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Optical conveyors: Active tractor beams for colloids, emulsions and aerosols DAVID RUFFNER, DAVID GRIER, New York University — A tractor beam is a travelling wave that transports material back to its source. We experimentally demonstrate such a beam by coherently superposing coaxial Bessel beams. These optical conveyors have periodic intensity variations along their axes that act as highly effective optical traps for micrometer-scale objects. Varying the Bessel beams' relative phase shifts the traps axially and thereby selectively transports trapped objects either downstream or upstream along the length of the beam. The same methods used to project a single optical conveyor can project arrays of independent optical conveyors, allowing bidirectional motion. This opens up new possibilities for three dimensional transport of colloids, emulsion droplets and aerosol particles with sub-micrometer resolution over ranges extending to 50 micrometers and potentially beyond.

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