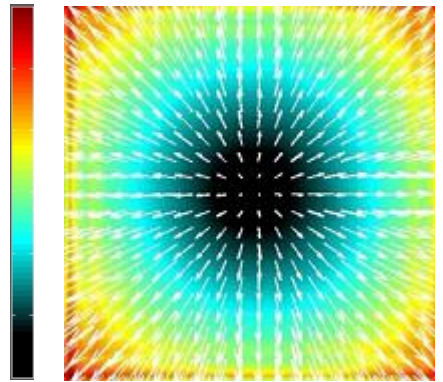
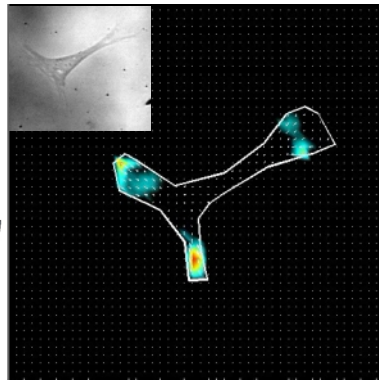
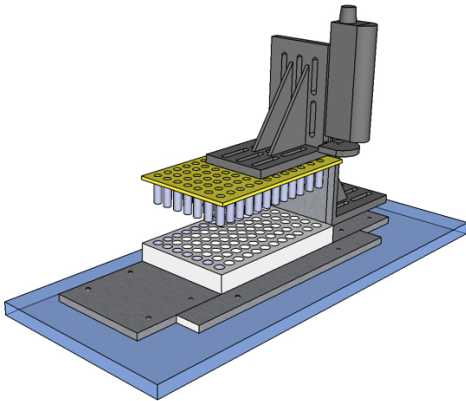


Realistic reproduction of a cell's dynamic physical environment



Applications

Bio-matrix stretcher: Precise, cost-effective, and high-throughput dynamic cell culture system

Cell Mapping Rheometry: Mapping stretch induced changes in traction forces exerted by any adherent cell

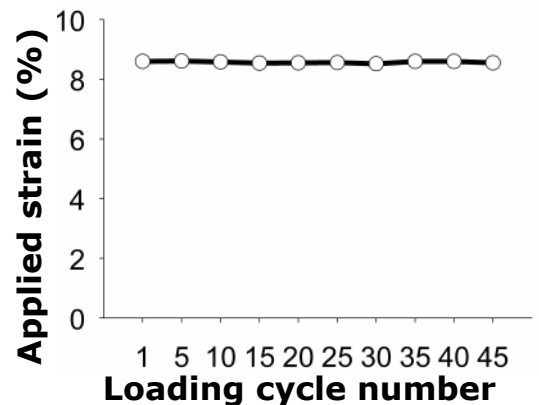
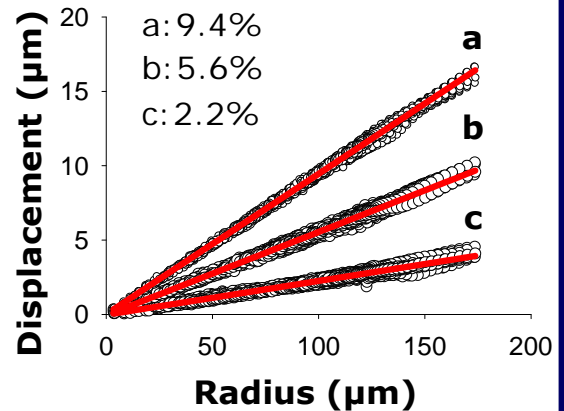
Salient Features

Cells are cultured upon soft, tunable and elastic matrices with tissue-like stiffnesses (50Pa-150kPa)

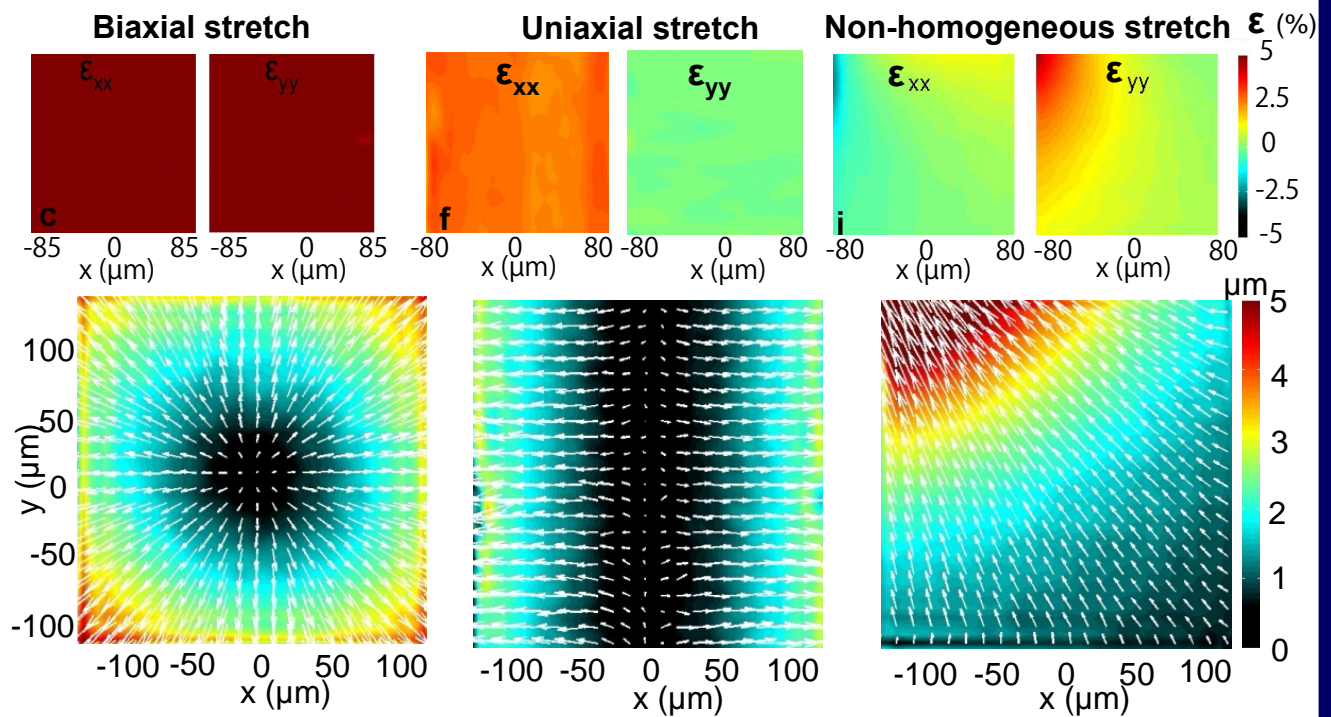
Applied stretch (0-20%) may be isotropic, anisotropic, tensile, compressive, transient or prolonged

Adaptable to standard multi-well configurations (e.g. 6, 12, 96, 384 well cell culture plates)

Elegantly simple, inexpensive and readily conducive to automation



Applied stretch is scalable within the physiological range (a-c). *Top:* Cell strains are homogeneous and uniform in the plane ($r^2 > 0.96$). *Bottom:* Applied strains are highly repeatable over multiple loading cycles.



Needs addressed/Markets

The invention brings together into one experimental platform three essential attributes of the dynamic cellular microenvironment: cell stretch that can be controlled in amplitude, in timing, and in isotropy; substrate stiffness that can be tuned over a wide range; and cell traction forces whose evolution in space and time can be measured. Cells are known to sense substrate stretch^{1,2}, substrate stiffness³, and traction forces between cell and substrate⁴, and to respond to these mechanical cues by modulating not only cytoskeletal contraction and polymerization, but also cell growth, division, migration, remodeling, gene expression, and differentiation. It has never before been possible, however, to introduce these three attributes into one experimental system, or, by extension, to explore their mutual biological interactions. In these regards, the invention surmounts physical limitations associated with existing technologies and in doing so is conducive to high throughput applications.

Additional information

1. Krishnan, R. et al. *PLoS One*, 4(5): e5486 (2009).
2. Trepat, X. et al. *Nature*, 7144:592-596 (2007).
3. Discher, D. E., Janmey, P. & Wang, Y. L. *Science* (2005).
4. Pelham, R. J., Jr. & Wang, Y. *Proc Natl Acad Sci USA* (1997).

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