Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

On-chip dynamic stress control for cancer cell evolution study
LIYU LIU, ROBERT AUSTIN, Princeton University — The growth and spreading of cancer in host organisms is an evolutionary process. Cells accumulate mutations that help them adapt to changing environments and to obtain survival fitness. However, all cancer–promoting mutations do not occur at once. Cancer cells face selective environmental pressures that drive their evolution in stages. In traditional cancer studies, environmental stress is usually homogenous in space and difficult to change in time. Here, we propose a microfluidic chip employing embedded dynamic traps to generate dynamic heterogeneous microenvironments for cancer cells in evolution studies. Based on polydimethylsiloxane (PDMS) flexible diaphragms, these traps are able to enclose and shield cancer cells or expose them to external environmental stress. Digital controls for each trap determine the nutrition, antibiotics, CO2/O2 conditions, and temperatures to which trapped cells are subjected. Thus, the stress applied to cells can be varied in intensity and duration in each trap independently. The chip can also output cells from specific traps for sequencing and other biological analysis. Hence our design simultaneously monitors and analyzes cell evolution behaviors under dynamic stresses.

Liyu Liu
Princeton University

Date submitted: 27 Nov 2009 Electronic form version 1.4