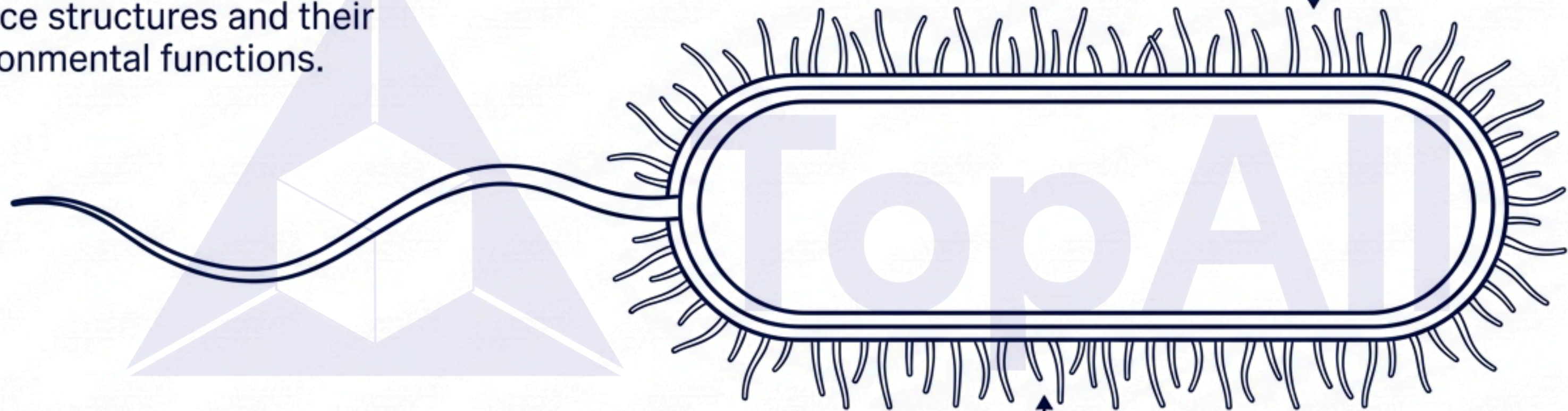


Movement and Attachment

A schematic breakdown of bacterial surface structures and their environmental functions.

[MOTILITY]

Structures designed for environmental navigation and propulsion.



[ATTACHMENT]

Structures designed to anchor the cell to host tissues and surfaces.

Flagella Dictate Motility

[MOTILITY]

Some bacteria are non-motile, but those capable of movement rely on thin, filamentous extensions from their cell wall known as flagella.

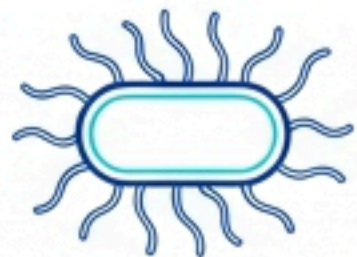
Scale & Density Variance



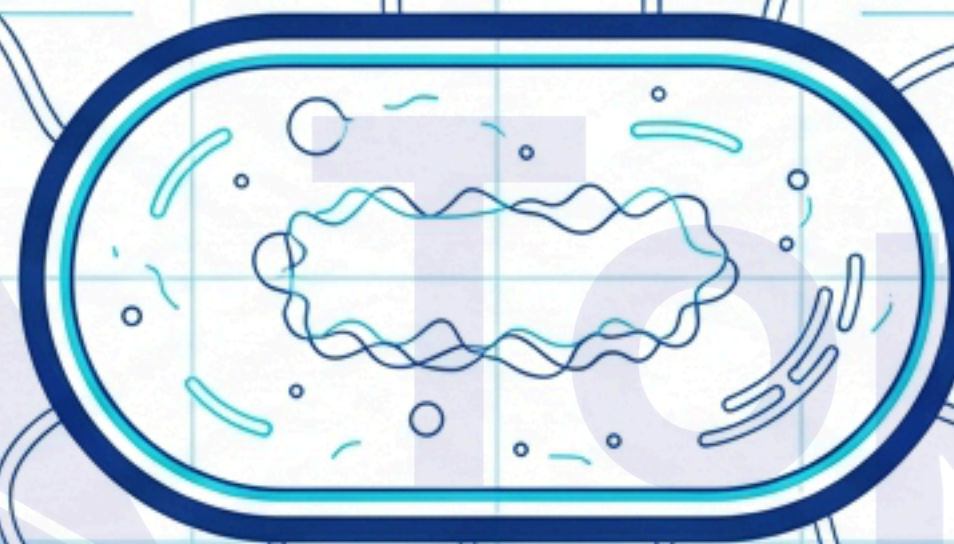
Single tail



Clustered tuft



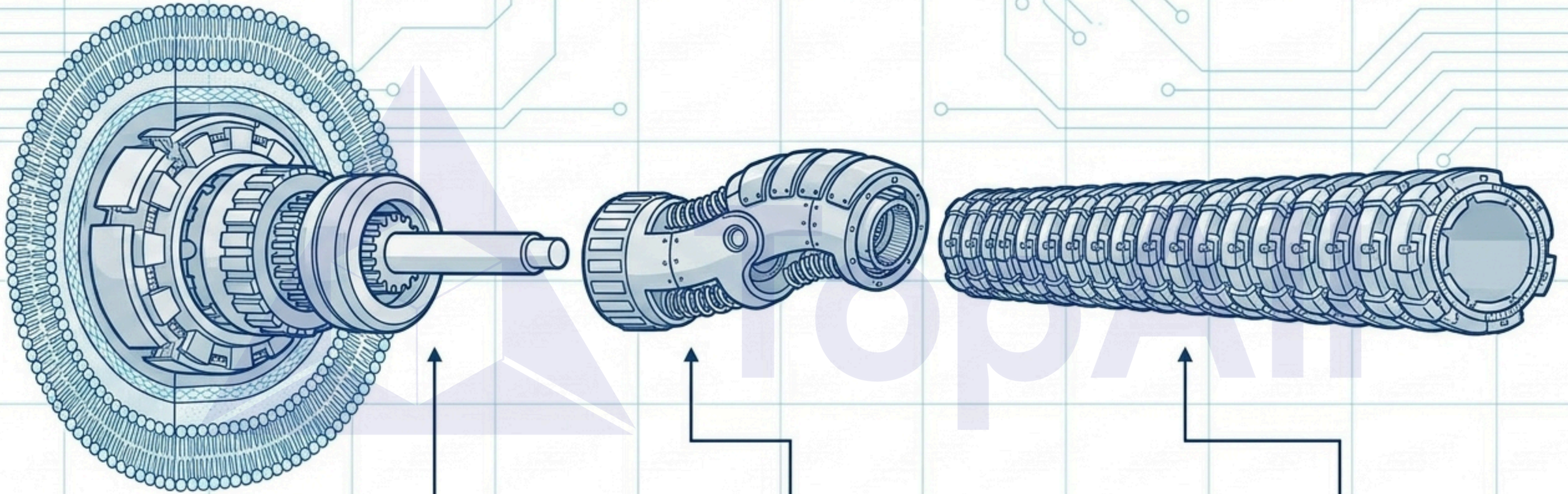
Uniform coverage



Evolutionary Context: Prokaryotic bacteria possess flagella, but these are structurally entirely different from eukaryotic flagella (which utilize a 9+2 microtubule array).

The Three-Part Motor

[MOTILITY]



Basal Body

Embedded directly into the cell envelope; acts as the rotary motor and structural anchor.

Hook

The curved, mechanical connector joint bridging the base to the external tail.

Filament

The longest portion; extends from the cell surface outward into the environment.



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Pili: Tubular Protein Structures

[ATTACHMENT]



Functional Boundary: Despite their appearance as surface extensions, pili do not play a role in cellular motility.

Elongated tubular structure

Composed of specialized protein

Hollow core

Fimbriae for Environmental Anchoring

[ATTACHMENT]

Form

Small, bristle-like fibres sprouting densely from the cell exterior.

Function

Allows bacteria to securely attach to host tissues or withstand physical currents by gripping rocks in streams.

Host tissue/rock interface

Surface Structure Diagnostic Matrix



	Flagella	Pili	Fimbriae
Primary Function	Motility	Attachment	Attachment
Structure	3-part engine (Filament, Hook, Basal Body)	Elongated tubular special protein	Small, dense bristle-like fibres
Scale/Density	Longest, ranging from single to clustered	Mid-length, tubular	Shortest, covering the entire cell surface

KEY TAKEAWAY: Bacterial surface appendages are highly specialized tools. While flagella act as the primary engine for environmental navigation, pili and fimbriae serve as the critical anchors required for colonization and survival in volatile environments.



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