E. coli in Motion

The bacterium *Escherichia coli*—*E. coli* for short—has long been the organism of choice for unraveling biochemical pathways, deciphering the genetic code, learning how DNA is replicated and read, and even for manufacturing proteins of commercial interest. For some thirty years, it also has been a model for studying the molecular biology of behavior. *E. coli* swims in a purposeful manner, propelled by long thin helical filaments, each driven at its base by a reversible rotary engine. As a microscopic organism immersed in an aqueous environment, it has mastered physical constraints utterly different from any that we know, devising sensors, comparators, and motors on the nanometer scale.

This cross-disciplinary monograph describes these feats in a manner accessible to scientists, engineers, and others not trained in microbiology who would like to learn more about living machines. It treats the history of the subject, the physiology, physics, biochemistry, and genetics, largely from first principles. It is all about a small but remarkably sophisticated friend who lives in your gut.

Topics discussed include:

- How does *E. coli* move about?
- How do cells decide whether life is getting better or worse?
- What is the machinery that makes this behavior possible?
- How is the construction of this machinery programmed?
- How does this machinery work?
- What remains to be discovered?