Genetic Exchange

- Horizontal versus Vertical genetic exchange
  - Movement of DNA from bacterium to bacterium occurs in 3 means:
- Conjugation
  - direct transfer of genetic material from cell to cell
- Transformation
  - uptake of naked DNA from environment
- Transduction
  - transfer of bacterial DNA via bacteriophage

Bacterial Genetics

- Obviously DNA must move from one bacterium to another
- Conjugation
  - cell to cell
- Transformation
  - DNA from environment
- Transduction
  - DNA via bacteriophage

Plasmids

- Small circular, self-replication DNA particle in bacteria
  - contain non-essential genes
  - necessary for conjugation
  - F plasmids contain genes for F (fertility or sex) pili which link cells in conjugation (may provide conduit for transfer of plasmids)
  - R plasmids contain genes for antibiotic resistance (may have up to 10 different genes)
  - Col plasmids contain bacteriocins which destroy other bacteria
  - and others----

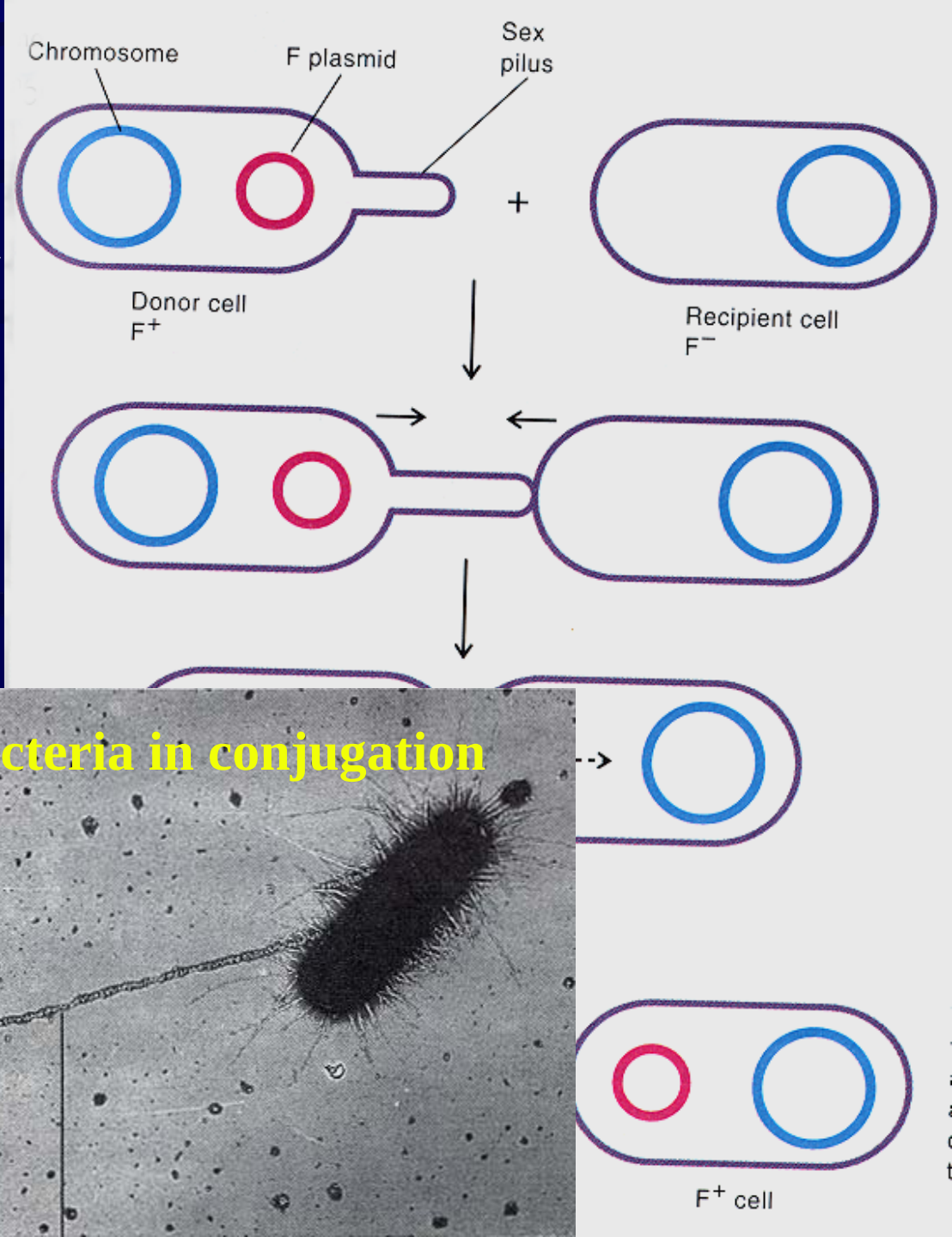
Conjugation

-- This is the normal method

-- The cell must contain the F-plasmid which contains genes for the F-pilus

--Only the plasmid (and its genes) are trans

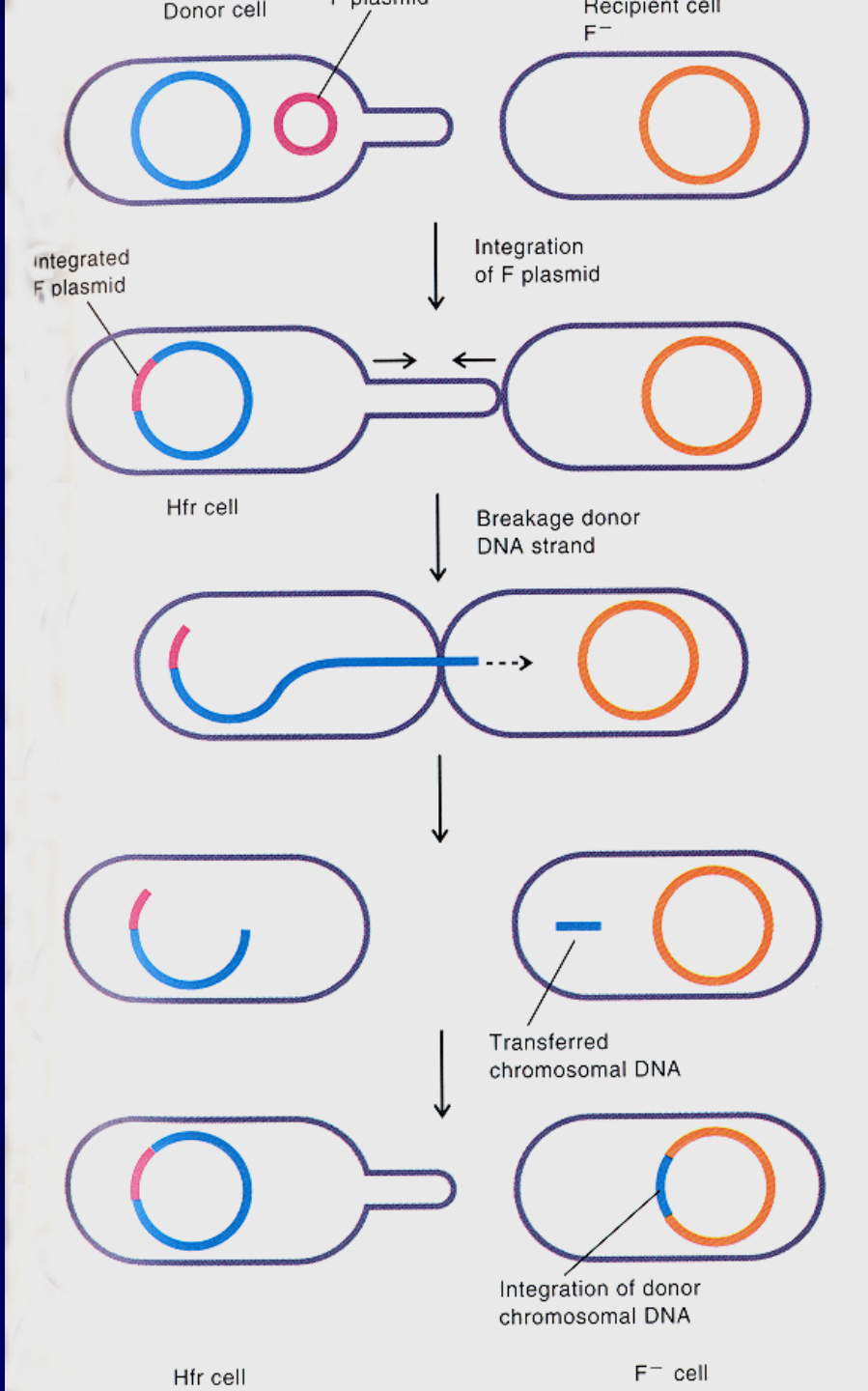
-- But the F plas
contain:
-R genes
-Col genes
-etc.



Rarely, the F plasmid becomes integrated into the genome of the bacterium.

It can still form the F-pilus then begin transferring the cell's genome.

But it usually only gets a small portion transferred before the connection is broken.

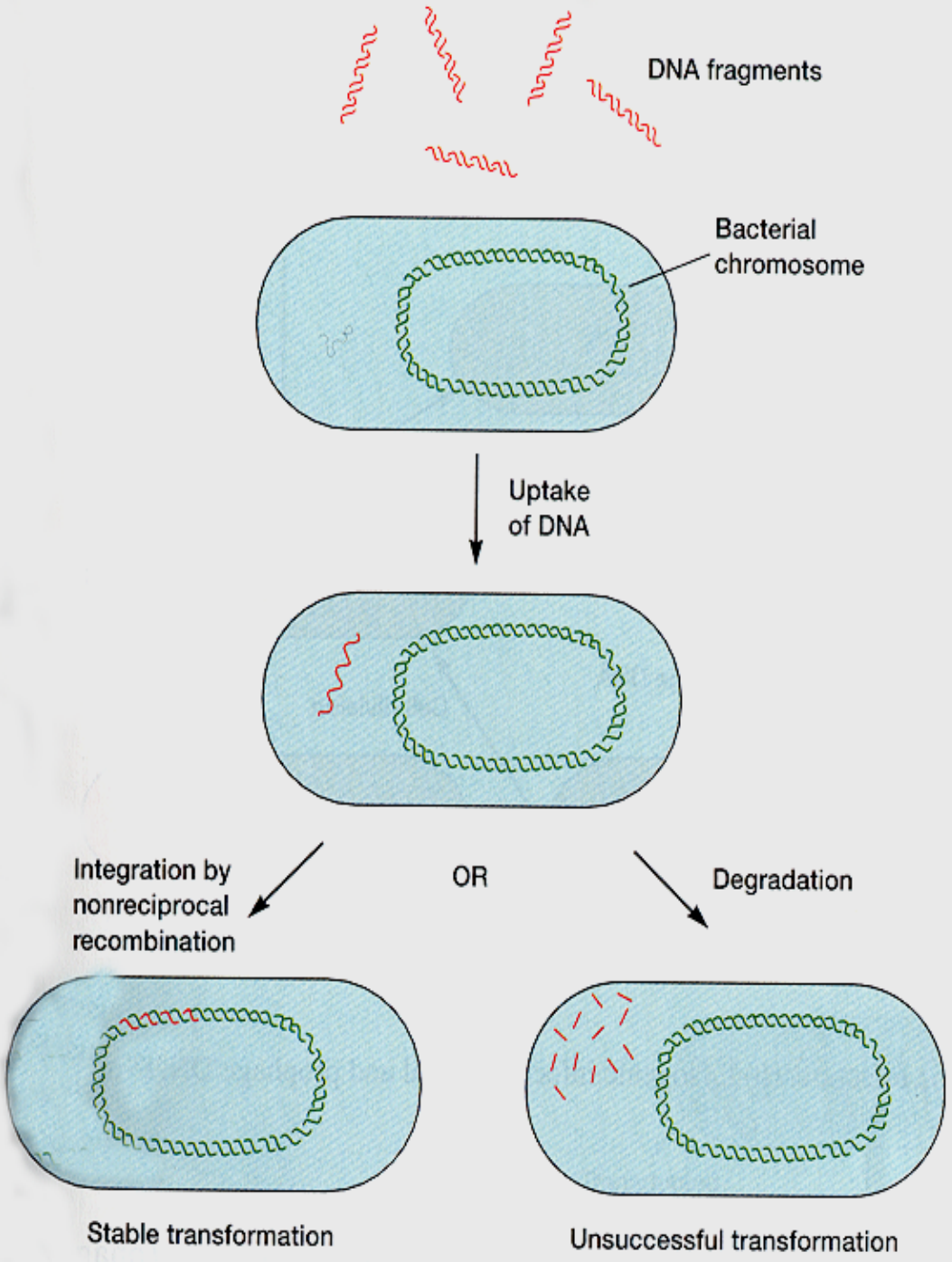


Transformation

Bacteria can take up naked DNA from their environment.

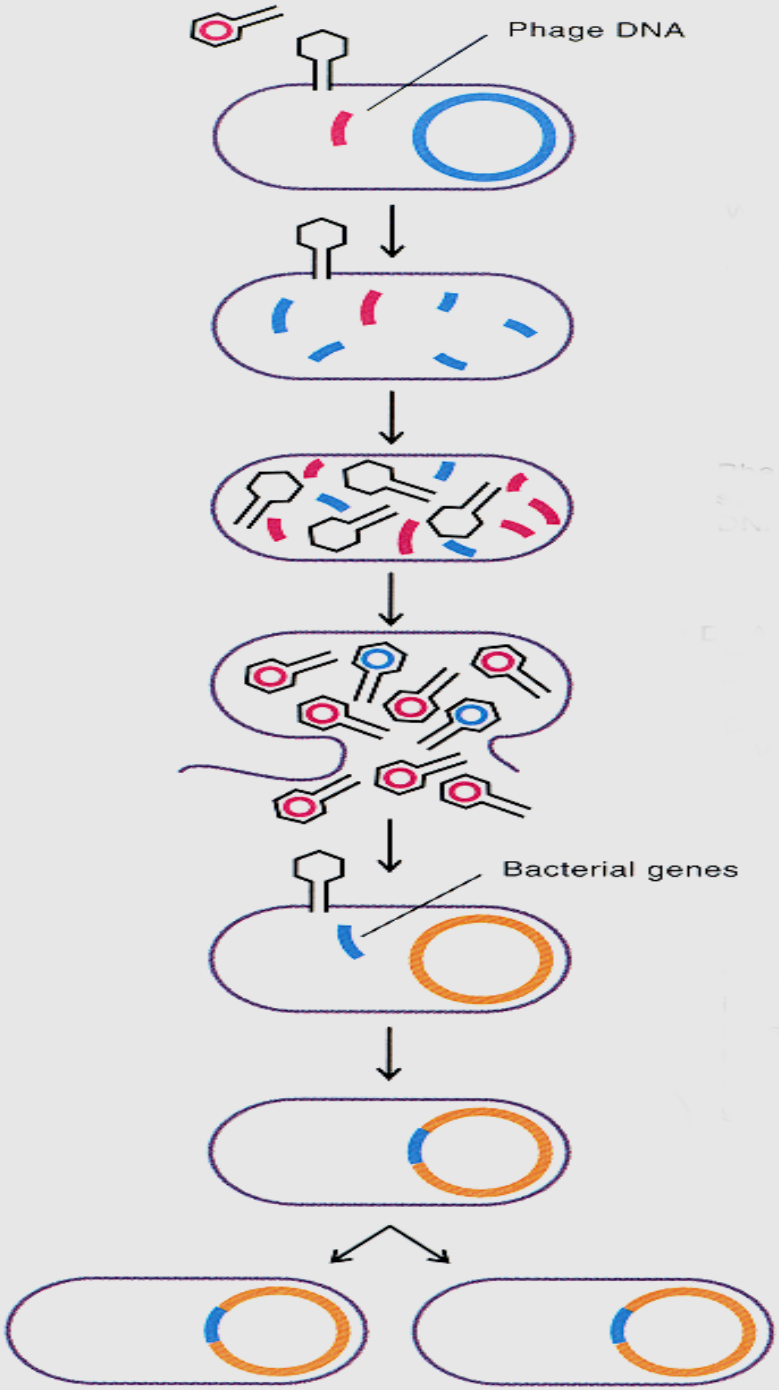
This DNA comes from lysis of dead bacteria.

It may be integrated into the genome of the cell or may be degraded



TRANSDUCTION

This process requires a bacteriophage and the incorporation of genomic DNA into the phage DNA



Metabolism:

- **Catabolism: breaking down larger organic compounds into smaller subunits; liberates energy.**
- **Anabolism: building large organic compounds from smaller subunits; requires energy expenditure.**
- **ATP is the energy currency of living cells**

Biosynthesis:

- Biological macromolecules are all made by dehydration synthesis. Four types exist:
  - Polysaccharides: Made from monosaccharides; function in support, protection, and storage
  - Proteins: Made from amino acids; function in support, transport, signaling, and as enzymes
  - Nucleic acids: Made from nucleotides; function in information transfer and energetics
  - Lipids: Made from glycerol and fatty acids; function in membranes, storage, and hormones

Prokaryotic Protein Synthesis

- **Ribosomes:**
  - **The cytoplasmic organelles for protein synthesis**
- **How do these work?**
  - **Eukaryote:**
    - **40s + 60s = 80s?**
  - **Prokaryotes:**
    - **30s + 50s = 70s?**
- **Why is this important??**