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Introduction Low Reynolds number regime AC electric field and DEP force Manipulation, Patterning, and Rotation of nanowires Manipulation by DEP and EP forces Summary

Life under low Reynolds numbers

How do microorganisms swim?



















| * | What Force ? | |
|----------|--|---|
| • Grav | ity (g) : weak force, | - |
| | Centrifuge (1-d) hard to alter direction | |
| • Magi | netic (B) : Force scales as ∇ (B ²) | |
| C | weak force, for magnetic entities only | |
| | hard to alter B over short distances | |
| • Elect | ric (E) (DC): Force scales as $\nabla(E^2)$ large dielectric constant (80) reduces force by 6400 water hydrolyzes at about 3 V | |
| • Elec | etric (E) (AC): Force scales as $\nabla(E^2)$ Dielectrophoretic (DEP) force greatly enhanced by frequency Force and gradient provided by patterned microelectrodes | |





| * | Characterization of nanowire motion in circular field 40 MHz 10 V | | |
|----------|---|--------------------|--|
| _ | Distance | Velocity v | |
| | | ν up to 400 μm/sec | |
| | | | |
| | In comparison: <i>E. coli</i> of similar size move with a speed of 10 μ m/sec | es | |
| | | 15 | |



































