# Bacterial Structure and Function

## Learning objectives:

- What is a bacterium? (defining characteristics)
- What is the structure of a bacterium?
- Shape, size, arrangements
- Identification of the main structural components

# Defining characteristic of prokaryotes

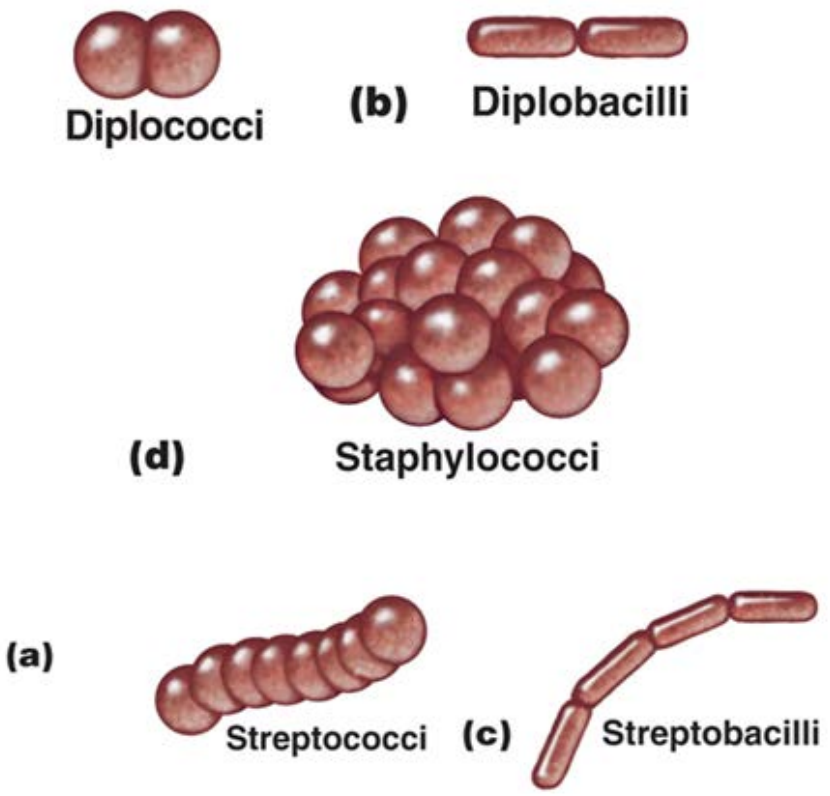
- All …
- What type of cells?
  - Lack …
    - thus, no....

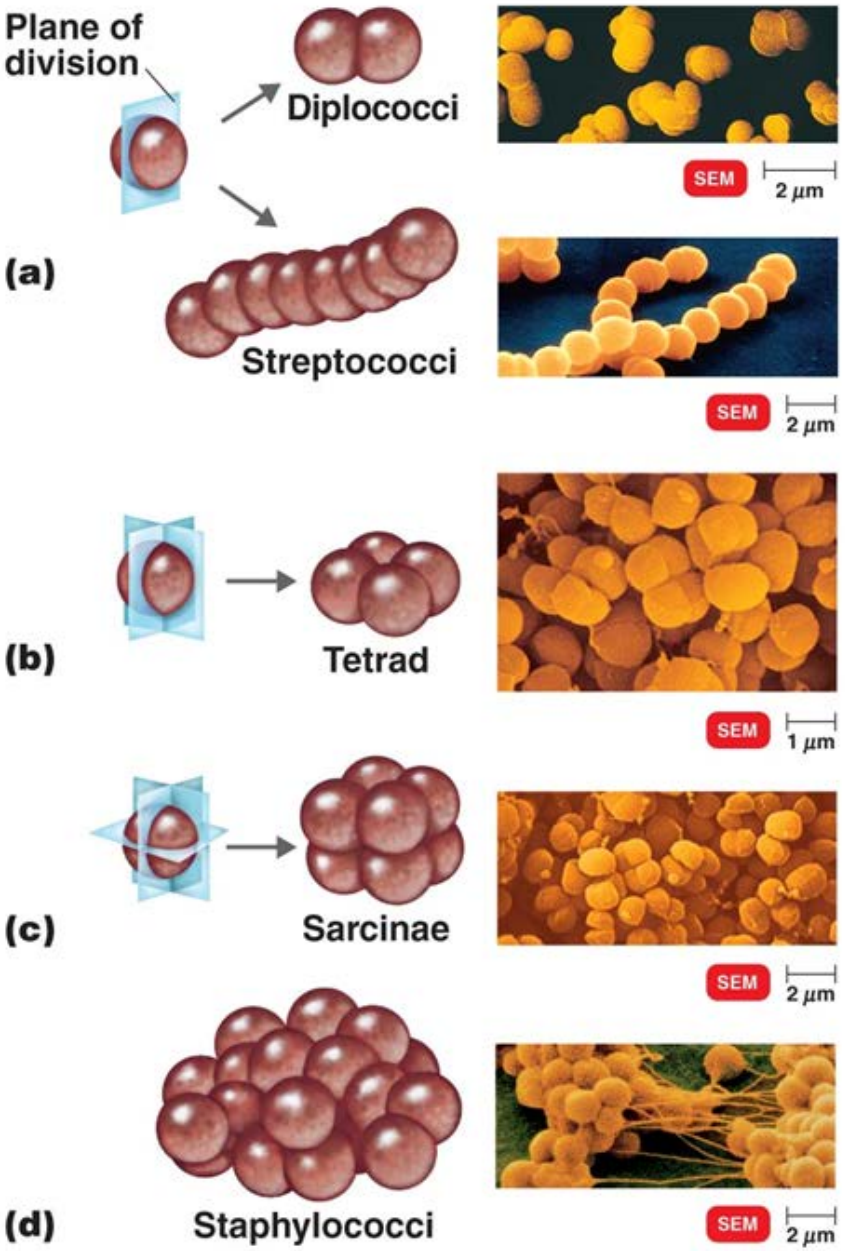
- Location of genetic material?
- Cytoplasmic organelles?
- Complexity?

# Part A: Bacterial cell structure and function

- **A1. Shape/Arrangement/Size** **(most are monomorphic)**
- **Common shapes:**

- **Common arrangements:**



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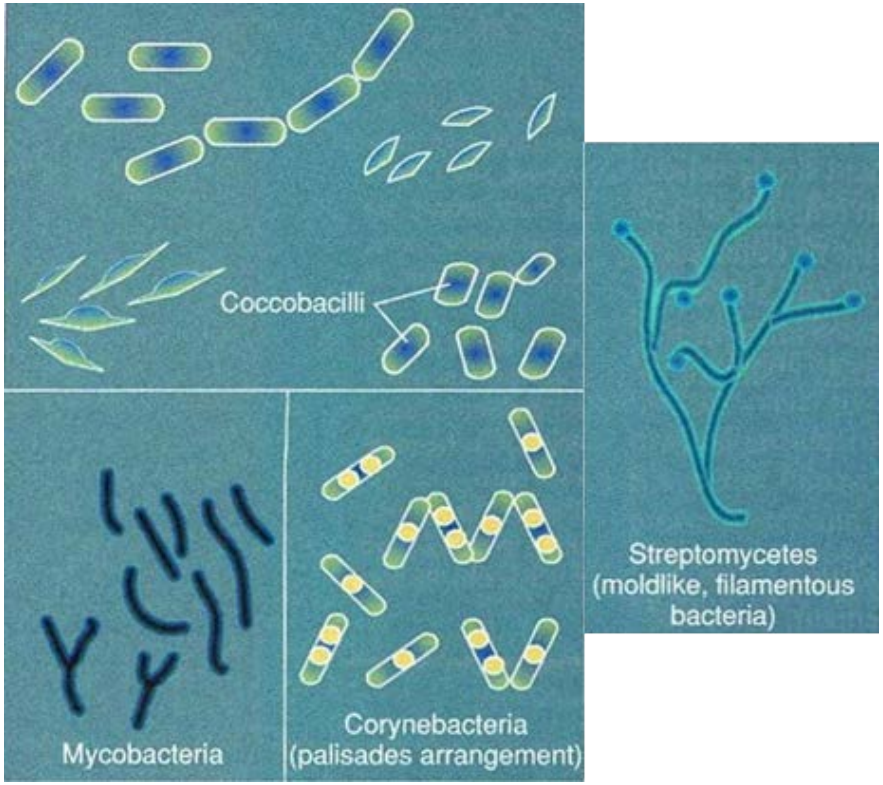
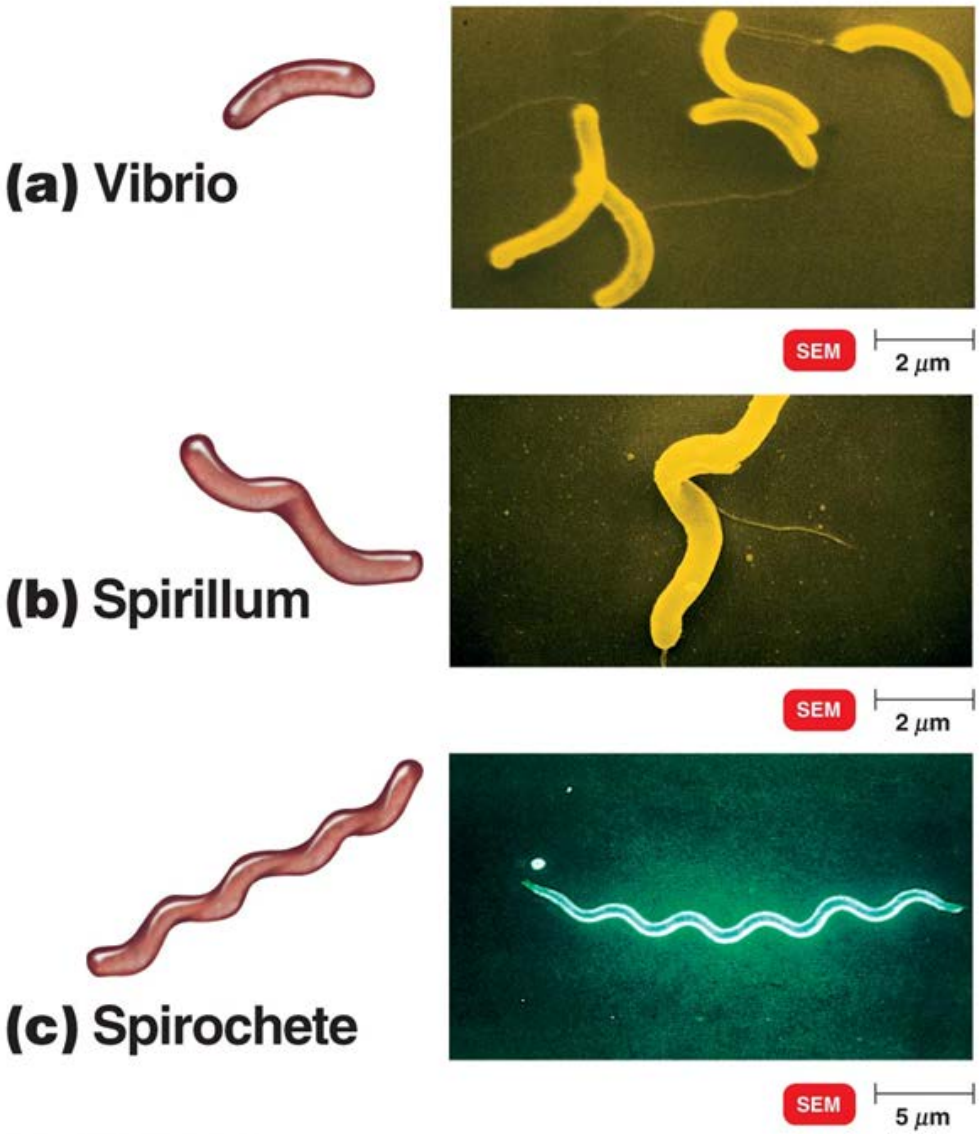
# Rod-shaped bacteria

- Multi-nucleus filament
  - Mycelium
- Corynebacteria
  - palisade or angular



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# Bacterial size ranges

- Average?
- Small?
- Large?

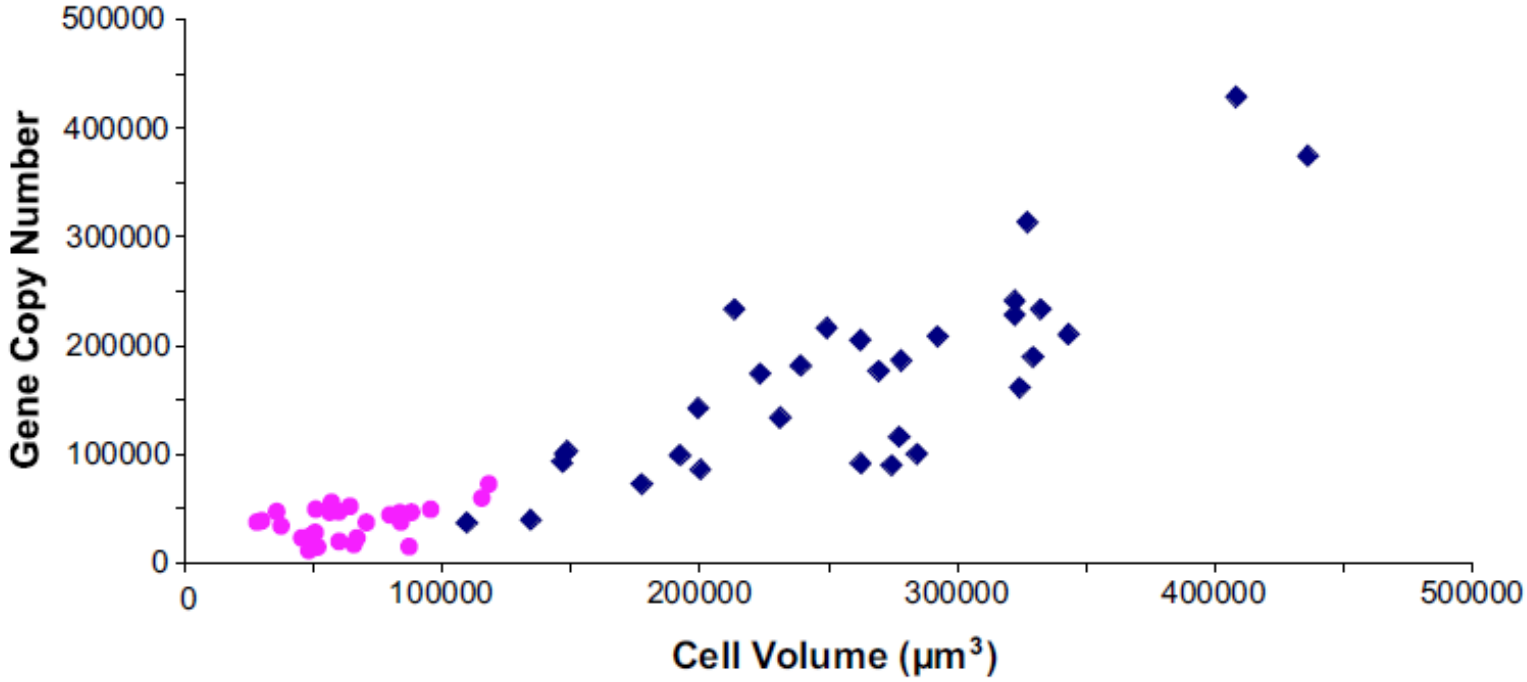
# Breaking the “rules”

- ***Epulopiscium fishelsoni***

- ***Thiomargarita namibiensis***

Table 1. Gene copy number in individual *Epulopiscium*

| Gene | Copy number* | Range† |
|---|---|---|
| *ftsZ* | 80,600 | 35,800–198,000 |
| 16S | 368,000 | 241,000–737,000 |



# A2. Cell structure and Functions

- Flagella (A2.6)
- Fimbriae and pili (A2.5)
- Capsules, slime-layers, S-layers (A2.4)
- Cell wall
  - Gram+ (A2.2)
  - Gram- (A2.3)
- ------- Plasma membrane (A2.1) ------

- Nucleoid (A2.7)
- Gas vacuoles (A2.8)
- Inclusion bodies (A2.9)
- Ribosomes (A2.10)
- Internal membrane system (A2.11)

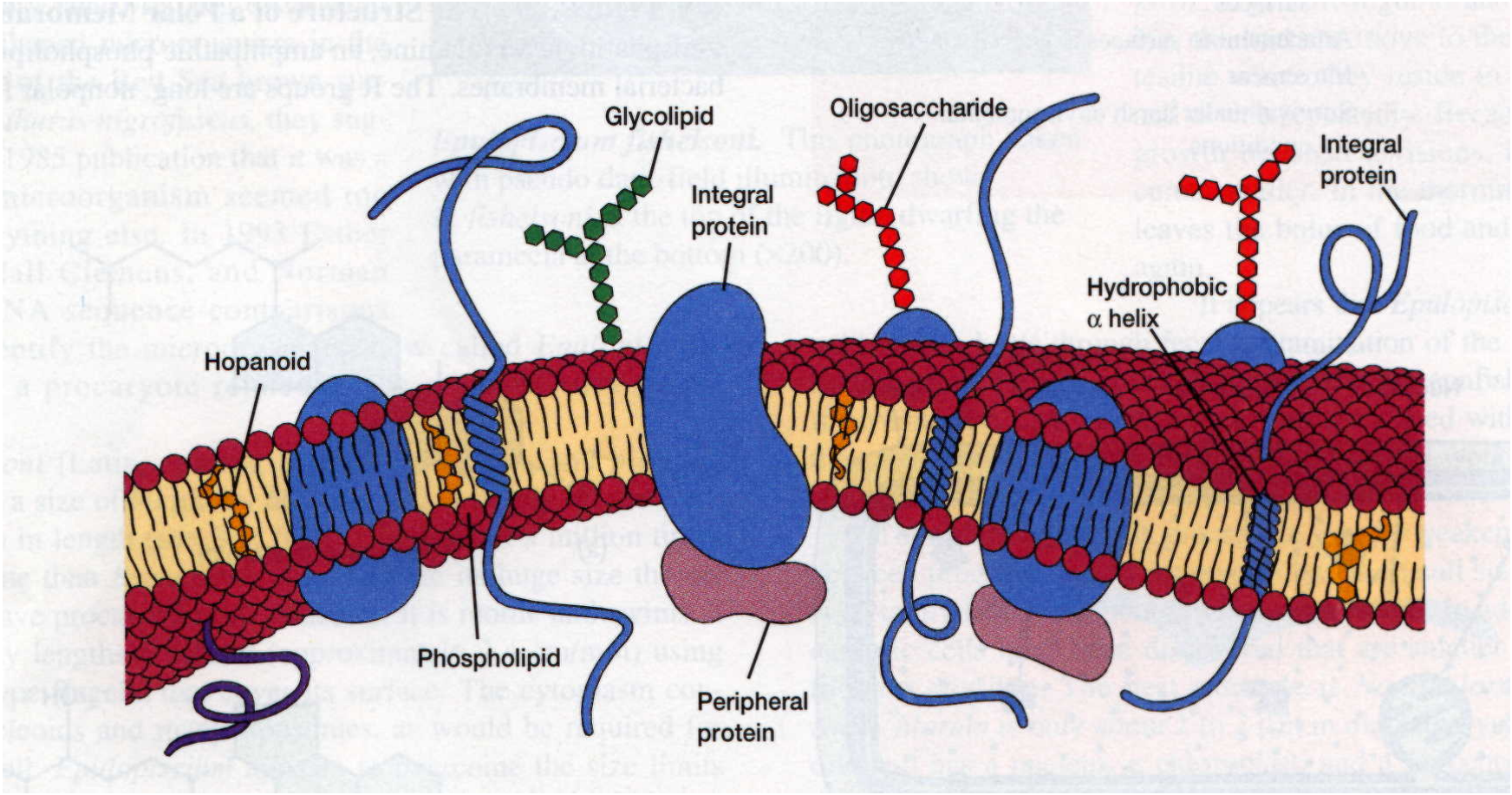
# A2.1 Plasma membrane (PM)

**Learning objectives:**

– The structure of the PM

– The function of the PM

# **Fluid mosaic model:** model for membrane structure



# Membrane associated lipids

- Amphiphatic
- Phospholipids
  –

- *Escherichia coli*, three major phospholipid species:
  – phosphatidylethanolamine (75%)
  – phosphatidylglycerol (20%)
  – cardiolipin (diphosphatidylglycerol, 1–5%)

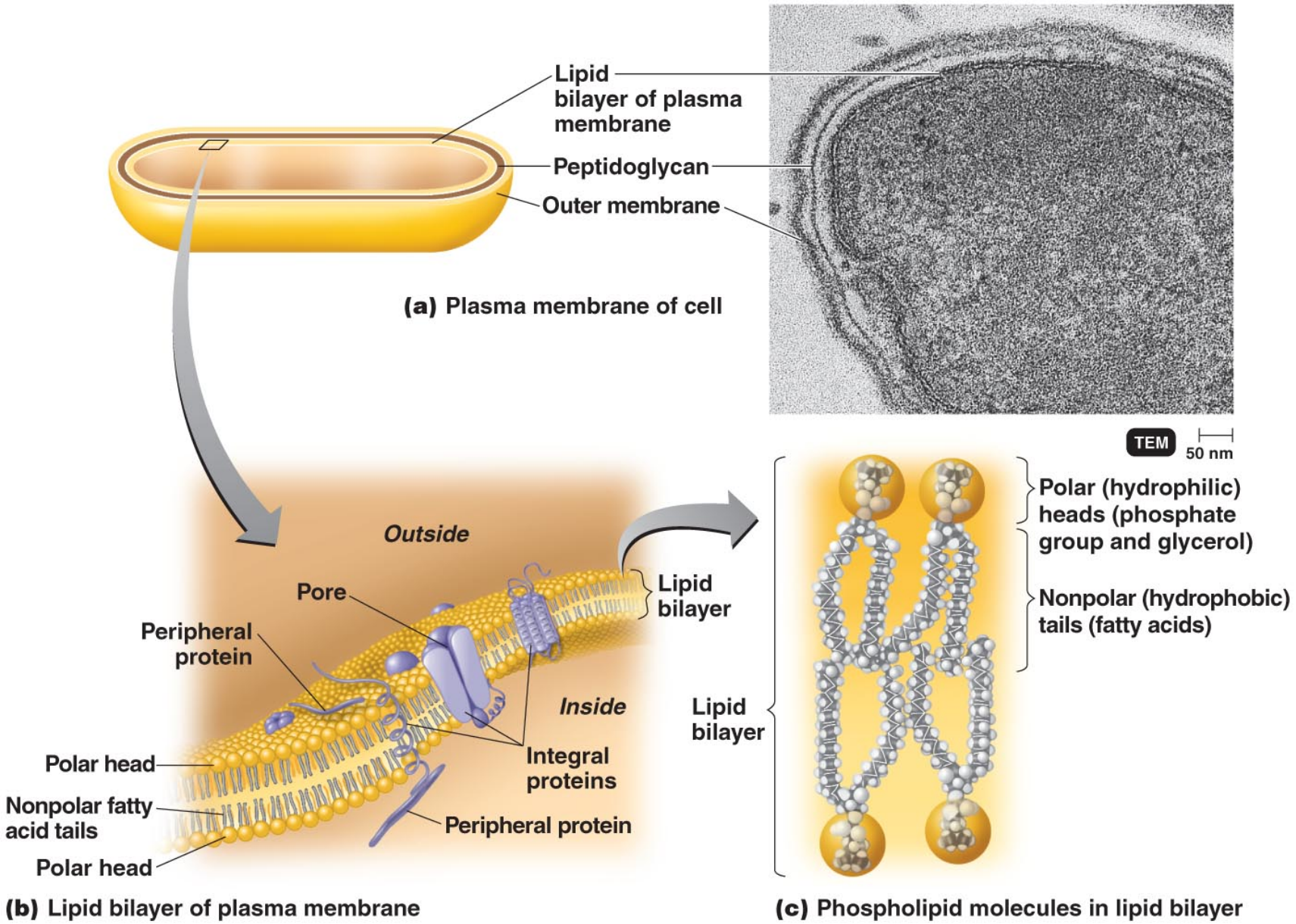
- Fluidity?

# Membrane-Associated Proteins

- A. Integral Proteins
  - Amount of total membrane proteins?
  - Ease of removal?
  - Solubility?

  - Position in PM?
  - Hydrophobicity?
  - Diffusion?

- B. Peripheral proteins
  - Amount of total membrane proteins?
  - Ease of removal?
  - Solubility?



# Glycolipids

- Heterogeneous membrane-bound compounds

- Roles