222 MBIO
Microbial Fine Structure

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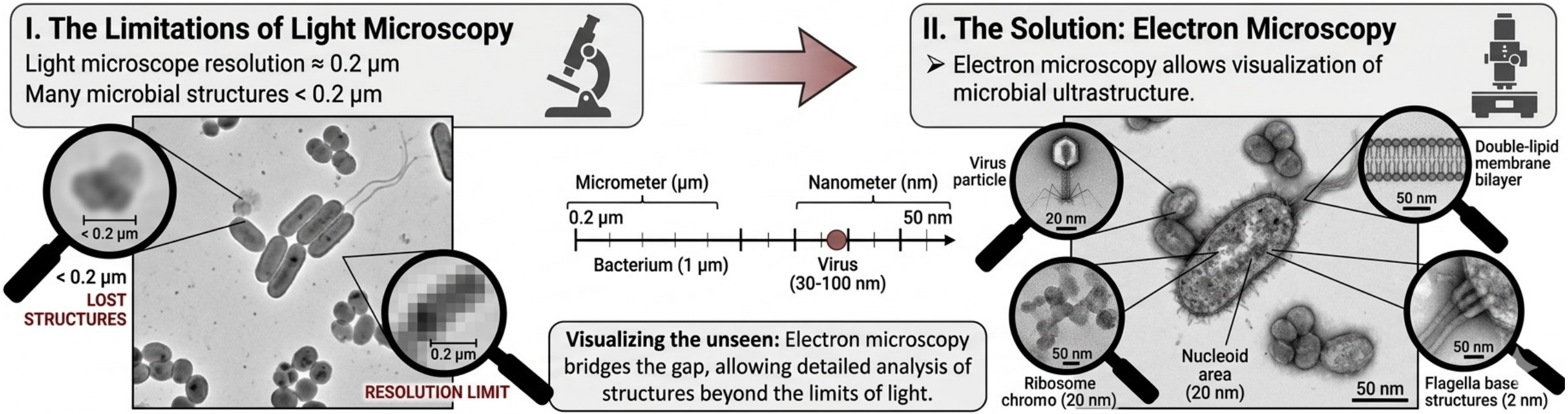
Electron Microscopy in the Study of Prokaryotic and Eukaryotic Microbial Ultrastructure

- Lab 9 -

Learning Objectives

- By the end of this lecture, students should be able to:
  - Distinguish between TEM and SEM based on biological application
  - Identify microbial structures visible only with electron microscopy
  - Describe ultrastructural features of prokaryotic cells revealed by TEM
  - Describe ultrastructural features of eukaryotic microorganisms revealed by TEM and SEM
  - Select the appropriate type of electron microscopy for specific microbiological investigations

Why do we need electron microscopy in microbiology?



- Light microscope resolution ≈ 0.2 µm
- Many **microbial structures** < **0.2 µm**

What is Ultrastructure?

- Electron microscopy **allows visualization** of microbial **ultrastructure**.
- **Ultrastructure** refers to the fine internal structural details of cells that **cannot** be observed using a light microscope.
- **Examples:**
  - membrane layers
  - ribosomes
  - nucleoid organization
  - cell envelope architecture
  - organelle internal structure

Types of Electron Microscopy Used in Microbiology

Transmission Electron Microscope

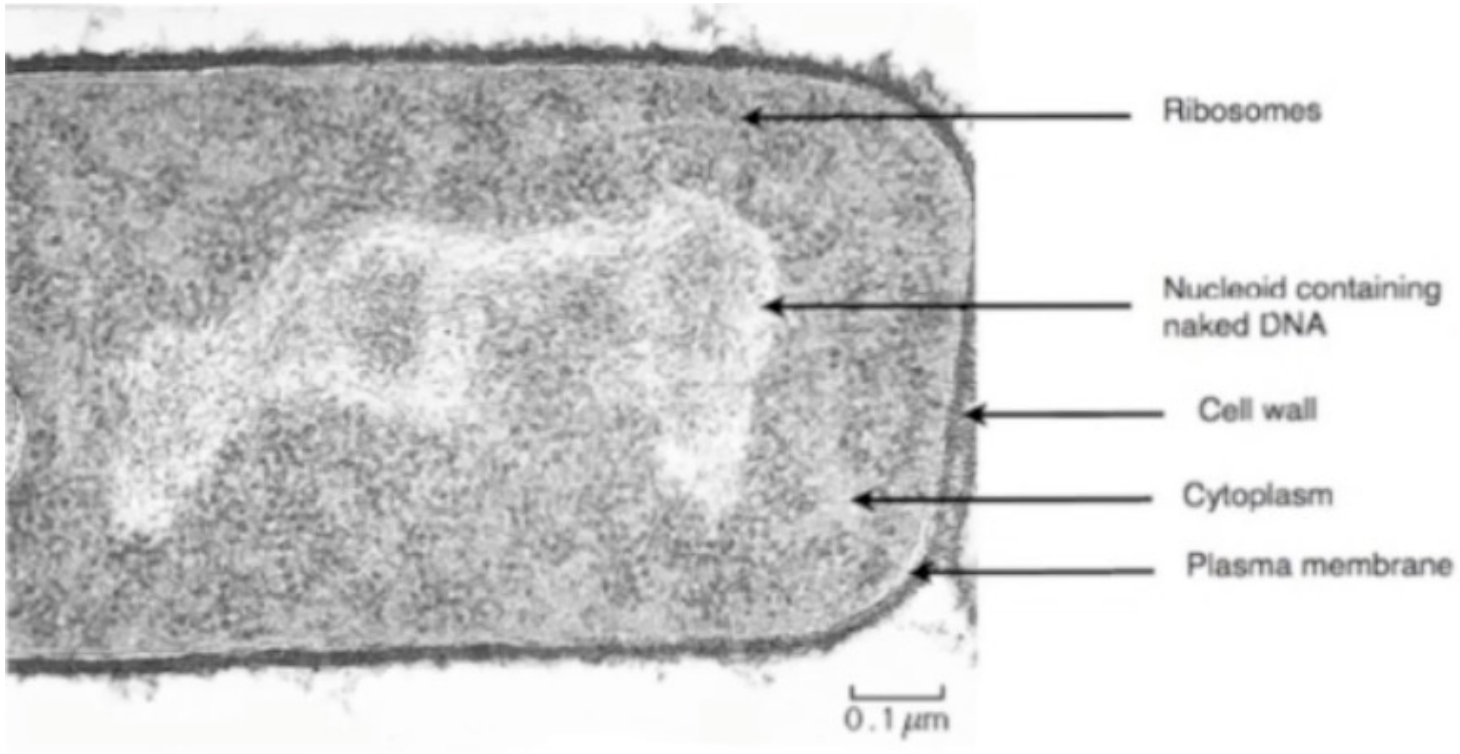
Internal structure (inside)

Scanning Electron Microscope

Surface structure (outside)

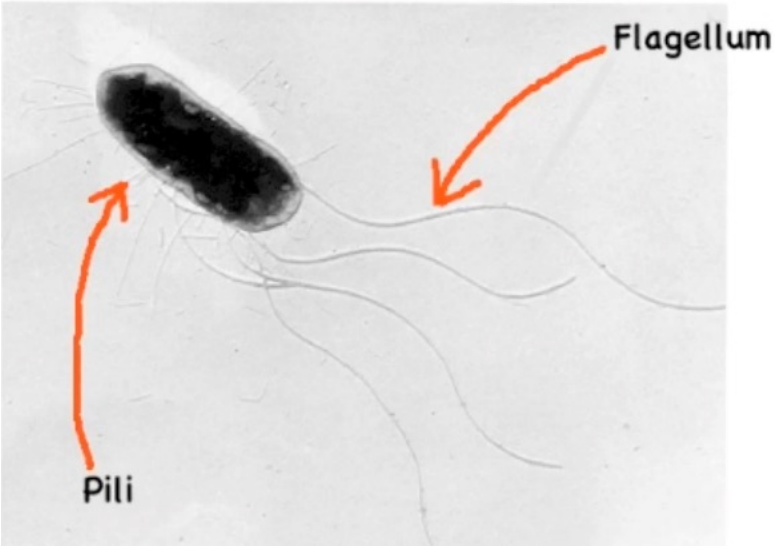
Electron Microscopy in Prokaryotic Cells

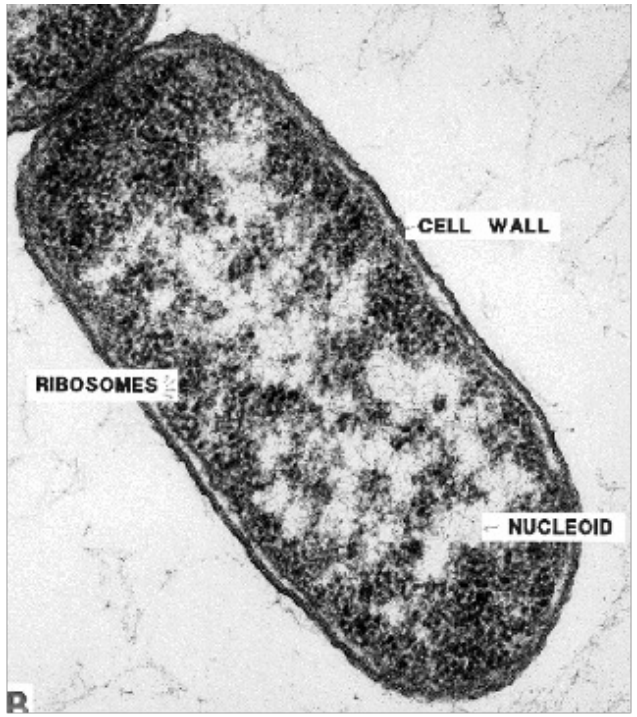
- **Electron microscopy helped identify:**
  - cell envelope organization
  - ribosomes
  - nucleoid structure
  - flagella ultrastructure
  - endospores
  - pili



❖ Structures Only Visible with Electron Microscopy:

- ribosomes
- pili
- flagellar basal body
- endospore layers

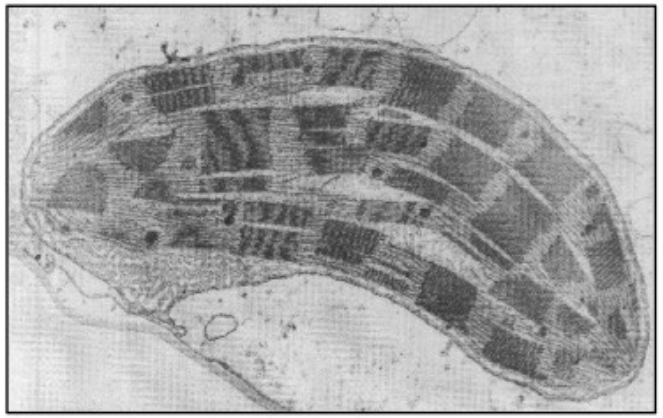




Electron Microscopy in Eukaryotic Microorganisms

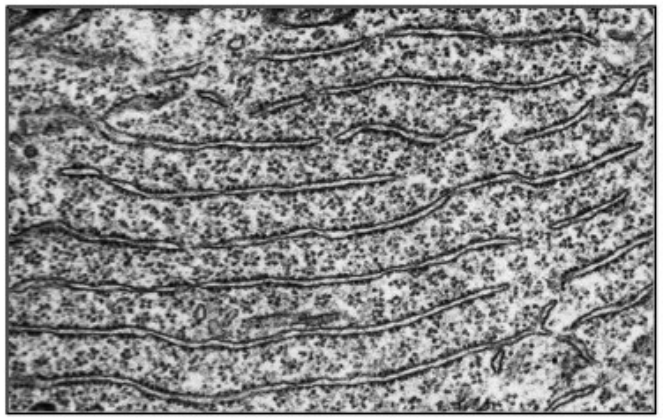
- **Used to visualize:**
  - nucleus
  - mitochondria
  - ER
  - cytoskeleton
  - chloroplast internal structure

Golgi Apparatus



Chloroplast

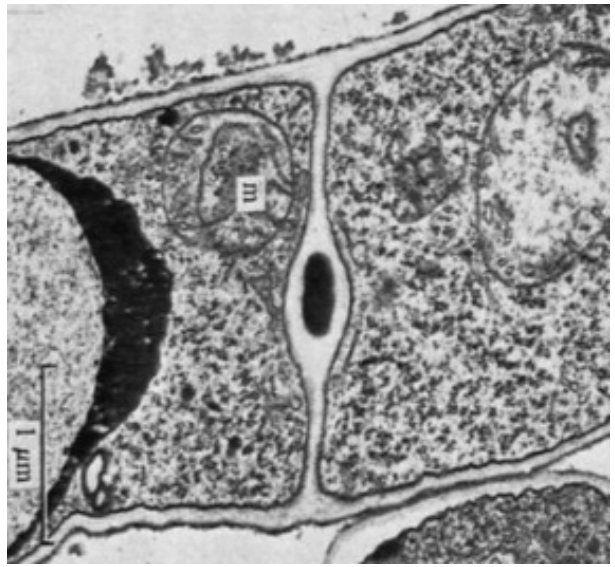
Mitochondrion

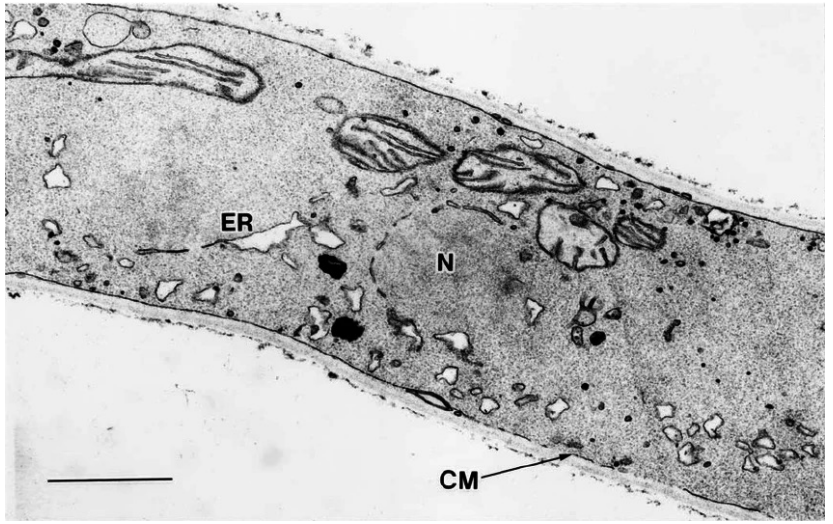


Endoplasmic Reticulum

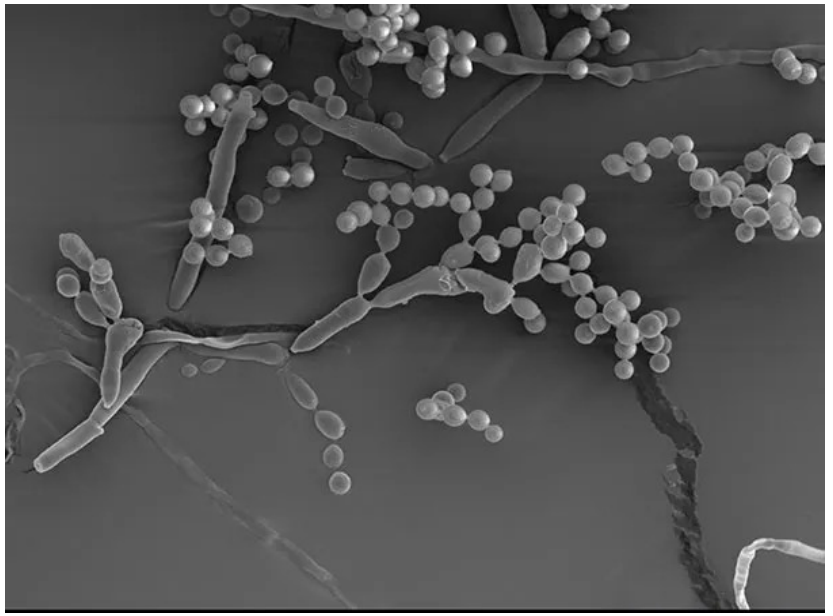
❖ Example: Fungal Ultrastructure:

- **TEM shows:**
  - septum structure
  - nuclear membrane
  - mitochondria





- **SEM shows:**
  - hyphal surface
  - spore morphology



"Success in this course comes from practice, attention to detail, and responsibility in the laboratory. Engage actively and make the most of every practical session.."

End of the Lab 🤓