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Cell Size

- Cells can range from 10μm to a few mm
  - Prokaryotes(bacteria and archea) are on the smaller end
  - Eukaryotes are on the larger end
    - Frog egg cell is commonly used in experiments, because of it's large size

Prokaryotic Cells

- Defined as cells that don't have a nucleus
- Unicelluar and typically are 1μm-10μm
- Possess a plasma membrane **and** a cell wall
  - Cell wall makes cell rigid and acts as defense against **osmotic shock**
    - **Osmotic shock** = stress caused by water coming in or out of the cell too quickly

Eukaryotic Cells

- Defined as cells that possess a nucleus and well-defined organelles
- Can be much larger than prokaryotes(typically 10μm-100μm)
  - Size is bounded below(*i.e.* it cannot be too small) by **surface-area-to-volume ratio**
    - Need enough surface area at plasma membrane to absorb nutrients and export toxins
  - Size is bounded above by stability
- Must have a way to regulate osmotic pressure
  - Solution is protein-based pumps

Origins of Eukaryotic Cells

- **Endosymbiotic Theory** = idea that symbiotic relationships between prokaryotes developed and eventually turned into organelles
  - Also called "endosynbiont theory"
  - Evidence
    - Mitochondrial DNA is a circular chromosome
    - Mitichondria have ribosomes that are like those of prokaryotes

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Linkage

- **Linkage** = an effect of when genes are arranged linearly on a chromosome
  - If they are in proximity on chromosome, they become *linked*
    - This means that they will sort *dependently*

Crossing Over

- During aligning of chromosomes in meiosis, if genes aren't linked, individual alleles can swap over
  - The class of gametes with with these swapped alleles are called **recombinant**
  - **Recombinant frequency** = the percentage of gametes that are recombinant
    - The closer two genes are, the less likely the genes are to cross over
      - This means that the recombinant frequency will be lower
    - We can use recombinant frequences to get the distance between gene sequences on the chromosome