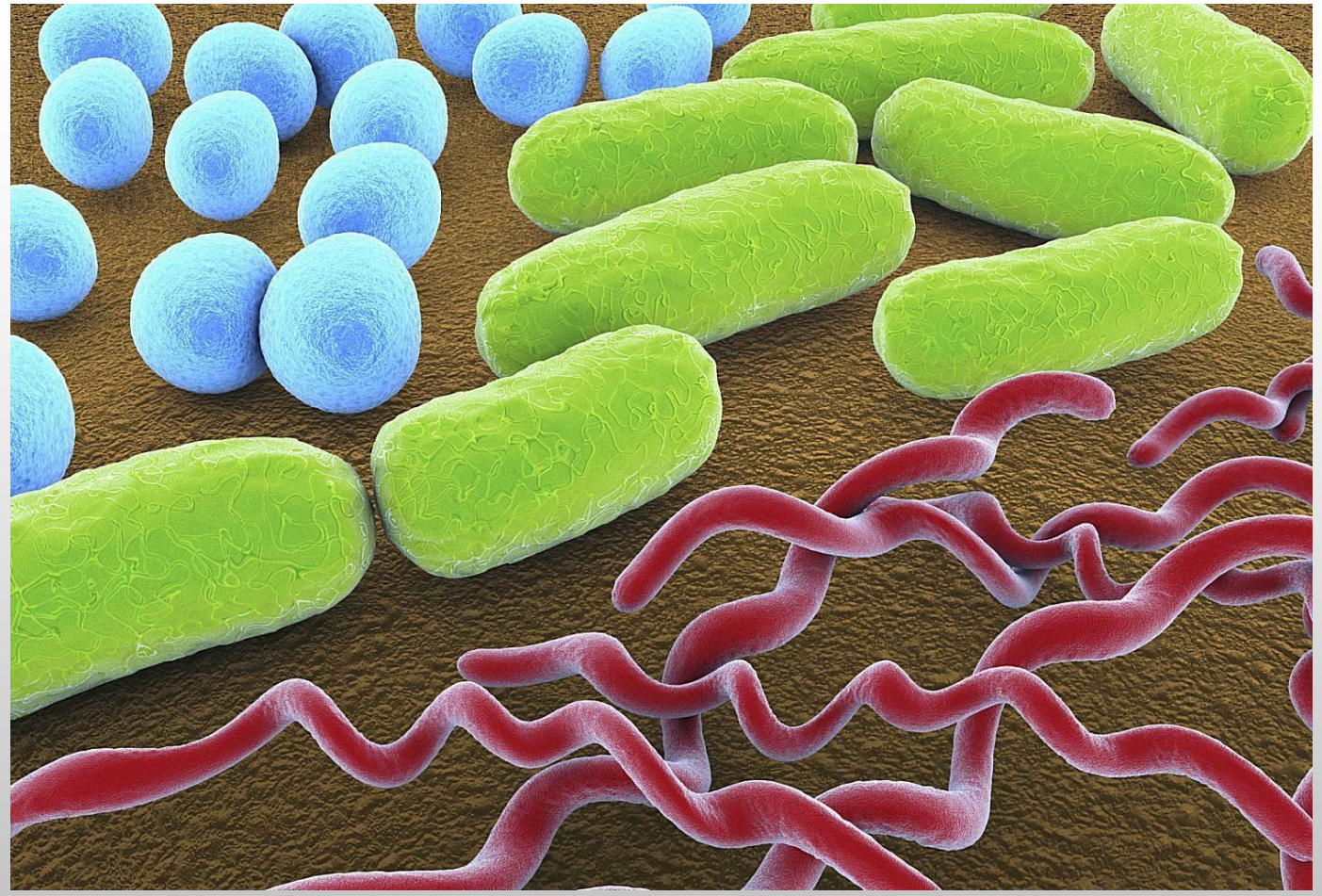
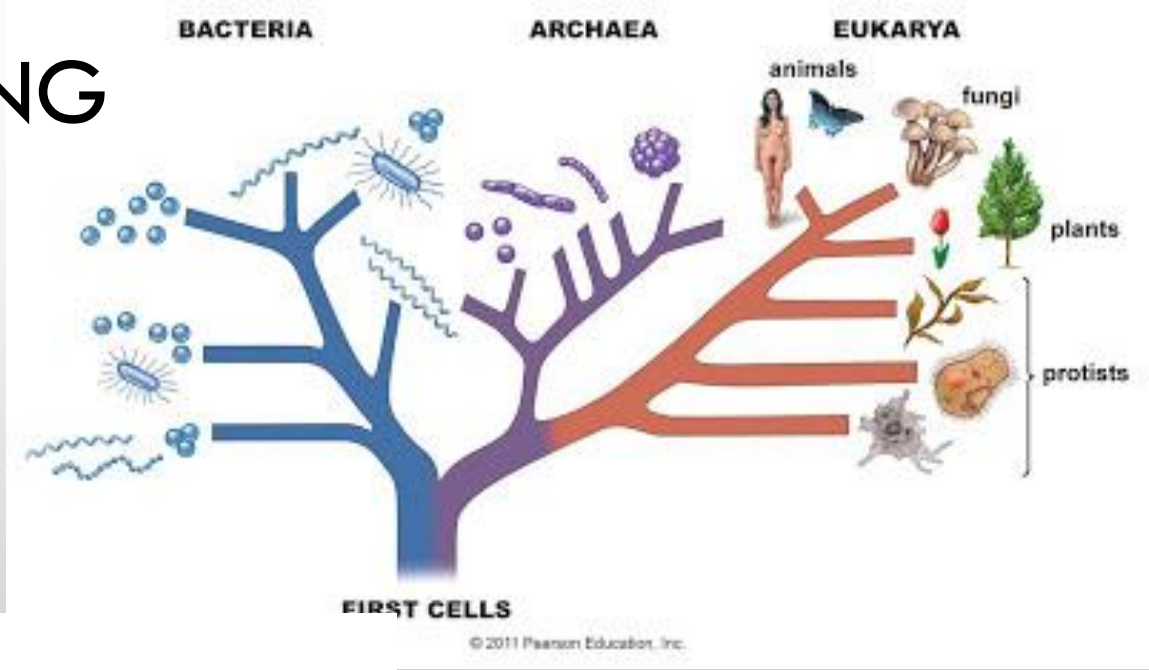
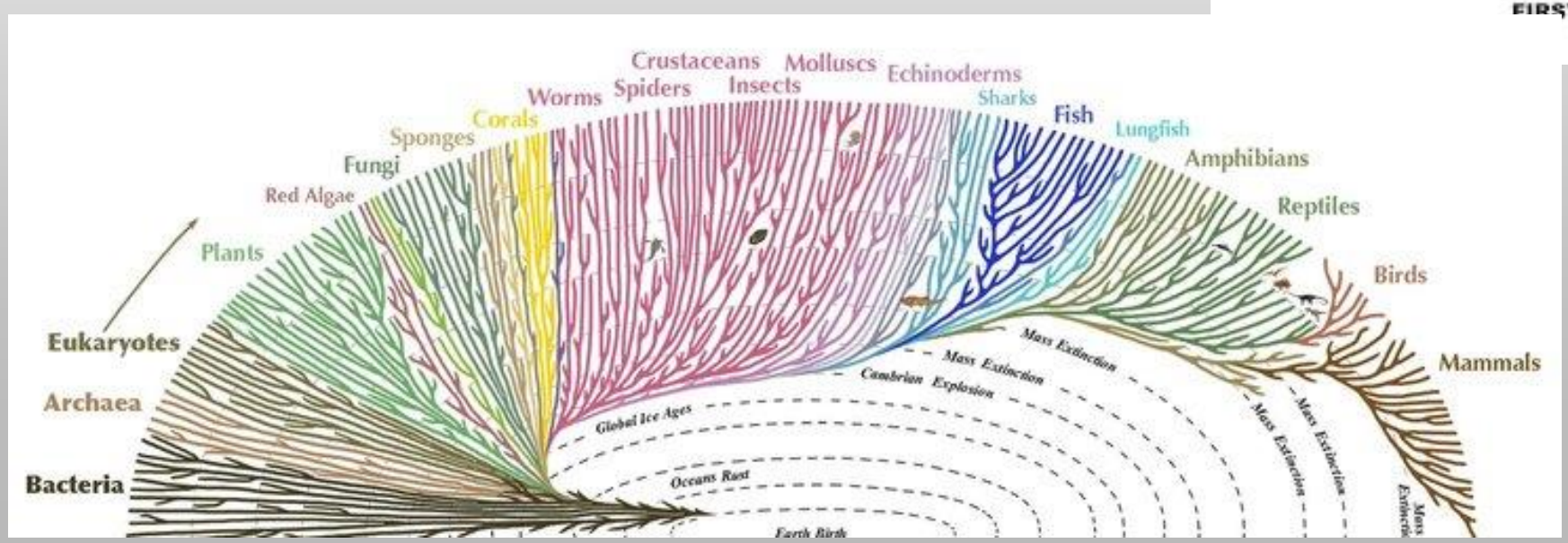
BACTERIA!



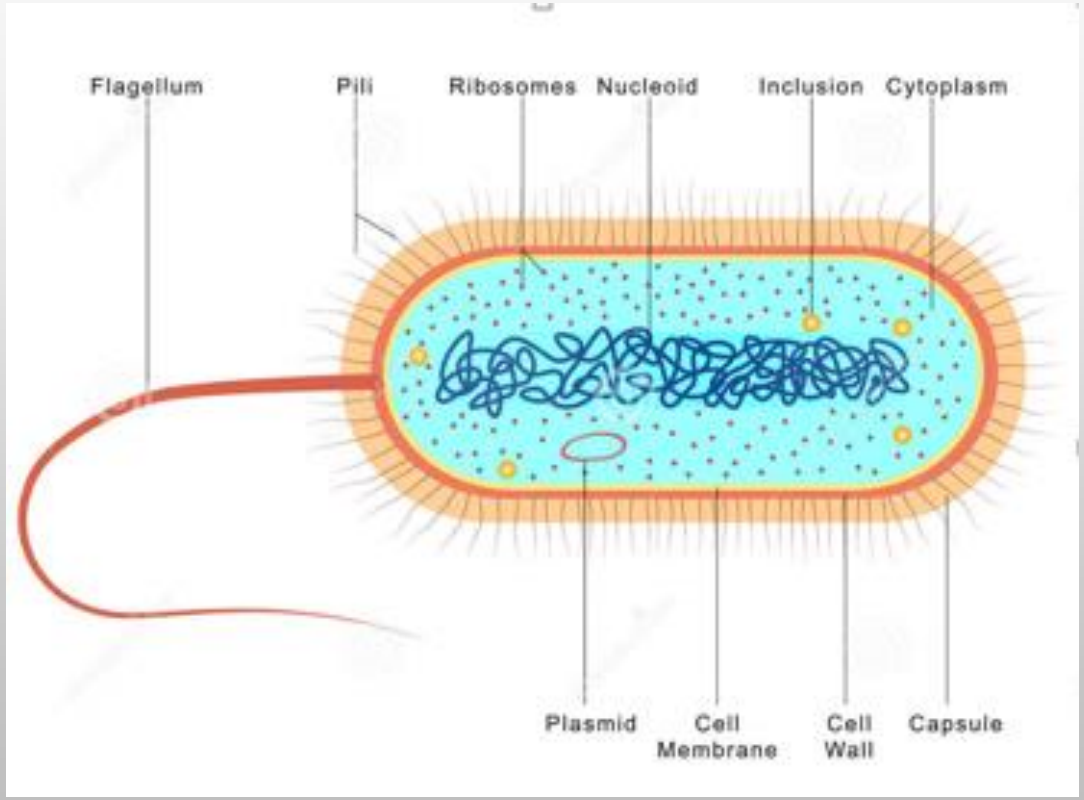
TRACING BACK TO THE BEGINNING





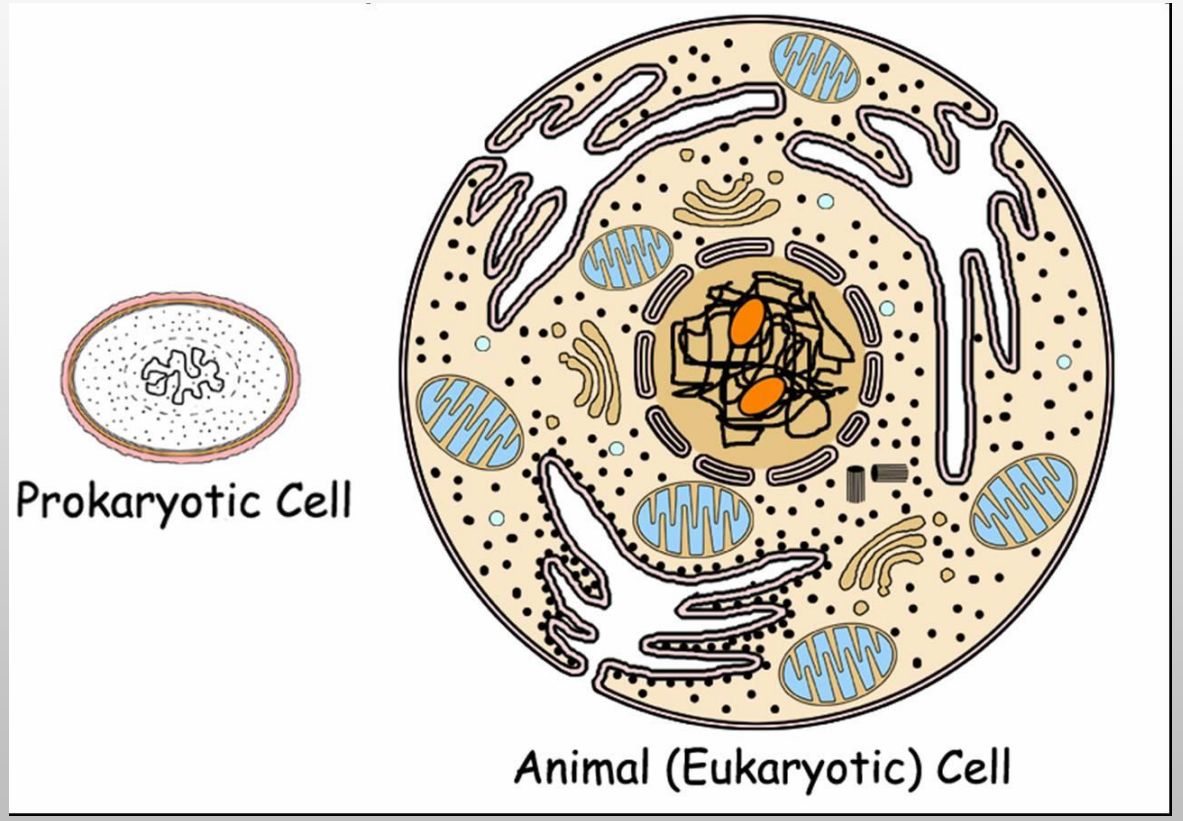
PROKARYOTES

- KINGDOM EUBACTERIA
- KINGDOM ARCHAEBACTERIA
- CHARACTERISTICS:
  - 1. NO NUCLEUS
  - 2. NO MEMBRANE BOUND ORGANELLES
  - 4. MOST ARE SMALLER THAN EUKARYOTES
  - 5. ARE SINGLE-CELLED ORGANISMS
  - 6. CONTAIN PLASMIDS
    - CIRCULAR INDEPENDENT DNA



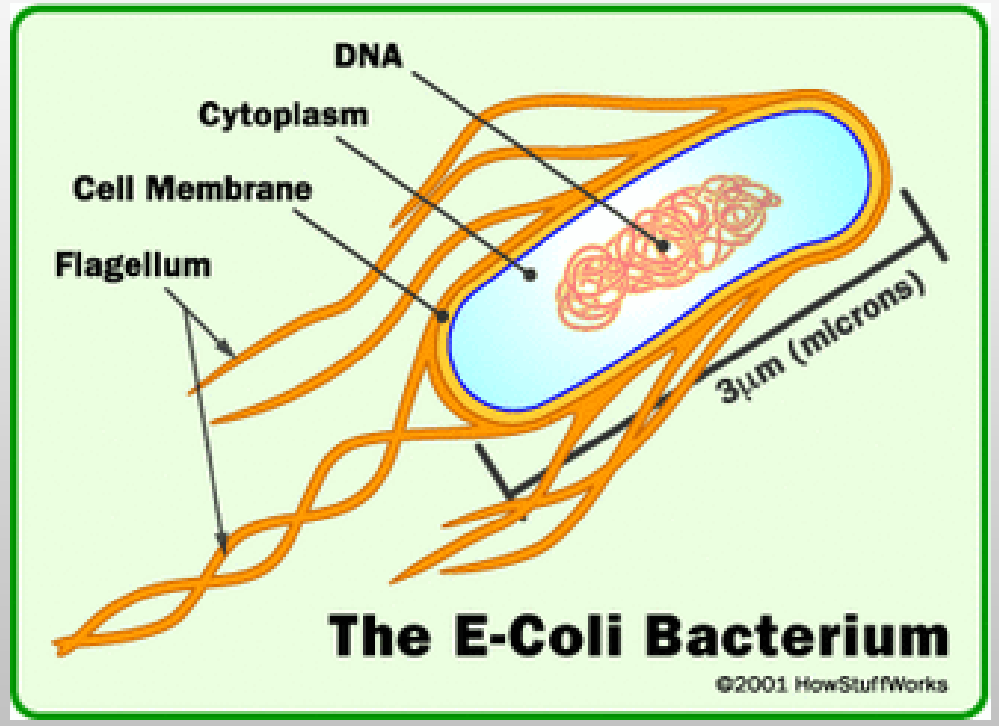
CLASSIFYING PROKARYOTES

- RECALL THAT ALL PROKARYOTES WERE PLACED IN KINGDOM MONERA
  - CURRENTLY SPLIT UP INTO TWO KINGDOMS
    - EUBACTERIA
    - ARCHAEBACTERIA
- SIZE RANGE
  - TYPICALLY RANGE BETWEEN 1 AND 5 MICROMETERS
    - EUKARYOTIC CELLS RANGE BETWEEN 10 AND 100 MICROMETERS



EUBACTERIA

- LARGER OF THE TWO KINGDOMS
- WIDE RANGE OF ORGANISMS
- LIVE ALMOST EVERYWHERE
  - FRESH WATER, SALT WATER, LAND, HUMAN BODY
- SURROUNDED BY A CELL WALL CONTAINING PEPTIDOGLYCAN (CARBOHYDRATE)
  - PROTECTS THE CELL FROM INJURY AND GIVES SHAPE
- HAS A CELL MEMBRANE
  - SOME HAVE A SECOND MEMBRANE FOR FURTHER PROTECTION

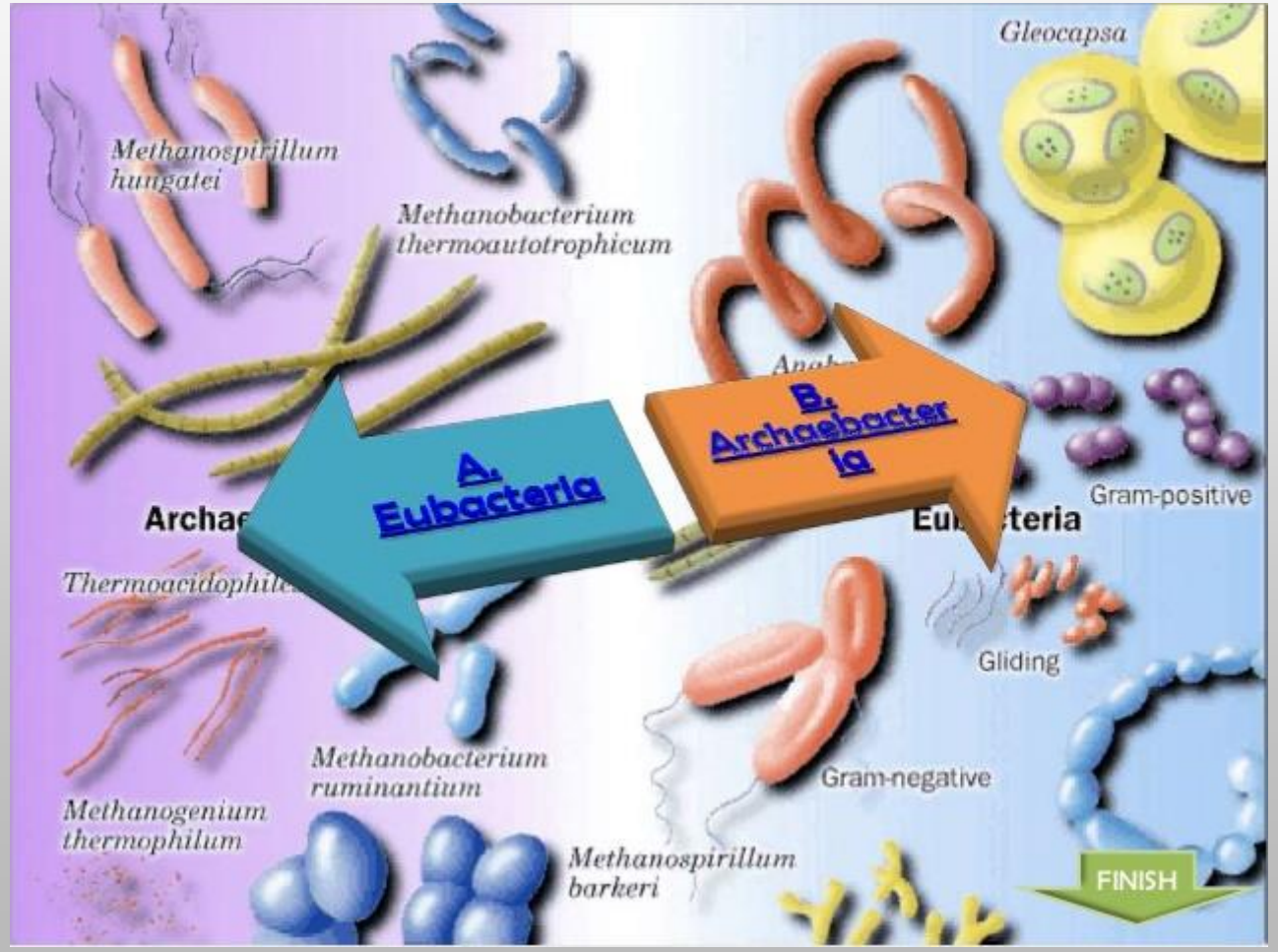


ARCHAEBACTERIA

- LOOKS SIMILAR TO EUBACTERIA
- MAJOR DIFFERENCES
  - CELL WALL DOES NOT CONTAIN PEPTIDOGLYCAN
  - ALSO HAVE DIFFERENT MEMBRANE LIPIDS(FATS)
  - DNA IS MORE SIMILAR TO EUKARYOTES THAN EUBACTERIA
    - MOST LIKELY THE ANCESTORS OF EUKARYOTES
- LIVE IN HARSH ENVIRONMENTS
  - OXYGEN FREE - METHANOGENS
  - EXTREME SALT – HALOPHILES
  - BOILING TEMPS - THERMOPHILES

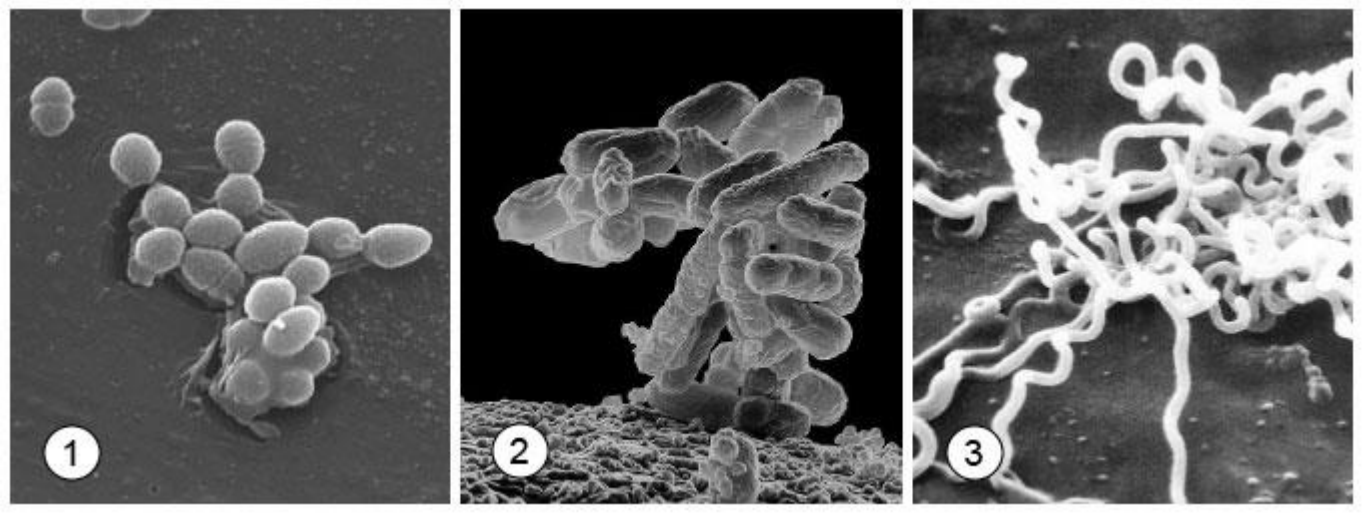
IDENTIFYING PROKARYOTES

- SHAPE
- CELL WALL
- MOVEMENT
- ENERGY

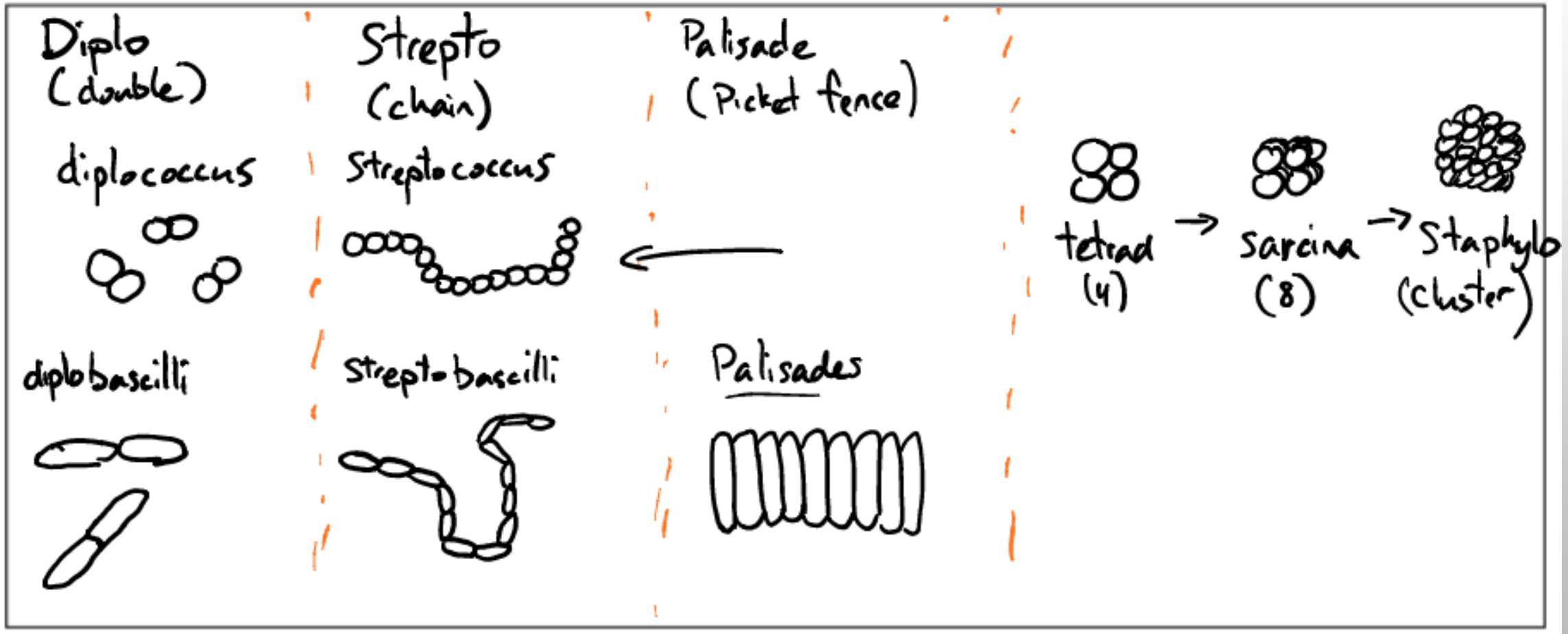


SHAPE

- 3 DIFFERENT SHAPES
  - ROD SHAPED- BACILLI (BUH-SIL-EYE)
  - SPHERICAL – COCCI (KAHK-SY)
  - SPIRAL – SPIRILLA (SPY-RIL-UH)

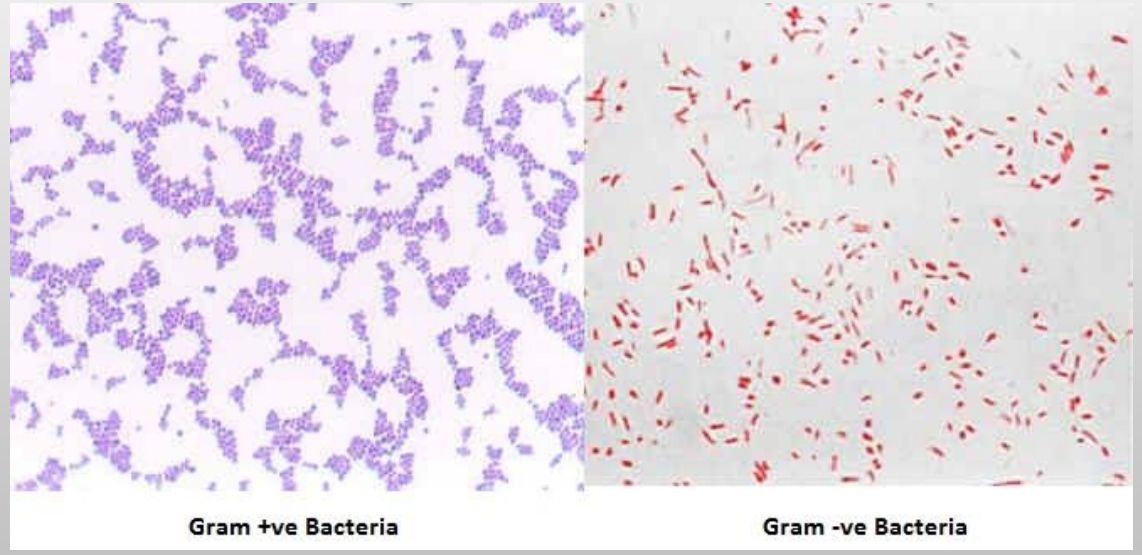


Prokaryote Arrangements:



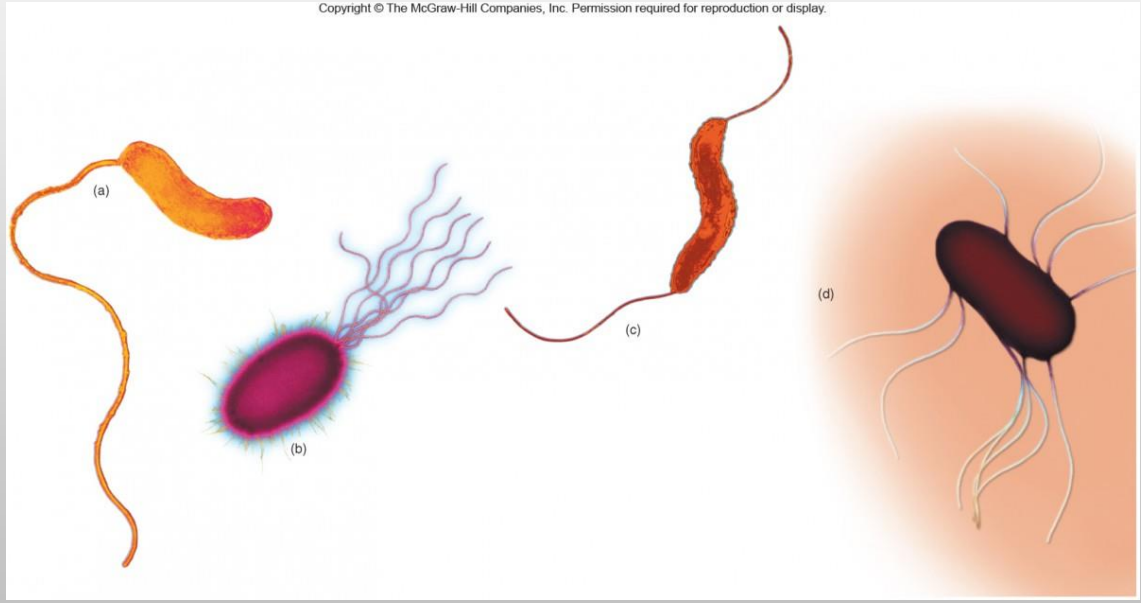
CELL WALL

- TWO TYPES OF CELL WALLS IN EUBACTERIA
- 1. GRAM POSITIVE BACTERIA
  - CELL WALL MADE OF PROTEIN AND SUGAR
  - TURN PURPLE AFTER GRAM STAINING
    - THICK WALL RETAINS STAIN
- 2. GRAM NEGATIVE BACTERIA
  - EXTRA LAYER OF LIPID OUTSIDE OF CELL WALL
  - TURN PINK/RED AFTER GRAM STAINING
    - THIN WALL DOES NOT RETAIN STAIN
  - REQUIRE DIFFERENT TYPES OF ANTIBIOTICS TO TREAT INFECTIONS



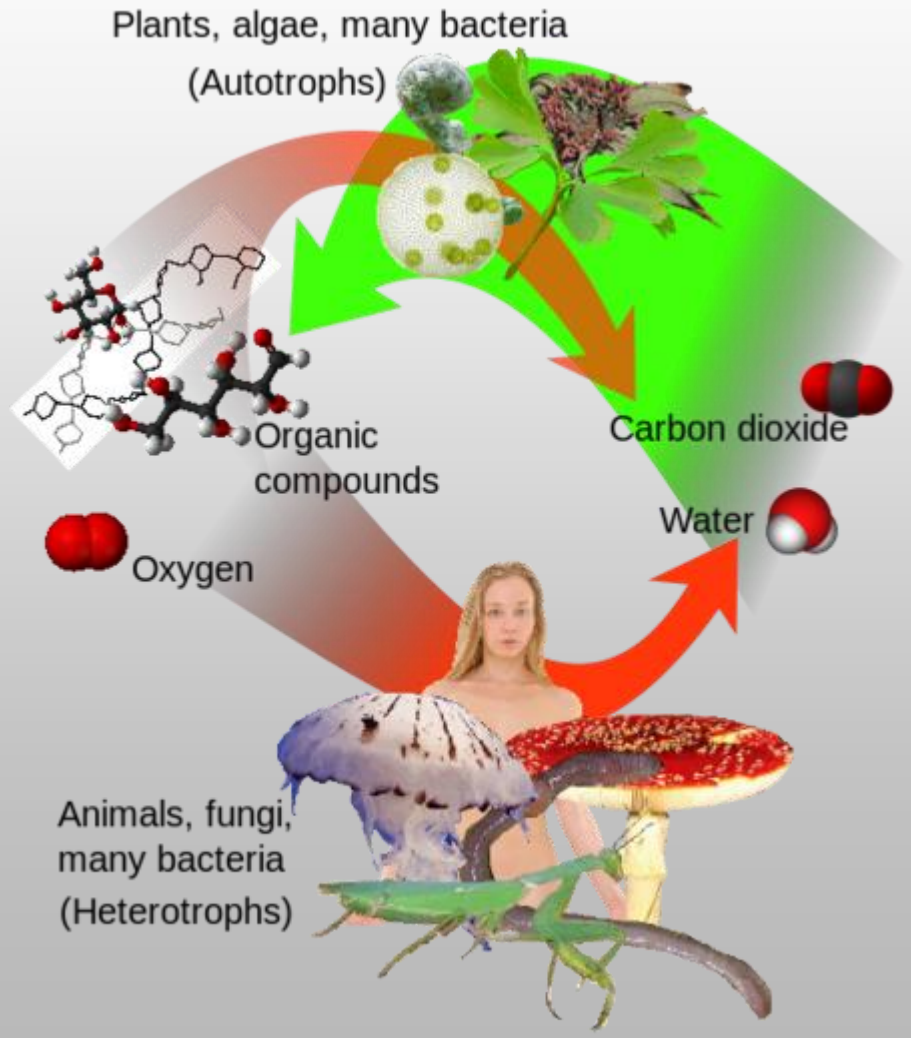
MOVEMENT

- SOME DO NOT MOVE
- THOSE THAT MOVE
  - VIA FLAGELLA
    - WHIP LIKE STRUCTURES
  - VIA CILIA
  - VIA LASHING, SNAKING OR SPIRALLING FORWARD
  - VIA GLIDING OVER SECRETED SLIME LAYER

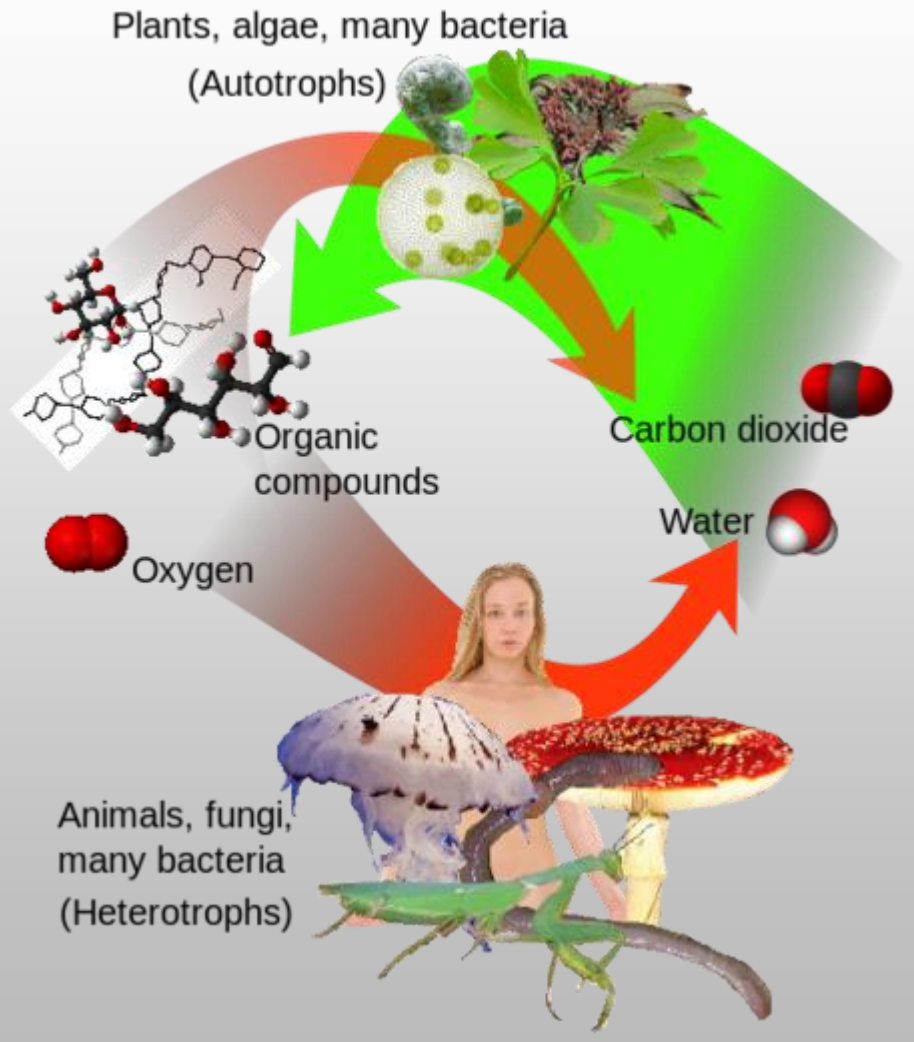


OBTAINING ENERGY

- MOST ARE HETEROTROPHIC
- MOST HETEROTROPHS ARE CHEMOHETEROTROPHS
  - MUST TAKE IN ORGANIC MOLECULES FOR ENERGY AND CARBON SUPPLY
- PHOTOHETEROTROPHS
  - USE SUNLIGHT FOR ENERGY BUT NEED TO TAKE IN ORGANIC MOLECULES FOR CARBON SUPPLY

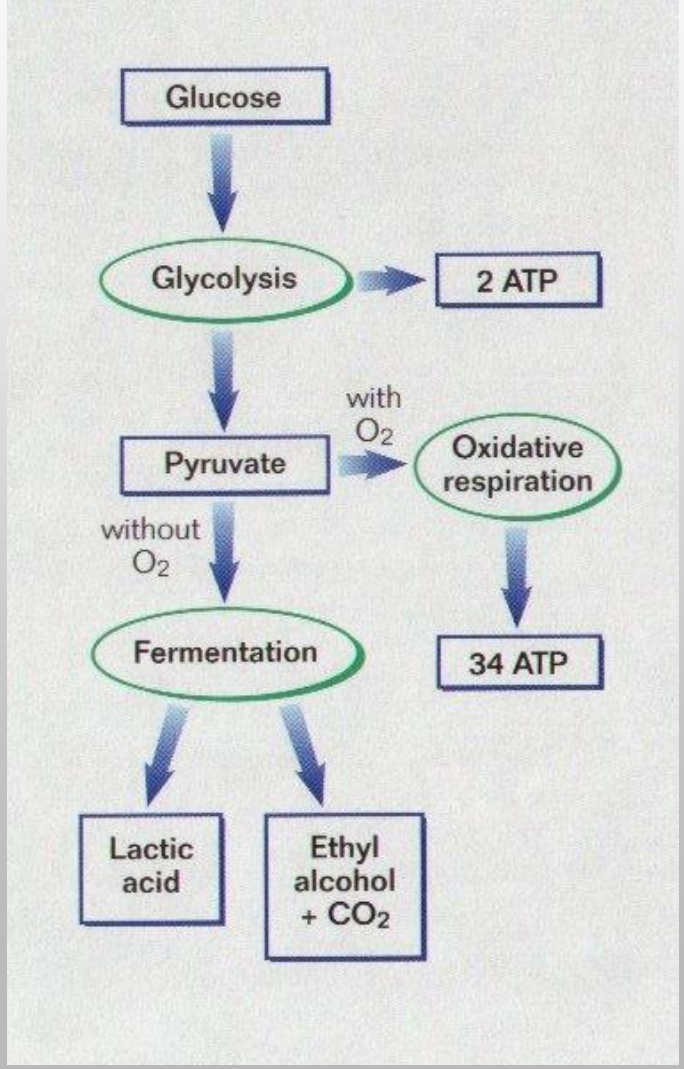


- AUTOTROPHS
  - PHOTOAUTOTROPHS
    - USE LIGHT ENERGY TO CONVERT CO2 AND H20 INTO ORGANIC MOLECULES AND OXYGEN
      - SIMILAR TO PHOTOSYNTHESIS IN PLANTS
  - CHEMOAUTOTROPHS
    - MAKE ORGANIC MOLECULES LIKE PHOTOAUTOTROPHS
    - HOWEVER DO NOT REQUIRE LIGHT AS THEIR SOURCE OF ENERGY
    - USE ENERGY FROM CHEMICAL REACTIONS INVOLVING AMMONIA, HYDROGEN SULFIDE, NITRITES, SULFUR OR IRON



USING/RELEASING ENERGY

- PROCESS BY WHICH NUTRIENTS ARE BROKEN DOWN TO PROVIDE ENERGY
  - CELLULAR RESPIRATION, FERMENTATION OR BOTH
    - A. OBLIGATE AEROBES
      - NEED OXYGEN TO LIVE (EG. TUBERCULOSIS)
    - B. OBLIGATE ANAEROBES
      - KILLED BY OXYGEN (EG. CLOSTRIDIUM TETANI IN DEEP WOUNDS)
    - C. FACULTATIVE ANAEROBES
      - CAN USE OXYGEN IF IT IS AVAILABLE BUT IT DOES NOT KILL THEM (EG. E. COLI IN HUMAN INTESTINES)

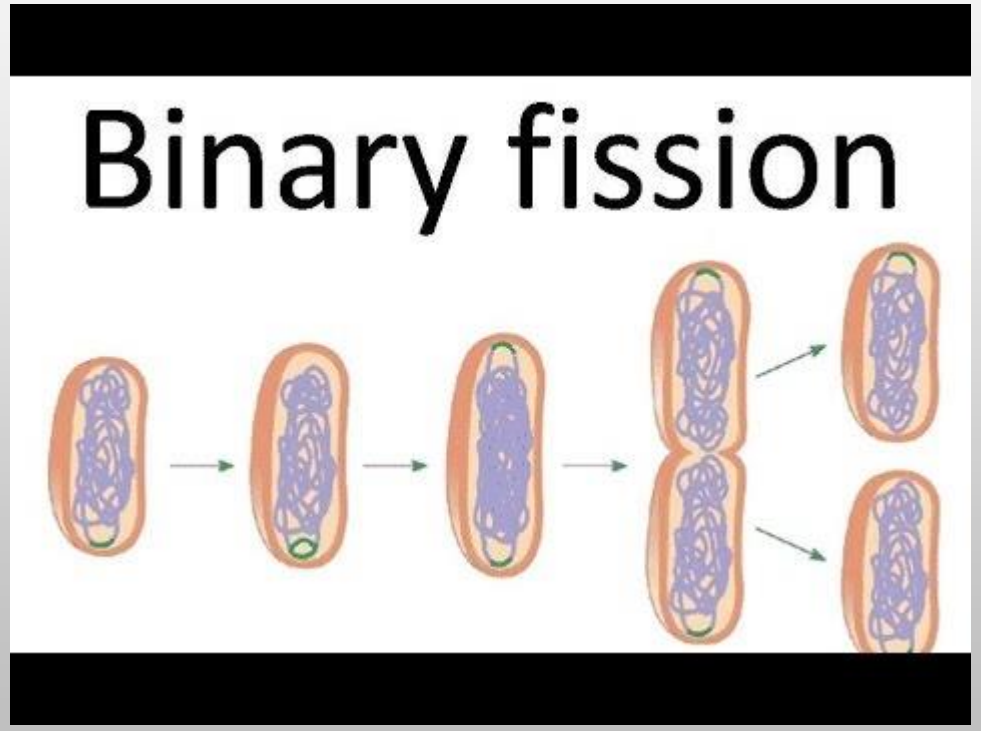


GROWTH AND REPRODUCTION

- IN IDEAL CONDITIONS
  - REPRODUCE VERY QUICKLY
  - DIVIDE APPROX. EVERY 20 MINUTES
- GROWTH IS KEPT IN CHECK BY
  - FOOD/SPACE AVAILABILITY
  - PRODUCTION OF WASTES

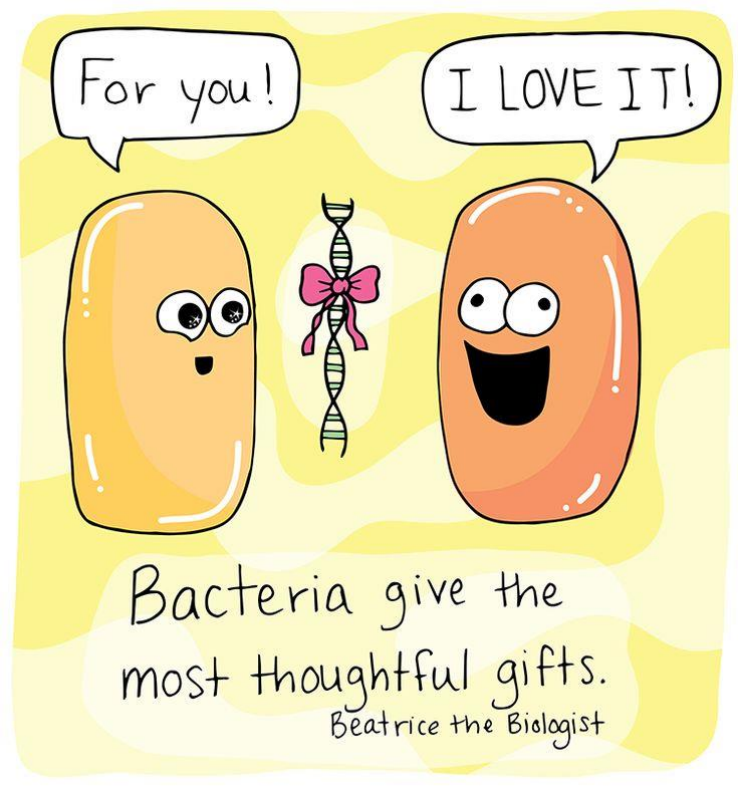
BINARY FISSION

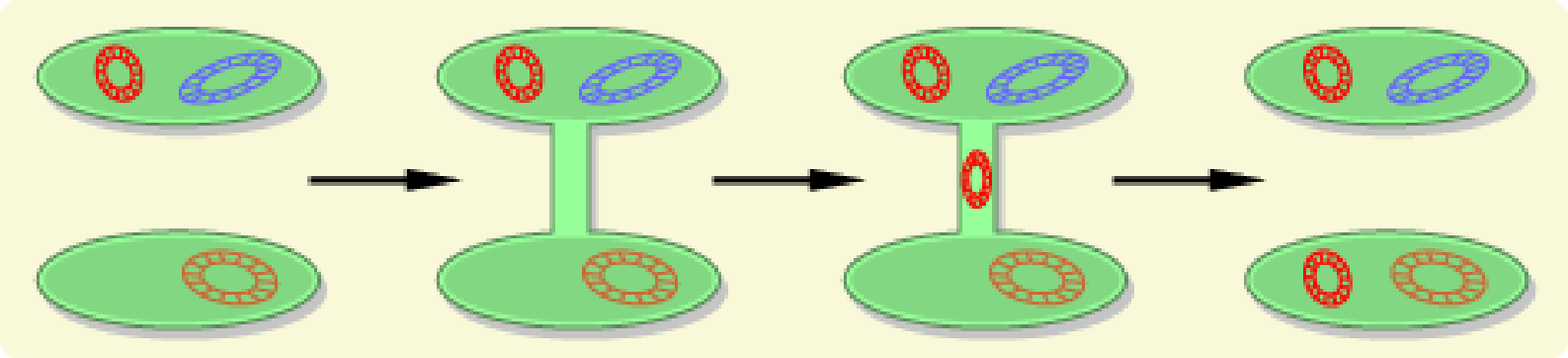
- ASEXUAL REPRODUCTION
- METHOD OF REPRODUCTION FOR MOST BACTERIA
  - OCCURS UNDER NORMAL CONDITIONS
  - PROCESS:
    - 1. DNA REPLICATES (IE. DOUBLES)
    - 2. CELL DIVIDES
    - 3. RESULT: 2 IDENTICAL DAUGHTER CELLS



CONJUGATION

- SEXUAL REPRODUCTION
- DNA IS EXCHANGED BETWEEN BACTERIA CELLS
- CELL TO CELL CONTACT USING PILI
- INCREASES DIVERSITY





SPORE FORMATION

- SOME BACTERIA CAN TRANSFORM INTO A DORMANT STATE CALLED AN ENDOSPORE
- IT ALLOWS BACTERIA TO SURVIVE DIFFICULT CONDITIONS
- BACTERIA FORM A THICK WALL AROUND ITSELF
- ABLE TO RESIST HEAT, DROUGHT, RADIATION
- WHEN CONDITIONS IMPROVE
  - ENDOSPORE WILL GERMINATE AND BACTERIUM WILL BEGIN TO GROW AGAIN