NANOHOUR

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3:00 PM
Beckman Institute - Room 3269

Nanoscale fluctuations of live cell membranes quantified by optical interferometry

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Phase contrast (PC) and differential interference contrast (DIC) microscopy have been used extensively to infer morphometric features of live cells without the need for exogenous contrast agents. These techniques transfer the information encoded in the *phase* of the imaging field into the irradiance distribution of the final image. However, both PC and DIC are *qualitative* in terms of optical path-length measurement. *Quantifying* the optical phase shifts associated with cells gives access to information about morphology and dynamics at the *nanometer scale*.

Recently, the development of *quantitative phase imaging* techniques has received increased scientific interest. We have developed new approaches to quantitative phase imaging which allow measuring the structure and dynamics of live cells with nanometer spatial sensitivity over time scales ranging from milliseconds to days. We used these methods to investigate dynamic phenomena in live cells, e.g. cell growth, cell motility and cell membrane dynamics.

Using red blood cells (RBCs) as models, we extracted spatial and temporal information about their nanoscale thermal fluctuations. These motions provide a window into the viscoelastic properties of the membrane and the interaction between the lipid bilayer and the cytoskeleton (spectrin) network. The ability to monitor mechanical properties of RBCs is of vital interest in monitoring disease progression or response to treatment as molecular and pharmaceutical approaches for treatment of diseases such as Sickle cell disease and malaria. In addition to its clinical relevance, understanding dynamic properties of RBCs is of interest to membrane biology and basic studies of cellular dynamics.

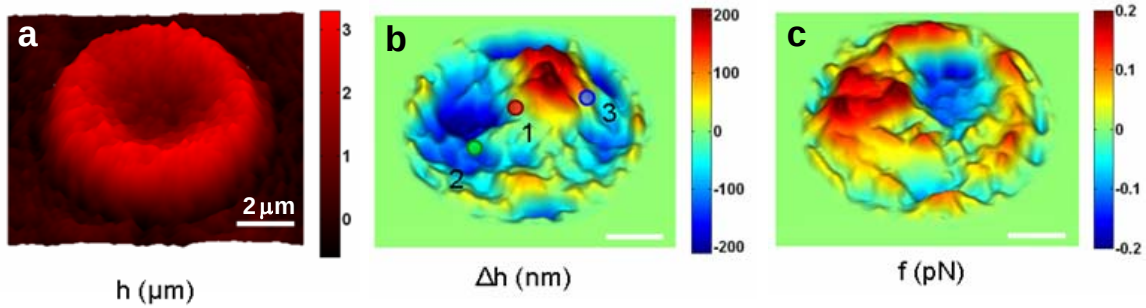

Figure *a) RBC topography measured by quantitative phase imaging; b) instantaneous membrane displacement map; c) instantaneous restoring force*

Coffee and cookies will be served.

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