PHYSICAL MATHEMATICS SEMINAR

POLYMORPHIC TRANSFORMATIONS IN BACTERIAL FLAGELLA

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ABSTRACT:

In many of the bacteria that swim by rotating helical flagella, the flagellum itself is not a simple, passive propeller. Flagella can adopt several helical shapes of varying pitch, radius and handedness, in response to changing conditions such as temperature, pH, and load. In *Escherichia coli*, in particular, at least 5 (out of 12 predicted) helical forms are observed during normal swimming. Polymorphic changes commonly occur during tumbling, appear to aid in the reorientation of swimming direction, and are induced by torque-changing variations in motor speed.

Measurements on individual, isolated flagellar filaments are revealing the forces required to cause polymorphic transformations. Within a single polymorphic form, the filament acts as a simple elastic object with a stiffness of 3.5 pN-μm^2. Under extension, sections of filament of variable length transform to a different polymorphic form, relieving tension in the filament. This type of detailed measurements of the flagellar filament will be necessary for a quantitative understanding of the connections between motor reversal, polymorphic change, and tumbling behavior. Since the filament is a uniform polymer of flagellin protein, whose structure is known, it provides a simple, macroscopically visible model of highly cooperative conformational changes in a biological polymer.

TUESDAY, SEPTEMBER 26, 2006
2:30 PM
Building 4, Room 270

Reception at 3:30 PM in Building 2, Room 349
(Applied Mathematics Common Room).

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