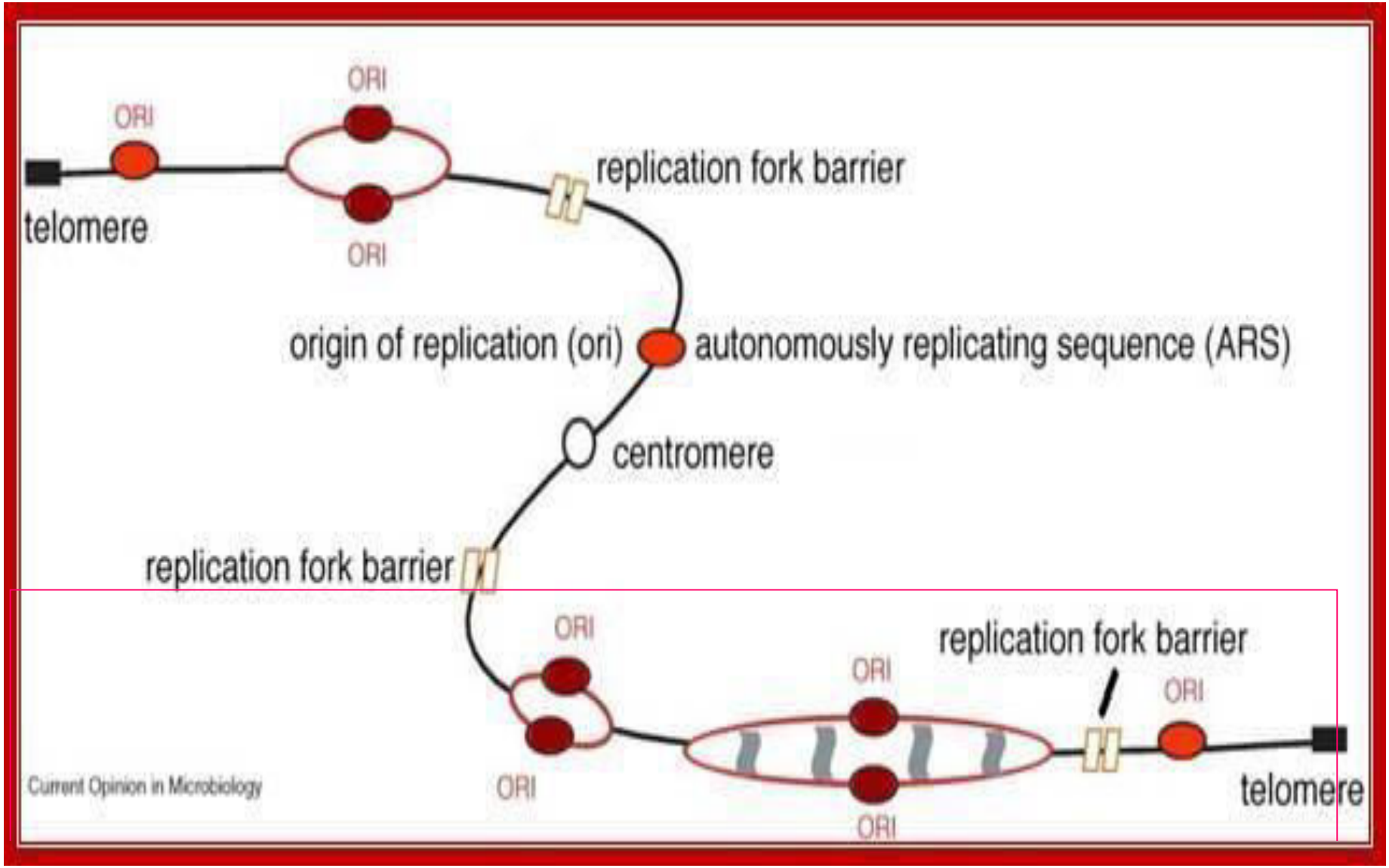
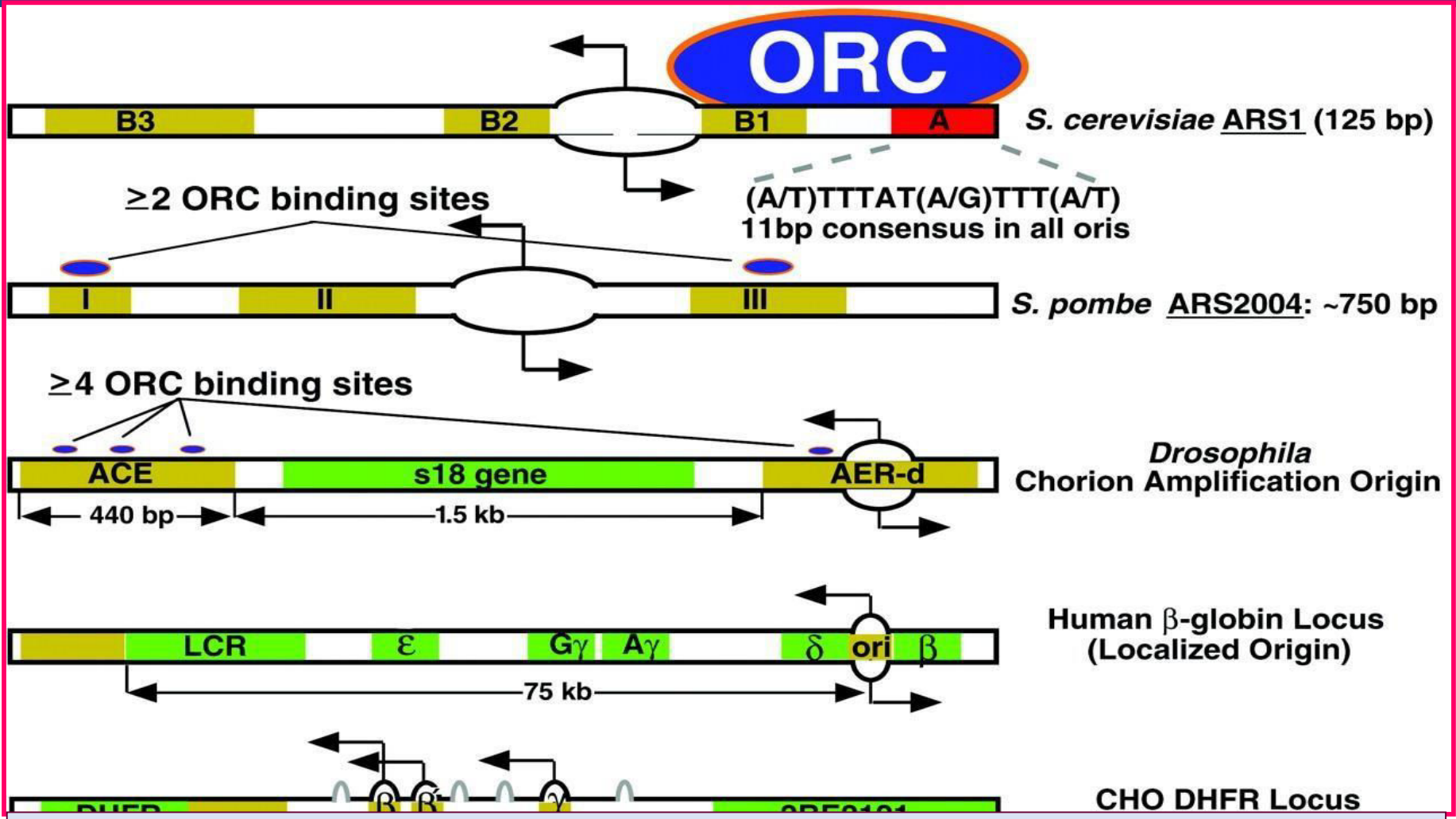
FACULTY OF ENGINEERING &TECHNOLOGY
DEPARTMENT OF BIOTECHNOLOGY

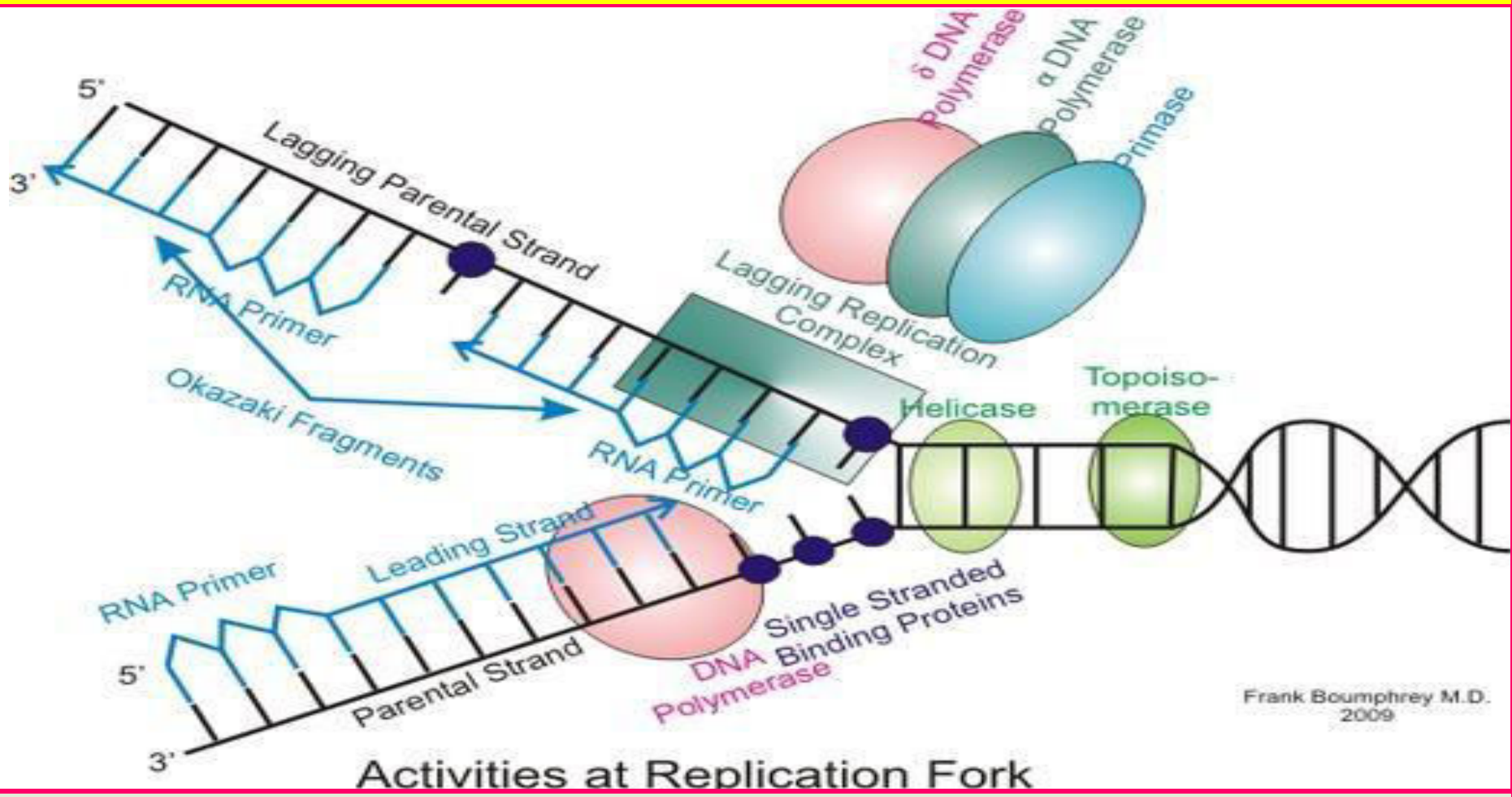
- In **Eukaryotic DNA Replication** occurs in the **S phase of the cell cycle.**
- Eukaryotic DNA Replication is bidirectional occurring at the multiple sites simultaneously .
- The **Replication origins** are present in **clusters** called **Replication units.** In human ,there are about 100 ori of replication consisting of 1000 base pairs each.
- Each **replicon** consist of replication bubbles with two replication forks moving in opposite directions. **Replication** continues until the replication bubbles merge together.
- **The mechanism is similar to that seen in prokaryotes.**
- There are 5 different types of DNA polymerases which catalyze replication and repair . **(Pol α, Pol β, Pol γ, Pol ε, Pol δ)**


ORI
ORI
ORI
telomere
replication fork barrier
origin of replication (ori)
autonomously replicating sequence (ARS)
centromere
replication fork barrier
ORI
ORI
ORI
replication fork barrier
ORI
telomere
Current Opinion in Microbiology

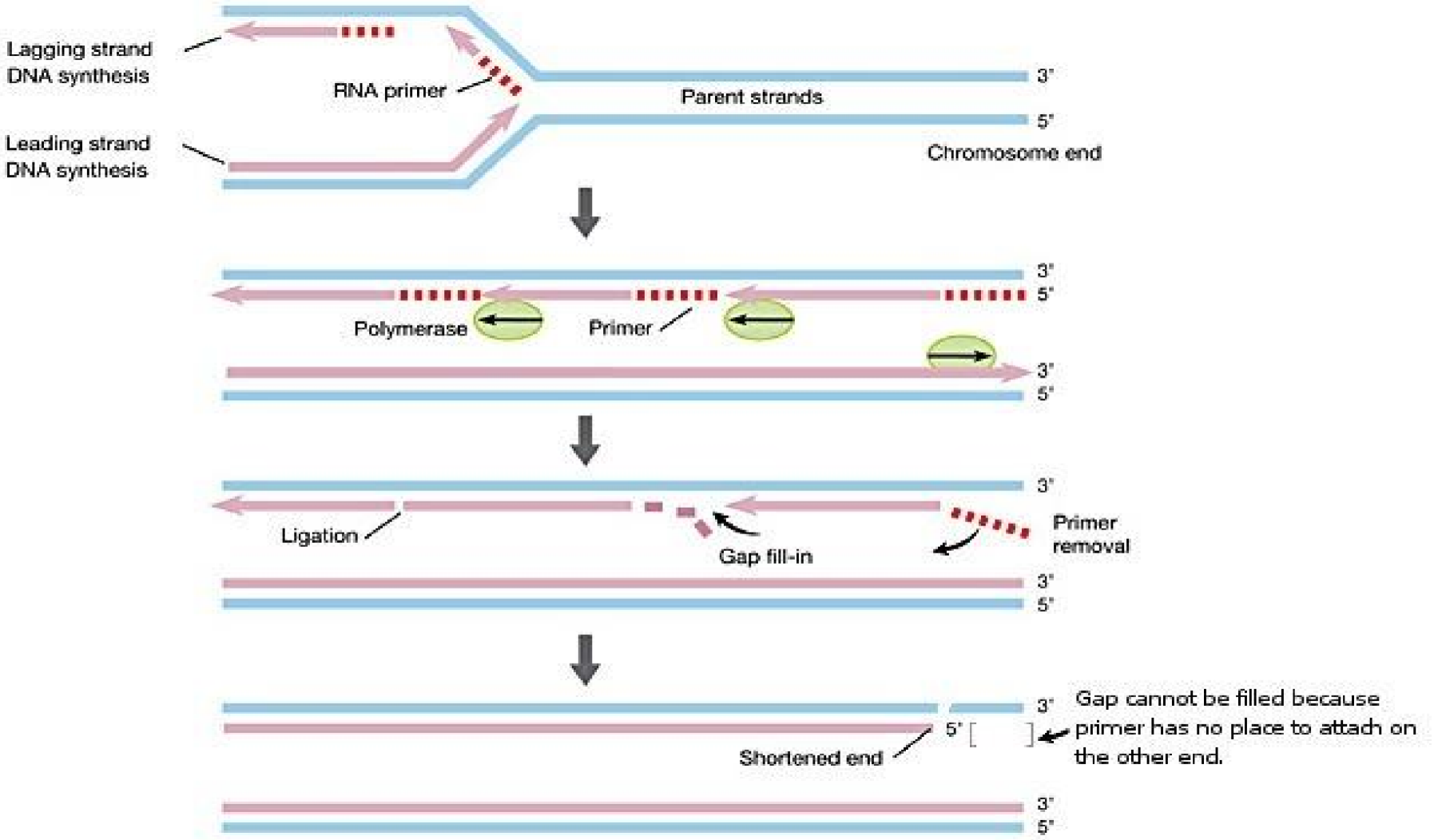

ORC
B3
B2
B1
A
S. cerevisiae ARS1 (125 bp)
(A/T)TTTAT(A/G)TTT(A/T)
11bp consensus in all oris
≥2 ORC binding sites
I
II
III
S. pombe ARS2004: ~750 bp
≥4 ORC binding sites
ACE
s18 gene
AER-d
440 bp
1.5 kb
Drosophila
Chorion Amplification Origin
LCR
ε
Gγ
Aγ
δ
ori
β
75 kb
Human β-globin Locus
(Localized Origin)
CHO DHFR Locus

- **Functions of proliferating cell nuclear antigen (PCNA): PCNA** binds to DNA polymerase δ (function similar to polymerase III of E.Coli). The binding of PCNA to polymerase δ , increases enzyme processivity and starts replicating long stretches of deoxyribonucleotides .

- This process is called **polymerase switching** because polymerase δ replaces polymerase α.



The mechanism of Eukaryotic DNA replication is similar to that seen in prokaryotes.


Lagging strand
DNA synthesis
Leading strand
DNA synthesis
RNA primer
Parent strands
3'
5'
Chromosome end
Polymerase
Primer
Ligation
Gap fill-in
Primer
removal
Shortened end
Gap cannot be filled because
primer has no place to attach on
the other end.