

the related 655nm QDs, conjugated using streptavidin to anti-insulin receptor antibody, are easily visualized bound to 2H3 cell insulin receptors (IR). Blinking of spots demonstrates imaging of individual QDs. We excite fluorescence from cell-bound QDs with non-polarized illumination and record orthogonally-polarized fluorescence images using an image splitter and an EMCCD camera. Image pairs are separated and one polarization is corrected for the optical path g-factor and for displacement, rotation and dilation relative to the other polarization. Time-dependent fluorescence from regions containing individual QDs in image pairs are extracted and the time-autocorrelation function for polarization fluctuations calculated either from actual polarization or from a combination of auto- and cross-correlations of polarized fluorescence intensities. Individual 655 nm QDs exhibit peak polarization fluctuations with an RMS amplitude of  $\sim 0.06$ . These fluctuations decay over 30-50 ms. Whether this slow decay represents hindered rotation of individual IR or results from crosslinking of multiple receptors by single QDs remains to be determined. Current work involves exploration of more highly-asymmetric QDs, use of faster detection methods and examination of the 2H3 cell Type I Fc $\epsilon$  receptor where rotational dynamics on faster timescales have previously been explored in detail. Supported by NIH grant RR023156 and NSF grant CHE-0628260.

## Molecular Mechanics & Force Spectroscopy I

### 3065-Pos

#### Identification of Infrared Spectrum from Human Bio-Energetic Campus Aurelian Udristoiu.

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The impact of living matter with unionized radiations is a theme of frequent researches for treatments in complementary medicine.

In presenting work we make the measurements of bio-energetic field applied to experimental fluids and we have given the explanations of the bio-energetic effect by quantum theory.

The technology of measurement was based on electro-mechanic principle, using a Laboratory pH Meter WPA-CD 7400, converting mV in units of intensity of bio-magnetic fields.

In bases of quantum theory ( $E = \nu h$ ) was calculated the Intensity of levels bio-energy, in mean value of 0.04 m eV, which correspond to  $10^2$  f T of bio-magnetic field, the Frequency of bio-magnetic wave, in value of  $0.9 \times 10^{12}$  Hz, the Bio-energetic wavelength =  $2.5 \times 10^{-3}$  mm and corpuscular mass of bio-magnetic waves in value of  $\sim 2 \times 10^{-32}$  Kg or 1/10 from electron mass, (M) when " $m$ " =  $2/Ec^2$ , in conformity with the parameter of mathematical counting or to prolong span of life cells.

Bio-energetic fluids can be used in technology of preparation of drugs, from homeopath medicine and in laboratory medicine for the changes of pH in liquid medium with cultivated stem cells for to prolong the span life of cells.

SPECIFICATIONS - pH Meter

Range	pH	0.00 to 14.00	0.00 to 14.00
	mV	0 to 1999	-
	°C	-50 to +50	-
Resolution		0.01pH mV/0.1C	0.01 pH
Accuracy (electrical)	at 25°C	±0.01pH mV/0.1C	±0.01 pH
Input resistance		>10 <sup>12</sup> $\Omega$	>10 <sup>12</sup> $\Omega$
Auto Buffer Recognition		4.00, 7.00, 10.00 pH	-
Temperature Probe		TFA 100 platinum Resistance, User Correction up to 35.0C	-

Table 1

### 3066-Pos

#### Solvent Effect on the Unfolding Force of a Single Hydrophobic Polymer Isaac T.S. Li<sup>1</sup>, Matthew Paige<sup>2</sup>, Gilbert C. Walker<sup>1</sup>.

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The hydrophobic collapse of a homopolymer is a much simplified model for studying the hydrophobic collapse of a protein. It is widely believed and theorized that the driving force for the hydrophobic collapse is the interfacial free energy between the polymer and the solvent. Therefore, changes in interfacial free energy should be directly proportional to the force to unfold the polymer in bad solvents. To test this hypothesis, we used single molecule force spectroscopy to unfold a single polystyrene chain in water-ethanol mixtures. Different percentage of binary mixture is used to create solvents with different interfacial energy with polystyrene. However, we do not see a linear correlation between the interfacial tensions with the unfolding forces. This is an indication that macroscopic properties such as the interfacial free energy cannot be directly applied to study certain systems in microscopic scale. In this study we also hypothesized a mechanism for the cause of this inconsistency.

### 3067-Pos

#### Active Stochastic Microrheology using Optical Tweezers

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Cells are dynamic structures capable of generating and reacting to physical cues in their environment. Measuring mechanical properties is thus essential for elucidating cell or other material structure-function in particular during dynamic rearrangement of the cytoskeleton. Although a variety of rheological techniques have been developed using video microscopy, AFM, and magnetic traps, the measurable frequency range is limited by the time to obtain the measurement, and forcing conditions such as amplitude, direction, contact geometry, and probe location. Here, we developed active stochastic microrheology using optical tweezers to enhance the temporal resolution and precision of detection. A stochastic force is generated by moving the trap relative to the sample. Both bead displacement and trap position are monitored simultaneously by separate position sensitive devices. With this method, both storage and loss shear moduli of the extracellular matrices can be extracted over a wide frequency range of  $10^{-2} - 10^3$  Hz within a few minutes. Also, this method was used to probe the local mechanical environment of B-cell receptor using antigen specific interaction. We showed that the local mechanical properties are strengthened in response to antigen binding and repeated external excitation in a physiological range of 1–100pN. The mechanical responses can also be measured with respect to direction such as force applied normal and perpendicular to the cell membrane. This technique is useful in characterizing the mechanical properties at a user-defined location and magnitude, over a wide frequency spectrum, in a short time, and with a small deformation  $< 100$ nm. With these advantages, the method can also be applied to other cell processes, studies of complex fluids, fibril growth, and polymer solutions. Support from the NIGMS (GM-076689), an NSF Career Award (0643745), and the Singapore-MIT Alliance for Research and Technology (SMART-BioSyM) are gratefully acknowledged.

### 3068-Pos

#### A Single Molecule Force Spectroscopy Study of the Binding Interaction Between Insulin and G-Quadruplex DNA

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The formation of guanine (G)-quadruplex in the guanine-rich tandem repeats of the insulin-linked polymorphic region (ILPR) is linked to transcriptional effects on the insulin gene. Recent studies demonstrate that these G-quadruplexes can bind insulin, and while this may impact the transcription of insulin, little is known about the binding mechanism. A single molecule force spectroscopy study was performed to examine the selective binding of insulin to the ILPR G-quadruplex DNA. In this study, the insulin was covalently attached to a flat gold surface while the quadruplex DNA was attached to an AFM probe. The rupture force between insulin and quadruplex DNA was measured at various force loading rates. To confirm the specificity of the binding, control studies were performed by blocking the tethered G-quadruplex with "free insulin" in solution. Additional control studies were performed with a shorter DNA sequence incapable of forming a G-quadruplex on the AFM tip and a scrambled DNA sequence of the ILPR sequence. Results from the dynamic force-pulling studies are described based on the Bell-Evans and Dudko-Hummer models.

### 3069-Pos

#### A Single Molecule Study of Guanine Quadruplex DNA

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We present an atomic force microscopy (AFM) based single molecule force spectroscopy study of guanine (G) DNA quadruplexes. A bimolecular G-quadruplex was formed between a pair of single-stranded DNA molecules, each with two G-rich domains, that were immobilized on an atomic force microscope probe and an ultra-flat gold surface. G-quadruplex stability was examined as a function of the potassium ion concentration and loading rate (dynamic force spectroscopy). Kinetic and thermodynamic parameters for these single molecule G-quadruplexes were estimated with theoretical models, and the effect of the number of guanines in each G-rich domain was assessed. This study demonstrates that AFM-based single molecule force spectroscopy is a powerful tool for characterizing the structure, kinetics, mechanical and thermodynamic properties of G-quadruplexes.

### 3070-Pos

#### Mechanics of Lipid Bilayers of High Curvature

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Lysosomes, enveloped viruses, synaptic and secretory vesicles are all examples of natural nano-containers (diameter  $\sim 100$  nm) which specifically rely on their