Summer 2009 Workshop in Biology and Multimedia for High School Teachers

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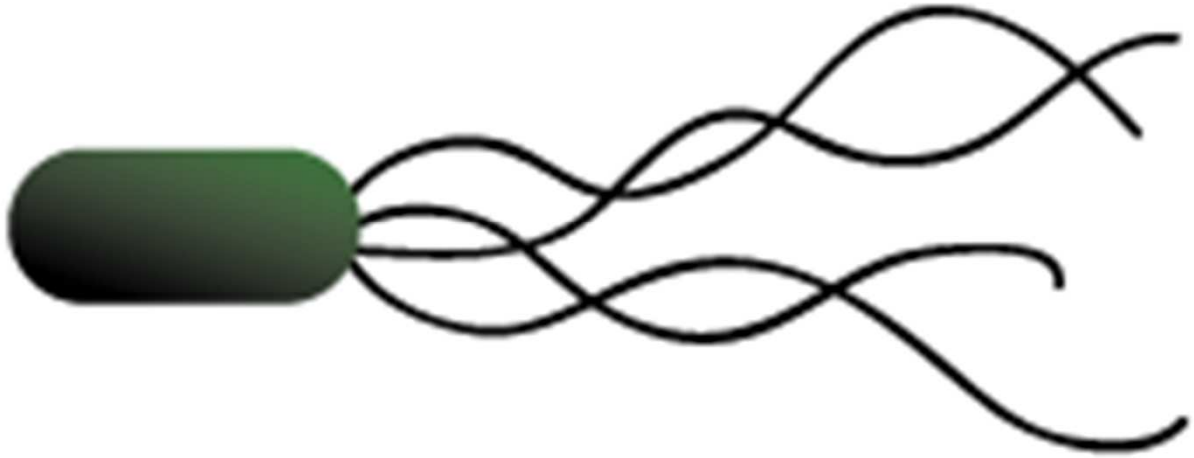
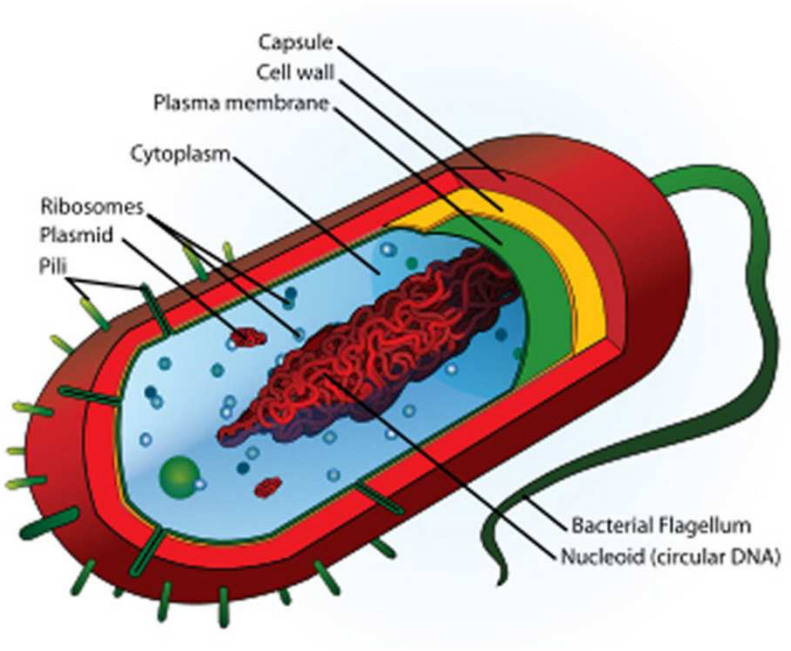
Physiology of Flagella in Bacterial Movement



http://upload.wikimedia.org/wikipedia/commons/0/08/Flagella.png

Flagella - semi rigid structure used to move rod shaped microbial cells

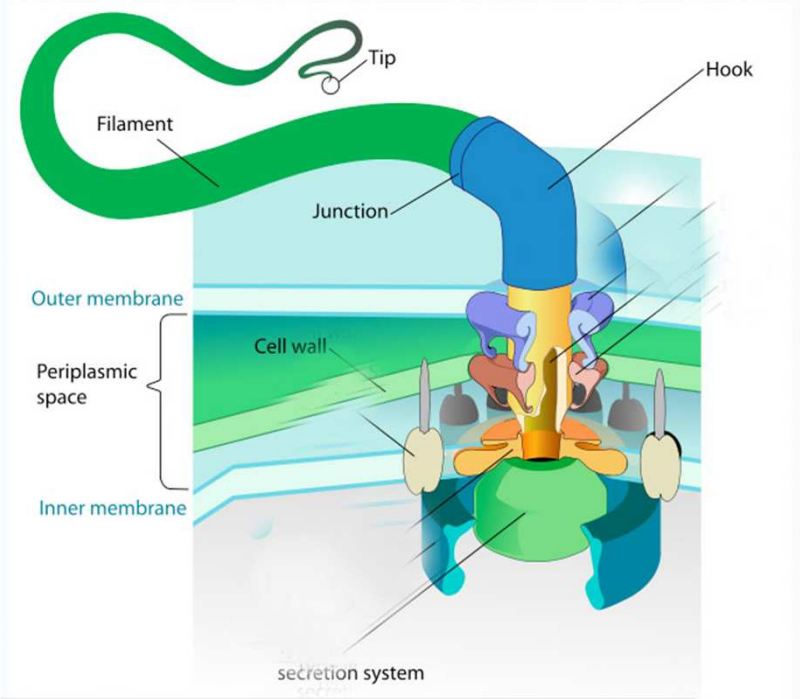
Rod shaped bacillus



http://en.wikipedia.org/wiki/File:Average_prokaryote_cell-_en.svg

Structure

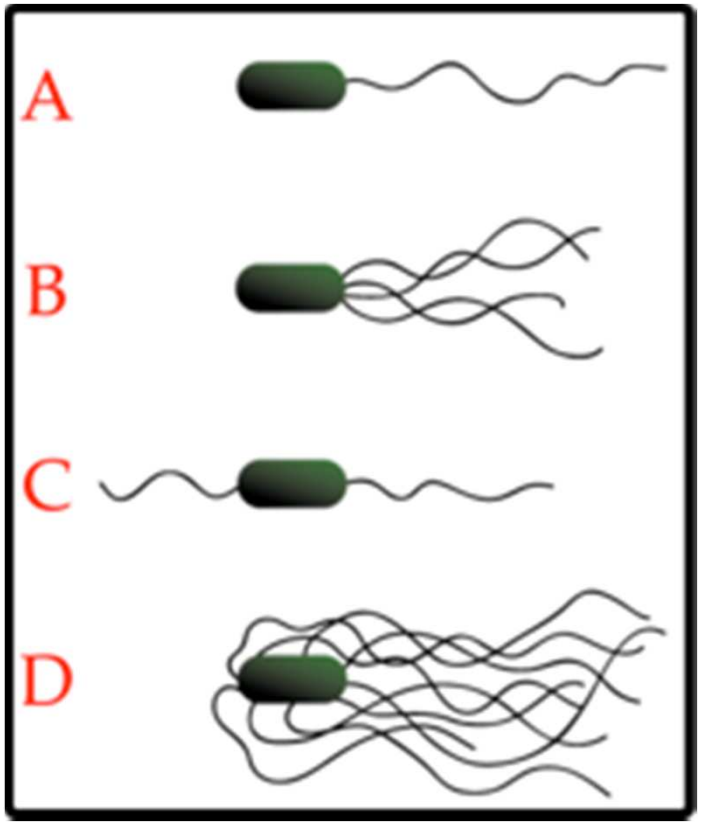
- Flagella composed of protein polymer Flagellin
- Attaches to cell membrane with Hooks and Basil Bodies at the Cell Membrane
- Flagella rotates like a screw using proton motor force



http://en.wikipedia.org/wiki/File:Flagellum_base_diagram_en.svg

Common Forms

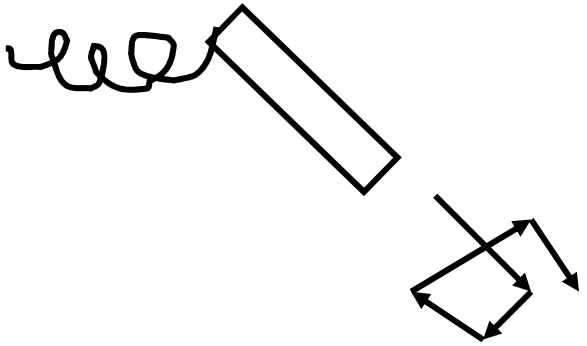
- A-Monotrichous; One flagella at one cell Pole
- B-Lophotrichous; Multiple flagela at one cell pole
- C-Amphitrichous; One flagella at each cell pole
- D-Peritrichous; Several flagella at multiple locations on cell



http://commons.wikimedia.org/wiki/File:Flagella.png

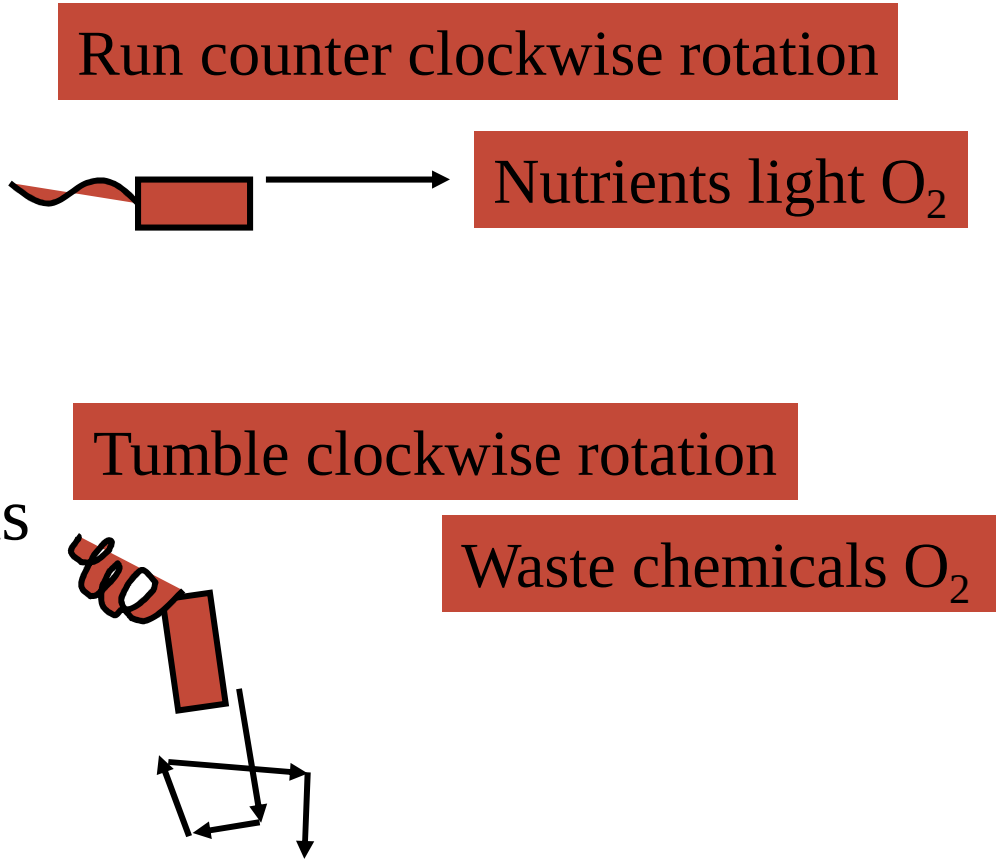
Direction of movement
Runs and Tumbles

- To move forward flagella rotates Counterclockwise propelling cell body with the tail following behind
- When flagella rotates Clockwise forward motion stops and cell tumbles



Flagella helps cell interact with it's Environment

- Bacteria behave or respond to their environment depending upon various stimuli such as chemicals, light or oxygen.

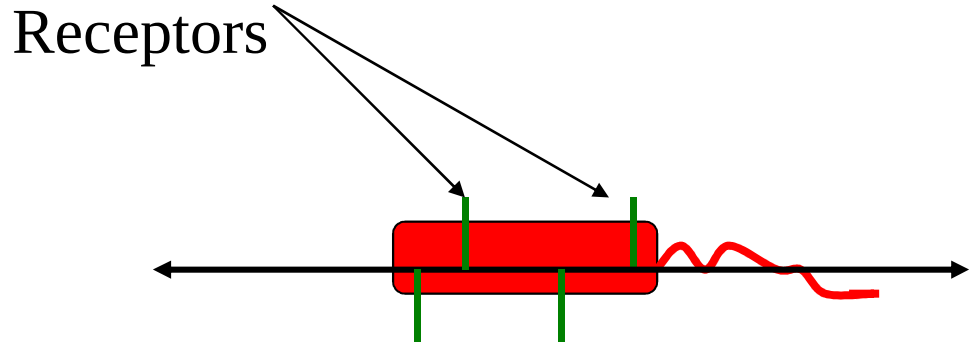


Behavior stimulus types

- Chemotaxis: Moving towards helpful chemicals such as nutrients or away from chemicals such as waste or harmful chemicals
- Phototaxis: Moving towards light
- Aerotaxis: Moving towards or away from Oxygen

Receptor molecules near surface of membrane detect environmental conditions and transfer signals to flagella motor making it turn counter clockwise or clockwise. Turning speed can be influenced by concentration gradient.

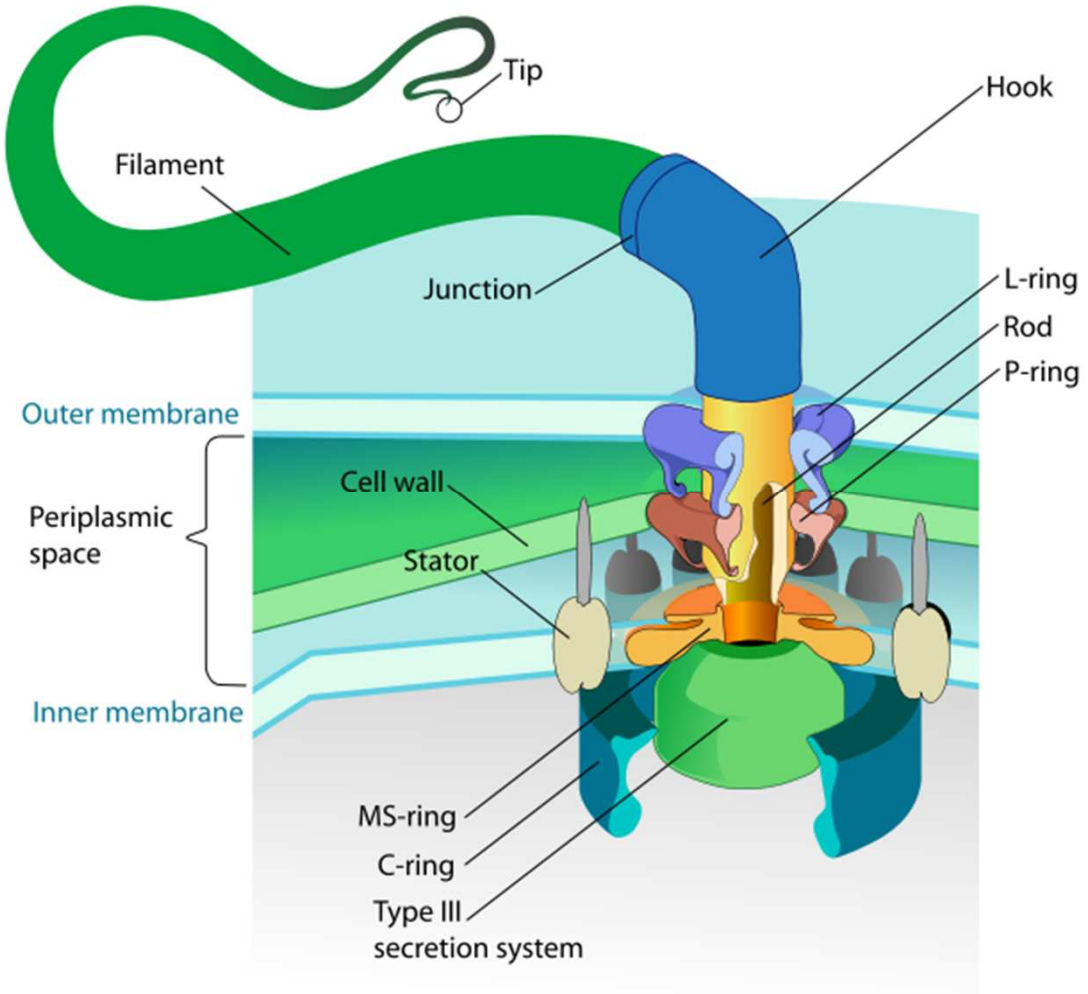
*Receptors may be related to transfer molecules



Bacteria are relatively Fast

Organism	Speed	Body lengths
Cheetah	111 km/hr	25
Human	37 km/hr	5.4
Bacteria	.00015 km/hr	10

Flagella are sophisticated structures that require the interaction of many different finely tuned systems that allows the organism to survive



http://en.wikipedia.org/wiki/File:Flagellum_base_diagram_en.svg

Resources:
http://en.wikipedia.org/wiki/Flagellum
http://en.wikipedia.org/wiki/Bacterium
http://en.wikipedia.org/wiki/Microorganism
http://en.wikipedia.org/wiki/Bacterial_cell_structure
Microbiology: Tortolla P 83-85