

Abstract for an Invited Paper  
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**Using optical forces to probe mechanical response from single molecules to biomaterials**

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In the past decade, the ability to manipulate and measure forces exerted by single biological molecules has transformed our understanding of their mechanical response, stability, and the mechanisms by which they operate. One of the essential tools in this revolution has been optical tweezers, which use a focused laser beam to “trap” (hold stably in three dimensions) micrometer-sized refractive particles. In this talk, I will briefly describe how optical tweezers work and how they can be used to manipulate and probe the mechanical response of single DNA and protein molecules. I will then describe the technique of holographic optical tweezers, which modify the phase of a laser beam in order to generate multiple optical traps at specified locations in three dimensions within a sample. I will discuss our work towards applying this technique to mechanical studies of protein-based biomaterials on the microscale.