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## 33 - Optical feedback tweezers

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We combine optical tweezers with feedback to impose arbitrary potentials on a colloidal particle. The feedback trap detects a particle's position, calculates a force based on an imposed \virtual potential," and shifts the trap center to generate the desired force. We create virtual harmonic and double-well potentials to manipulate particles. The harmonic potentials can be chosen to be either weaker or stiffer than the underlying optical trap. We show that we can create a virtual double-well potential with fixed well separation and adjustable barrier height. These are accomplished at length scales down to 11 nm, a feat that is difficult or impossible to create with standard optical-tweezer techniques such as time sharing, dual beams, or spatial light modulators.

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