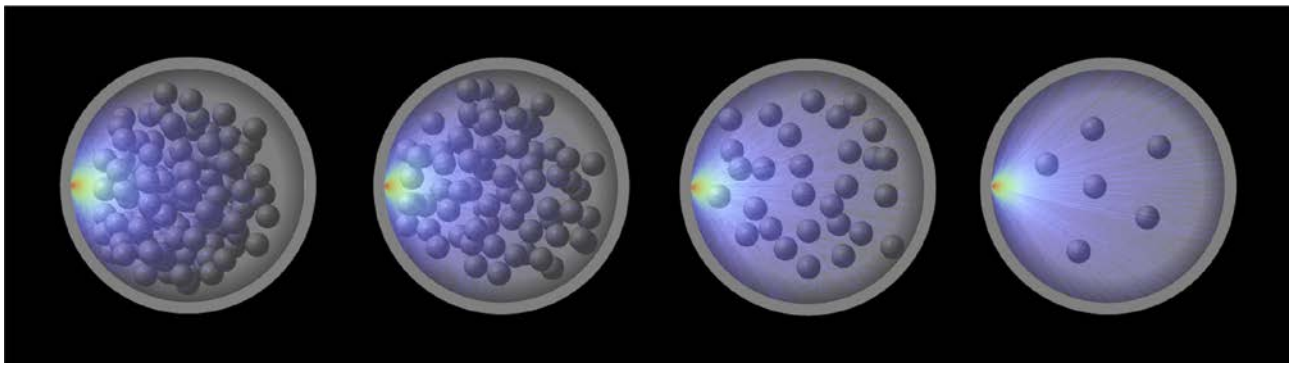
# Scattered light, it is all the same

Savo, R.; Pierrat, R.; Najar, U.; Carminati, R.; Rotter, S.; Gigan, S. Observation of Mean Path Length Invariance in Light-Scattering Media. *Science,* **2017**, *358*, 765–768.

Materials can vary from transparent to opaque depending on the density of scatters within the medium. As light propagates through a material, intuition might suggest that the more scatters there are, the longer the path along which the light can propagate. However, a recent theory predicts that this is not the case and that exciting a medium homogeneously and isotropically makes some of its optical properties depend only on the medium's outer geometry.

With their experiment, Romolo Savo *et al.,* confirm this surprising prediction and uncover a new physical invariant. They shone light through a series of samples of varying scatterer density and found that the average path length that the light traveled was independent of the sample microstructure. They developed a reverse version of diffusing-wave-spectroscopy and measure the mean value of the optical path length through the temporal decorrelation of the optical speckle pattern.

Their results provide rigid bounds for the path length enhancement in multiple scattering media and could help to optimize the design of light trapping and light storage devises.
On a fundamental level, their observation crucially relies on the validity of the equipartition theorem and thus provides a stringent test of this fundamental principle in scattering media. Given its generality there is no reason why this finding should not be applicable also to acoustics, matter and gravitational waves.



Look at the article: http://science.sciencemag.org/content/358/6364/765