Rac1 and RhoA, the three canonical RhoGTPases involved in cell polarity. We applied our quantitative optogenetic method to the regulation of Cdc42, a spatial resolution of 5
induce subcellular gradients of recruited proteins of any chosen profile up to
of this complex. From these experiments we determined that it is possible to
of Cry2/CIBN complexes at the cell membrane and the disassociation kinetics
patterns of light stimulation and corresponding gradients of induced signaling
dimerization system in order to establish the quantitative relationship between
global polarization is still unclear. Recently developed optogenetic methods
involving signaling networks regulated in space and time at the sub-cellular
level is vital for basic understanding of normal/abnormal biological
processes. Indeed, abnormal changes in the mechanics of biological systems are
often indicators of pathophysiological states. For example, amyloid beta pepdi-
tide (Aβ), a protein present in neural plaques formed in Alzheimer’s disease
and cholesterol are reported to alter cell membrane mechanical properties leading
to abnormal cell morphology. Atomic force microscopy (AFM) provides an
ideal tool to image the structure and examine the mechanics in physiologically
relevant medium. We have created a new cantilevered probe for AFM for the
study of nano-to-microscale mechanics of biological interfaces. We used it to
evaluate the role of Aβ1-42 insertion in DPPC lipid monolayers and its effect on
the viscoelastic properties that underlie altered membrane fluidity. Real-
time analysis of mechanical properties of the model membrane monolayer in
the presence of Aβ1-42 shows a decrease in the viscosity of the monolayers
over time, consistent with increased membrane fluidity. The finding is consist-
tent with changes in membrane permeability due to Aβ1-42 inserted pores.

**Platform: Bioengineering**

**1238-Plat**

**Biomechanical Basis of Alzheimer’s Disease and Other Protein Misfolding Diseases: Designing a New AFM Probe to Study Amyloid-Mediated Membrane Disorders**

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Most important biological interactions with its environment occur at interfaces
such as a lipid cellular membrane. These interactions are often dynamic and
show time-dependent changes in material properties (e.g. viscoelastic proper-
ties). A detailed understanding of biomechanical properties at molecular and
subcellular level is vital for basic understanding of normal/abnormal biological
processes. Indeed, abnormal changes in the mechanics of biological systems are
often indicators of pathophysiological states. For example, amyloid beta peptide
(Aβ), a protein present in neural plaques formed in Alzheimer’s disease
and cholesterol are reported to alter cell membrane mechanical properties leading
to abnormal cell morphology. Atomic force microscopy (AFM) provides an
ideal tool to image the structure and examine the mechanics in physiologically
relevant medium. We have created a new cantilevered probe for AFM for the
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time analysis of mechanical properties of the model membrane monolayer in
the presence of Aβ1-42 shows a decrease in the viscosity of the monolayers
over time, consistent with increased membrane fluidity. The finding is consist-
tent with changes in membrane permeability due to Aβ1-42 inserted pores.

**1239-Plat**

**Light-Powered Bioanoelectronic Devices with Biologically-Tunable Performance Characteristics**

Ramya Tunuguntla, Kyunghoon Kim, Mangesh Bangar, Caroline Ajio-
Franklin, Pieter Stroeve, Aleksandr Noy.

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UC Berkeley, Berkeley, CA, USA, 3Lawrence Berkeley National Laboratory,
Berkeley, CA, USA, 4Chemical Engineering, UC Davis, Davis, CA, USA,
5Lawrence Livermore National Laboratory, Livermore, CA, USA.

Bacteriorhodopsin (bR) is a well-characterized photoactivated proton pump
coupled to transmembrane proton gradient generation. Atomic force microscopy (AFM) provides an
ideal tool to image the structure and examine the mechanics in physiologically
relevant medium. We have created a new cantilevered probe for AFM for the
study of nano-to-microscale mechanics of biological interfaces. We used it to
evaluate the role of Aβ1-42 insertion in DPPC lipid monolayers and its effect on
the viscoelastic properties that underlie altered membrane fluidity. Real-
time analysis of mechanical properties of the model membrane monolayer in
the presence of Aβ1-42 shows a decrease in the viscosity of the monolayers
over time, consistent with increased membrane fluidity. The finding is consist-
tent with changes in membrane permeability due to Aβ1-42 inserted pores.

**1240-Plat**

**Light Driven Conformational Switching: An Approach to Creating Designed Protein Motion**

Elizabeth Bromley, Lara Small, Asahi Cano-Marques, Dek Woolfson,
Paul Curmi, Martin Zuckermann, Nancy Forde, Gerhard Blab, Heiner Linke.

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Biomolecular motors have inspired the design and construction of artificial
nanoscale motors and machines based on nucleic acids, small molecules, and
inorganic nanostructures. However, the high degree of sophistication and
efficiency of biomolecular motors derives from the complexity afforded by
protein building blocks. Here, we discuss a novel bottom-up approach to under-
standing biological motors and present a class of designs for synthetic protein
motors that move along a linear DNA track.