CDB SEMINAR


# Yusuke T. Maeda

The Rockefeller University


Monday, January 24, 2011

16:00~17:00 C1F CDB Auditorium

## Physical approach to the origin of life: How nature separates molecules


### Summary

One of fascinating questions is the origin of life. The complexity of existing cells hinders the deep understanding of their origin. Bottom-up synthesis of simplified cells might be feasible but gives another puzzle: the existence of assembler and separator of molecules at early stage of life. In this talk, I will present a simple separator that is the transport of molecules under a temperature gradient.

Local temperature increase creates the concentration gradient of polymer polyethylene glycol (PEG), called thermophoresis. Another solute experiences thermophoresis and non-equilibrium osmotic force from PEG. As the osmotic force depend on size, different sized solutes are separated. Using focused laser heating we observed: (1) DNA separated from different sized RNA in PEG under a temperature gradient. (2) the separation of short DNA in PEG was analogous to gel electrophoresis while the behavior was reverse with DNA length above 5kbp, so that longer DNA traveled far from due to its unfolding. (3) DNA separation by a DNA gradient.

Separation of molecules that may carry out the selection at the origin of life would be a step toward the understanding of how life may occur particularly in thermal vents in the ocean where temperature gradients are present. In addition, for biology of present age, I will show how this separation works on the optical control of cell motility and the shape of cells.



**Host:**
**Hiroki R. Ueda**
Systems Biology, CDB
hiro@cdb.riken.jp
Tel:078-306-3190
(ext:4212)