016 McConnell Lectureship

Thursday, April 21st

**Professor Hermann E. Gaub, Ludwig Maximilian University of Munich**  
**“Force and Function: How do Biomolecules do it?”**

4:30pm Braun Lecture Hall  
S.G. Mudd Building



### About the Seminar:

Molecular interactions are the basis of life, and forces play a crucial role in both the assembly and the structural integrity, as well as the dynamics of all living systems. The regulation of biomolecular complexes, the maintenance of cellular structures, and even cell signaling are all controlled by mechanical forces. At the molecular level, the relationships between these forces and their biological functions have become accessible through various single molecule force spectroscopy techniques developed in recent years. A deeper understanding of the physics of these relationships has emerged from the very fruitful combination of the high resolution and precision of such experiments together with the insight in structural rearrangements from all-atom Molecular Dynamics Calculations. In this talk, a general overview on this field will be given, followed by a report on recent discoveries: The activation mechanisms of two prominent intracellular force sensors, Myosin Light Chain Kinase and Titin Kinase were elucidated. The clamp-mechanism of catch bonds between Cohesin and Dockerins in Cellulosome complexes

could be resolved. Novel strategies for parallelization of force-measuring assays will be discussed, and a new chip based strategy will be introduced starting out from genes and providing direct access to the mechanics of the encoded proteins in a single step process. Finally, the use of molecular force balances for the analysis of DNA-protein interactions will be presented.

### About the Speaker:

Hermann Gaub studied physics in Ulm and Munich and completed his Ph.D. in 1984 at the TU Munich with the investigation of scaling concepts in two-dimensional polymers. He then went to Stanford and explored antigen presentation in the immunological synapse. Back in Munich as an associate professor, he pioneered the use of atomic force microscopy for the study of mechanical properties of single molecules. His investigations have had a significant impact on our view of the role of mechanical forces in biology. His lab was the first to measure the interaction forces between individual ligand-receptor systems and to provide a detailed view of their binding potentials and unbinding forces. Having taken over the chair for Applied Physics at the Ludwig Maximilian University in 1995, he invented single molecule force spectroscopy techniques and applied them to the study of biopolymers. His group was the first to explore the unique mechanical properties of single proteins. In addition to these fundamental developments, his lab used the single molecule AFM approach to engineer the first man-made single molecule motor and to pioneer single molecule cut-and-paste technology. Hermann Gaub is co-founder and director of several institutions amongst them the Center for NanoScience Munich. He has received multiple honors such as the Max Planck Award of the Alexander von Humboldt Foundation and the Langmuir Lecture Award of the American Chemical Society. He holds an adjunct professorship at the Jilin University and is a member of several institutions and academies including the German National Academy.

### Contact

If you have questions or need additional information, please contact: [chemistry-events@stanford.edu](mailto:chemistry-events@stanford.edu)