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Constructing Dual Beam Optical Tweezers for Undergraduate Biophysics Research BRIAN DAUDELIN, DEVON WEST-COATES, JON DEL'ETOILE, ERIC GROTZKE, THAYAPARAN PARAMANATHAN, Bridgewater State University, MA — Optical tweezing, or trapping, is a modern physics technique which allows us to use the radiation pressure from laser beams to trap micron sized particles. Optical tweezers are commonly used in graduate level biophysics research but seldom used at the undergraduate level. Our goal is to construct a dual beam optical tweezers for future undergraduate biophysical research. Dual beam optical tweezers use two counter propagating laser beams to provide a stronger trap. In this study we discuss how the assembly of the dual beam optical tweezers is done through three main phases. The first phase was to construct a custom compressed air system to isolate the optical table from the vibrations from its surroundings so that we can measure pico-newton scale forces that are observed in biological systems. In addition, the biomaterial flow system was designed with a flow cell to trap biomolecules by combining several undergraduate semester projects. During the second phase we set up the optics to image and display the inside of the flow cell. Currently we are in the process of aligning the laser to create an effective trap and developing the software to control the data collection. This optical tweezers set up will enable us to study potential cancer drug interactions with DNA at the single molecule level and will be a powerful tool in promoting interdisciplinary research at the undergraduate level.

Brian Daudelin
Bridgewater State University, MA

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