International Autumn School

Biophysics & Bioelectrochemistry for Medicine:
Basic Concepts, New Techniques and Application Perspective
Vulcan, October 1-6, 2010

UNDER THE HOOD: A GLIMPSE AT *E. COLI* ROTARY MOTOR

Gabriel Basarab Hosu

Harvard University
Department of Molecular and Cellular Biology
16 Divinity Avenue, Cambridge, MA 02138

E. coli, a single-celled organism living in our gut, is propelled by a set of rotary motors. Each motor drives a helical filament which rotates in the external aqueous environment. When all motors rotate in the same direction - counterclockwise, the filaments bundle and the cell swims forward, executing a "run". When at least one motor changes its direction of rotation to clockwise, its filament comes out of the bundle and the cell executes a random change in direction, a "tumble". Specialized receptors sense chemical gradients. *E. coli* can chase or avoid chemicals by extending the length of its runs toward attractants or away from repellents.

Although the signaling pathways involved in chemotaxis and the molecular composition of the motor are known, the actual mechanism of rotation and switching of the direction of rotation are still under debate. We study these mechanisms by employing molecular biology and fluorescence microscopy techniques, together with instrument design. We investigate the rotation of components of the motor believed to be part of the rotor by polarized bleaching microscopy, a technique under development. We expect to learn which internal components of the motor rotate, at what rate and whether a gear mechanism is involved in driving the filament. By single-motor fluorescence resonance energy transfer (FRET) experiments, we try to correlate the switching events with protein interactions between motor components and signaling molecules.