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Single molecule measurements and biological motors

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Abstract Recent technological advances in lasers and optical detectors have enabled a variety of new, single molecule technologies to be developed. Using intense and highly collimated laser light sources in addition to super-sensitive cameras, the fluorescence of single fluorophores can now be imaged in aqueous solution. Also, laser optical tweezers have enabled the piconewton forces produced by pair of interacting biomolecules to be measured directly. However, for a researcher new to the field to begin to use such techniques in their own research might seem a daunting prospect. Most of the equipment that is in use is custom-built. However, most of the equipment is essence fairly simple and the aim of this article is to provide an entry point to the field for a newcomer. It focuses mainly on those practical aspects which are not particularly well covered in the literature, and aims to provide an overview of the field as a whole with references and web links to more detailed sources elsewhere. Indeed, the opportunity to publish an article such as this on the Internet affords many new opportunities (and more space!) for presenting scientific ideas and information. For example, we have illustrated the nature of optical trap data with an interactive Java simulation; provided links to relevant web sites and technical documents, and included a large number of colour figures and plots. Our group's research focuses on molecular motors, and the bias of this article reflects this. It turns out that molecular motors have been a paradigm (or prototype) for single molecule research and the field has seen a rapid development in the techniques. It is hoped that the methods described here will be broadly applicable to other biological systems.

Keywords Optical tweezers · Acto-myosin · Single molecules · Fluorescence · TIRF

This is an interactive contribution, which can be accessed at: http://www2.bioch.ox.ac.uk/~oubsu/ebjknight/

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