Bacterial Motility: Swimming and Gliding

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Much is known about the swimming behavior of *Escherichia coli.* I will mention early work on tracking that revealed *E. coli's* biased random walk, followed by the realization that bacterial flagella rotate rather than wave or beat. Then I will describe the signaling network that couples the receptors to the flagella, including adaptation that occurs both at the input and at the output of this network, as receptors are methylated to retain activity and motors are remodeled to optimize their operating point. The motor also adapts to changes in viscous load, adding or removing force-generating units as required to provide adequate torque. *Flavobacterium johnsoniae*, another rod-shaped Gram-negative bacterium, has neither flagella nor pili and is unable to swim, but it glides over surfaces by driving an adhesin, sprB, over its surface along spiral tracks. If cells are sheared in the manner used for tethering *E. coli* and one adds anti-sprB antibody, cells stop gliding and spin, but at constant speed rather than constant torque, so these cells are equipped with a new kind of rotary motor. But how then does one go from rotation to translation? Are we dealing with a microscopic snowmobile?