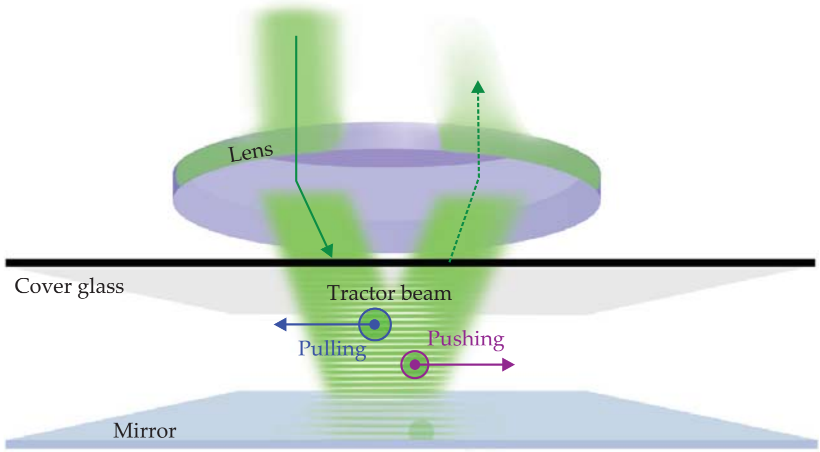

A laser beam (green) reflected from the mirrored bottom of an aqueous cell interferes with itself and forms interference fringes (white). If the angle between incident and reflected beams is sufficiently wide, nearly antiparallel, those fringes can produce enough forward scattering (to the right) that microscopic particles start to recoil to the left, against the momentum direction of the light field. Because the scattering is sensitive to particle size and beam polarization, it's possible to create conditions whereby differently sized particles move in opposite directions. (Adapted from ref. 4.)

spheres of 800-nm and 1000-nm diameters were sorted in a light beam within two seconds of the researchers' switching the beam's polarization to the perpendicular orientation—one size pulled and the other pushed along the fringes.

Optical sorting isn't the only possible result. Light scattering can also mediate particle interactions. The light scattered by one particle interferes with the light scattered by another and prompts either repulsion or attraction between them. An assembly of like particles may thus migrate to antinodes in the interference pattern and, although relatively far apart, become self-organized, or optically bound to each other in the light field.

Although the new scheme exerts tractor-beam-like forces, don't expect it to reel in moon dust, let alone spacecraft. Indeed, mesoscopic particles can only be pulled over a distance—to date, about 30 μm—equal to the width of the enveloping beam. That width, however, is limited only by the available laser power.

Zemánek imagines that the group's method will prove useful in compact lab-on-a-chip settings. New York University's David Grier speculates that the range of applications may turn out to be wide. "Tractor beams, optical sorting, and optical binding are now all their own distinct subfields. The new scheme unites them in a single experiment—it's a potpourri of classical optical manipulation techniques."

Mark Wilson

References

1. P. L. Marston, *J. Acoust. Soc. Am.* **120**, 3518 (2006).
2. J. Chen et al., *Nat. Photonics* **5**, 531 (2011); L. Zhang, P. L. Marston, *Phys. Rev. E* **84**, 035601 (2011).
3. For a review of optically induced pulling forces, see A. Dogariu, S. Sukhov, J. Sáenz, *Nat. Photonics* **7**, 24 (2013).
4. O. Brzobohatý et al., *Nat. Photonics* **7**, 123 (2013).

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fornia, Berkeley, has used radionuclide dating with argon isotopes to establish that to within the 30 000-year uncertainty of the measurement, the two events occurred simultaneously, 66.04 million years ago. To date the meteor strike, Renne and company analyzed numerous tektites, glassy droplets created by the meteor's energetic impact. To determine the time of the extinction, the group studied clays obtained from coal-bed strata such as the ones in Montana shown in the figure; the strata were at or near the level where clues such as pollen changes indicate a shift from the dinosaurs' Cretaceous period to the following Paleogene period. The million years before the mass extinction saw numerous episodes of significant global cooling. The associated stress, suggest the researchers, may have made Earth's ecosystem particularly susceptible to the environmental havoc wrought by the meteor's devastating strike. (P. Renne et al., *Science* **339**, 684, 2013.) —SKB

Cellular rain gauges. Knowing where and how hard rain is falling is important not only for deciding whether to take an umbrella, but also for managing water resources, improving precipitation models, anticipating floods, and assessing climate. Yet many parts of the globe lack good data, whether from weather radar or from rain gauges. (Gauge prevalence is less than half what it was a decade or two ago.) Meanwhile, the world is being increasingly covered by cellular communications networks, and radio signals broadcast between cell towers have been proposed as a new means of monitoring rainfall: At common communications frequencies (roughly 7–40 GHz), the attenuation of signals transmitted from one cell tower to another is mainly due to absorption and scattering by raindrops along the path. Such attenuation data are typically gathered by cellular companies every 15 minutes or so to monitor the stability of their networks. Armed with attenuation data from a Dutch telecom for 2400 network links, Aart Overeem, Hidde Leijnse, and Remko Uijlenhoet at Wageningen University and the Royal Netherlands Meteorological Institute have now dynamically mapped rainfall over all the Netherlands. For each link, the researchers extracted the spatially averaged rainfall intensity during each 15-minute interval, compensating in real time for such systematic issues as water films on the cell-tower antennas. The intensities correlate well with radar imaging and can identify and track individual storms. (A. Overeem, H. Leijnse, R. Uijlenhoet, *Proc. Natl. Acad. Sci. USA* **110**, 2741, 2013.) —RJF ■