

DNA Replication Mechanism

Semiconservative Replication

- Each strand serves as template
- Two identical daughter DNA molecules
- Proven by Meselson-Stahl experiment

Key Enzymes

- **Helicase:** Unwinds DNA helix
- **Primase:** Synthesizes RNA primers
- **DNA Pol III:** Main replication ($5' \rightarrow 3'$)
- **DNA Pol I:** Removes primers
- **Ligase:** Joins Okazaki fragments

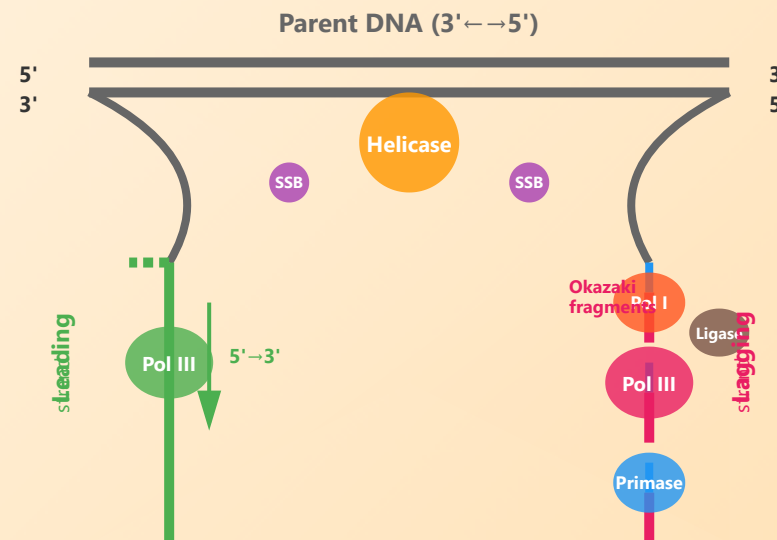
Leading vs Lagging

- **Leading:** Continuous synthesis
- **Lagging:** Discontinuous (Okazaki)
- Fragment size: 1000-2000 nt

✓ Proofreading & Fidelity

- $3' \rightarrow 5'$ exonuclease activity
- Error rate: ~ 1 in 10^7 bases
- Mismatch repair systems

DNA Replication Fork - Detailed Mechanism



— RNA primer
 — New DNA (leading)
 — New DNA (lagging)
 ● Enzymes

Fork movement → 