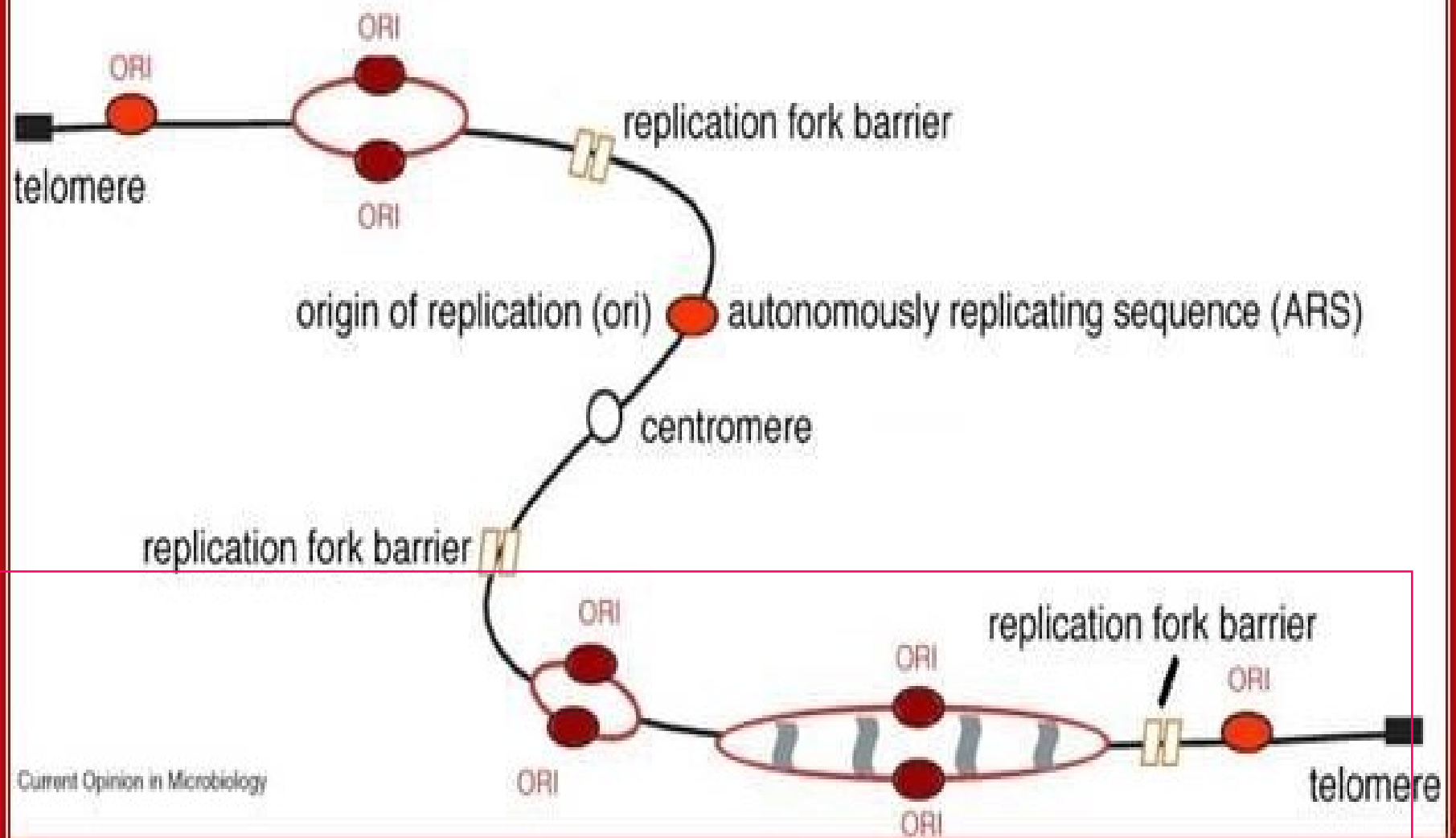
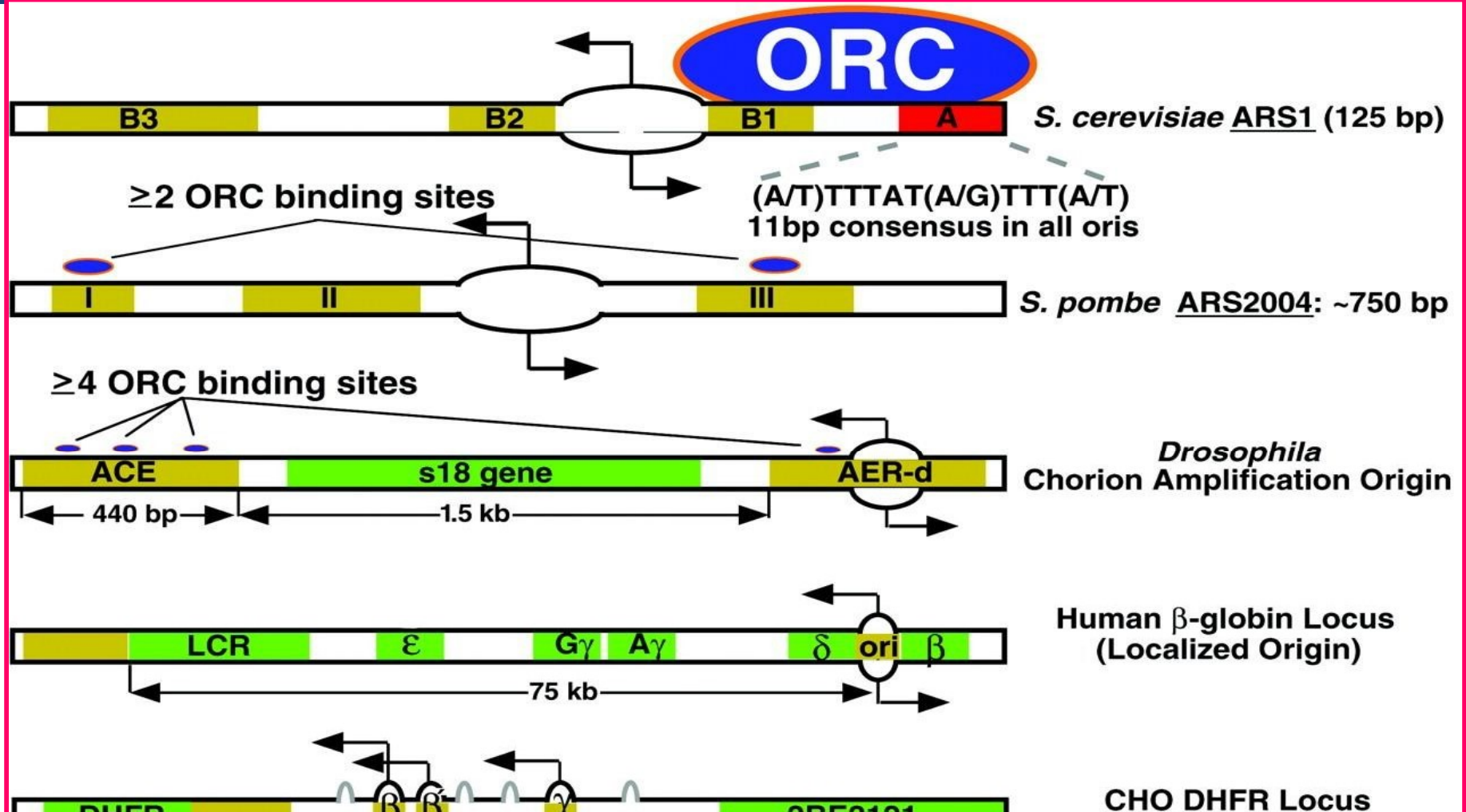




FACULTY OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF BIOTECHNOLOGY

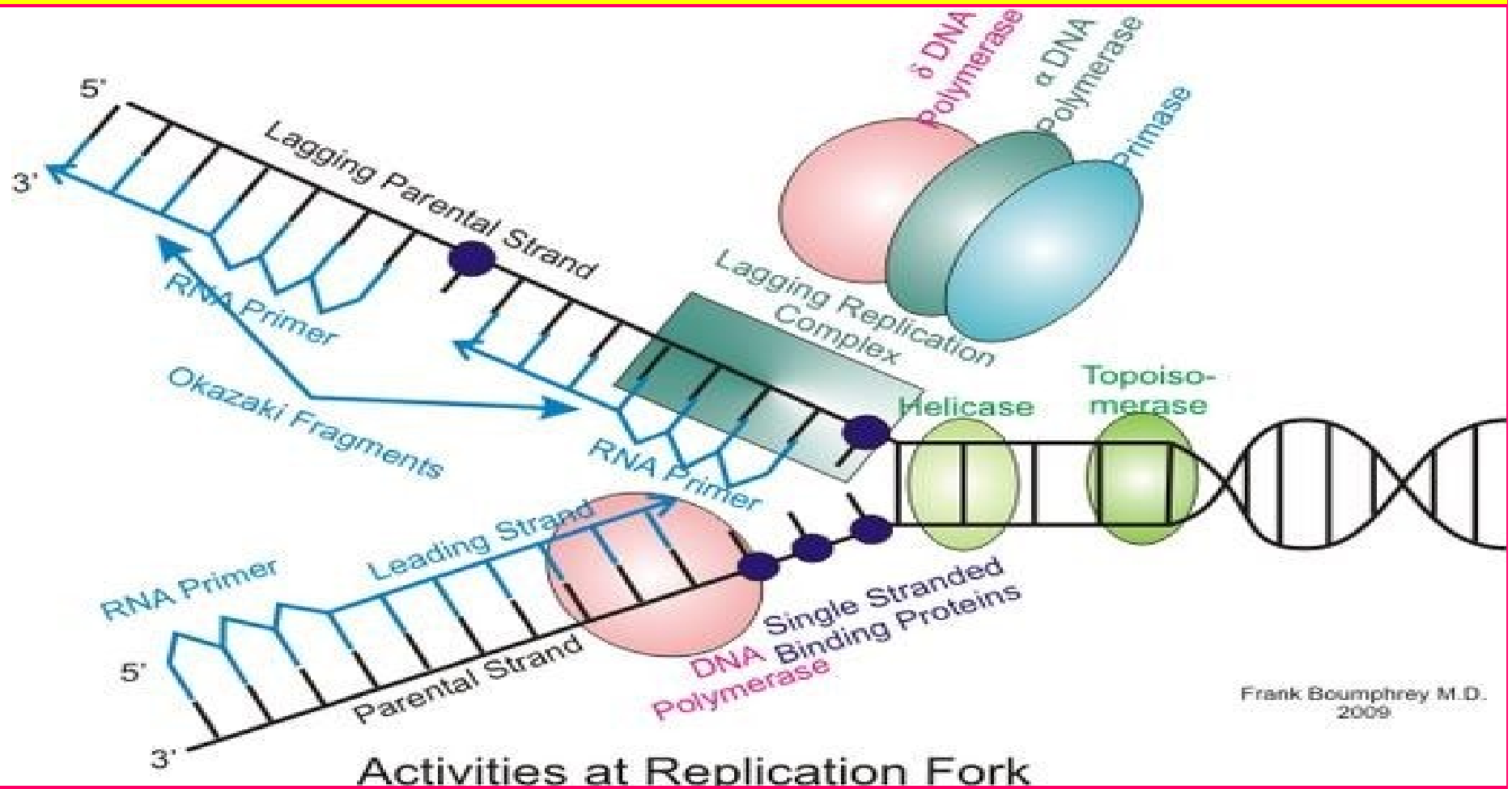
- In **Eukaryotic DNA Replication** occurs in the **S phase of the cell cycle**.
- Eukaryotic DNA Replication is bidirectional occurring at the multiple sites simultaneously .
- The **Replication origins** are present in **clusters** called **Replication units**. In human ,there are about 100 ori of 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**)





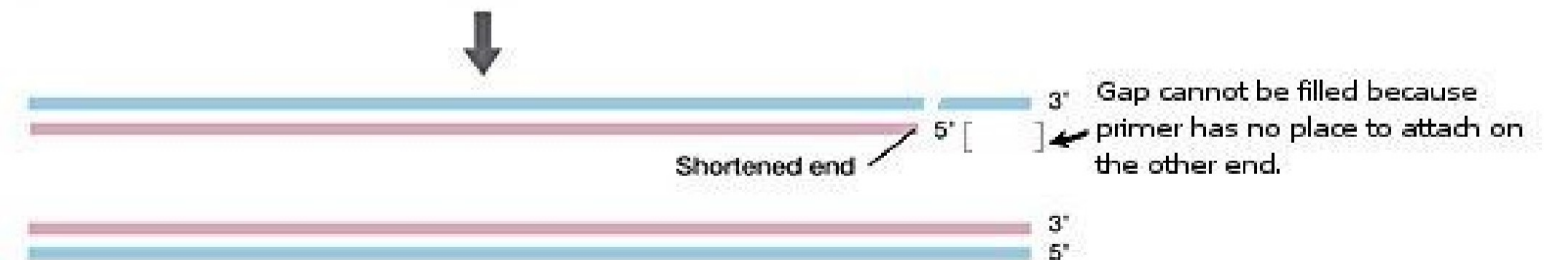
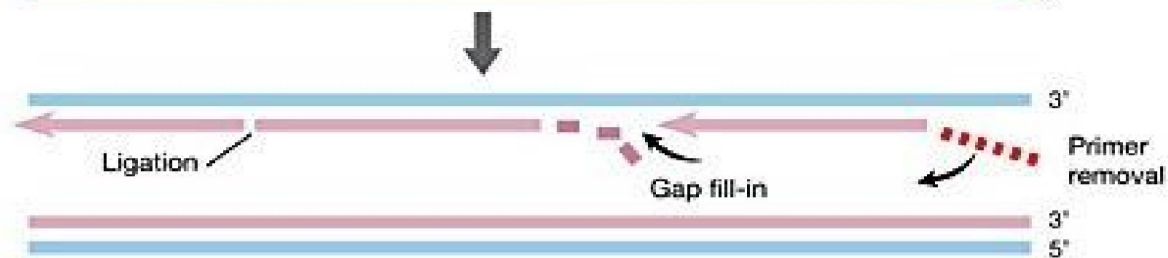
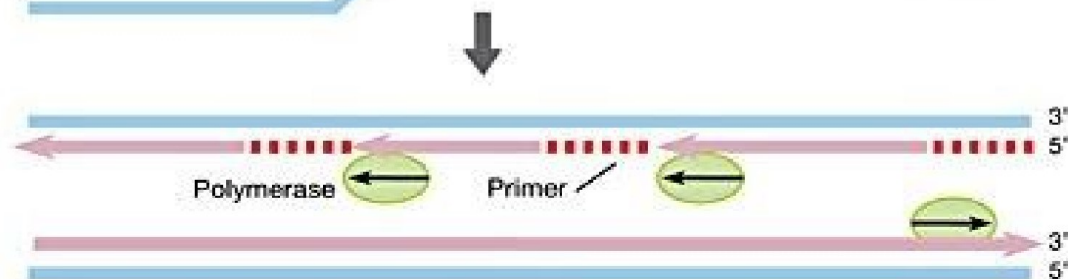
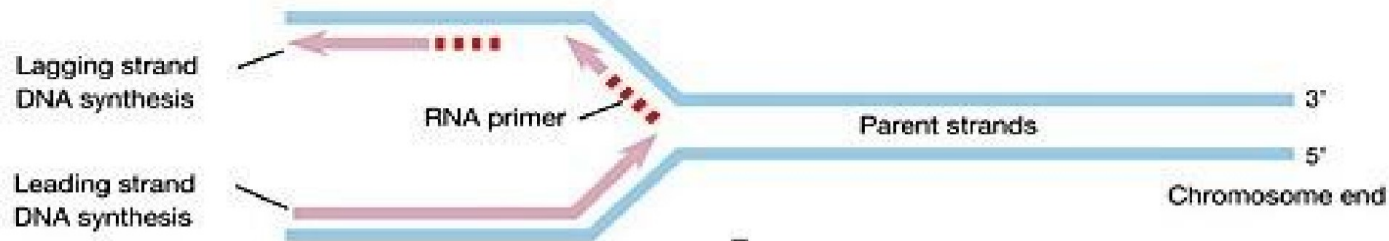
- **Functions of proliferating cell nuclear antigen (PCNA):** PCNA binds to DNA polymerase δ (function similar to polymerase III of E.Coli). The binding of PCNA to polymerase δ , increases enzyme processivity and starts replicating long stretches of deoxyribonucleotides .
- This process is called **polymerase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





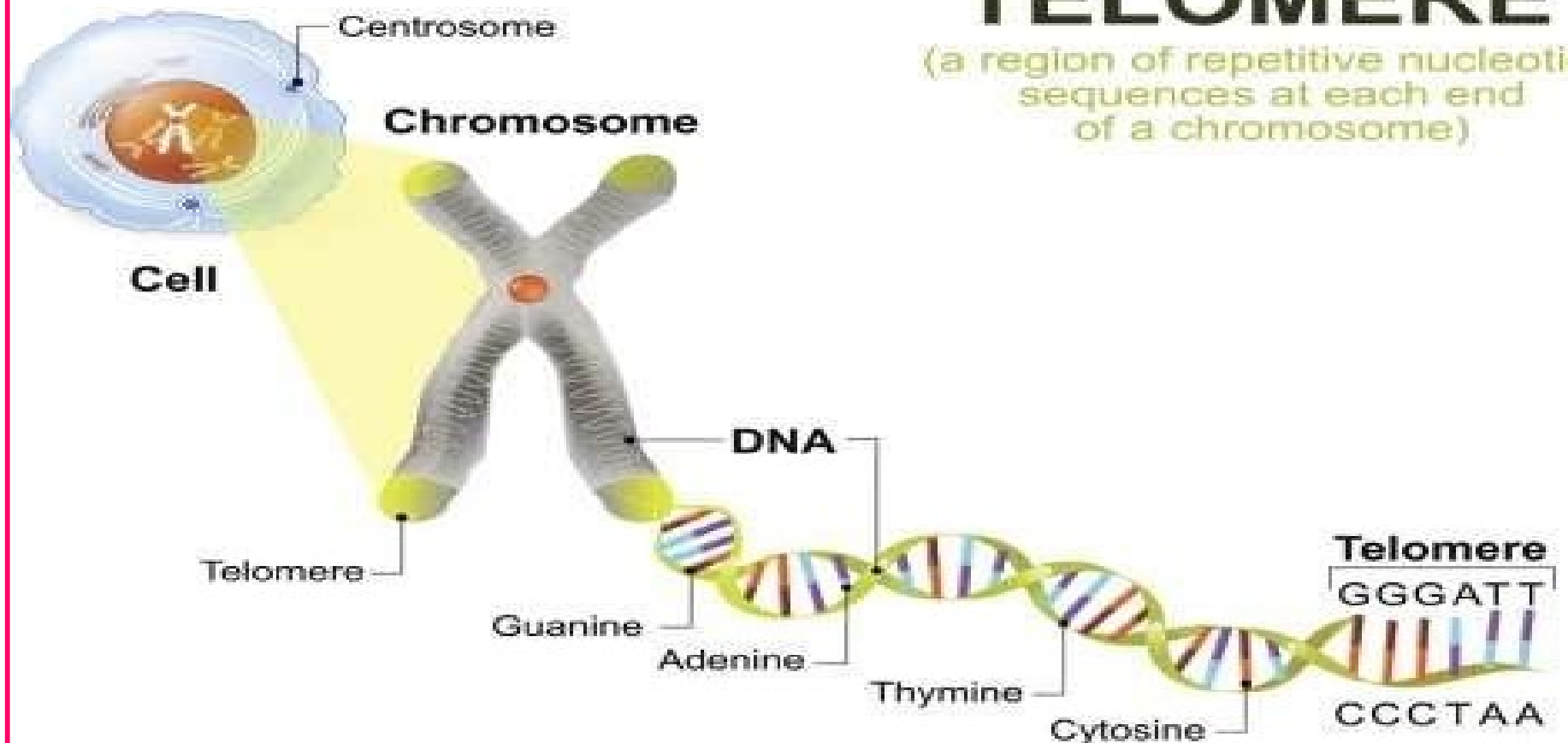
Frank Boumpfrey M.D.
2009

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



TELOMERE

(a region of repetitive nucleotide sequences at each end of a chromosome)

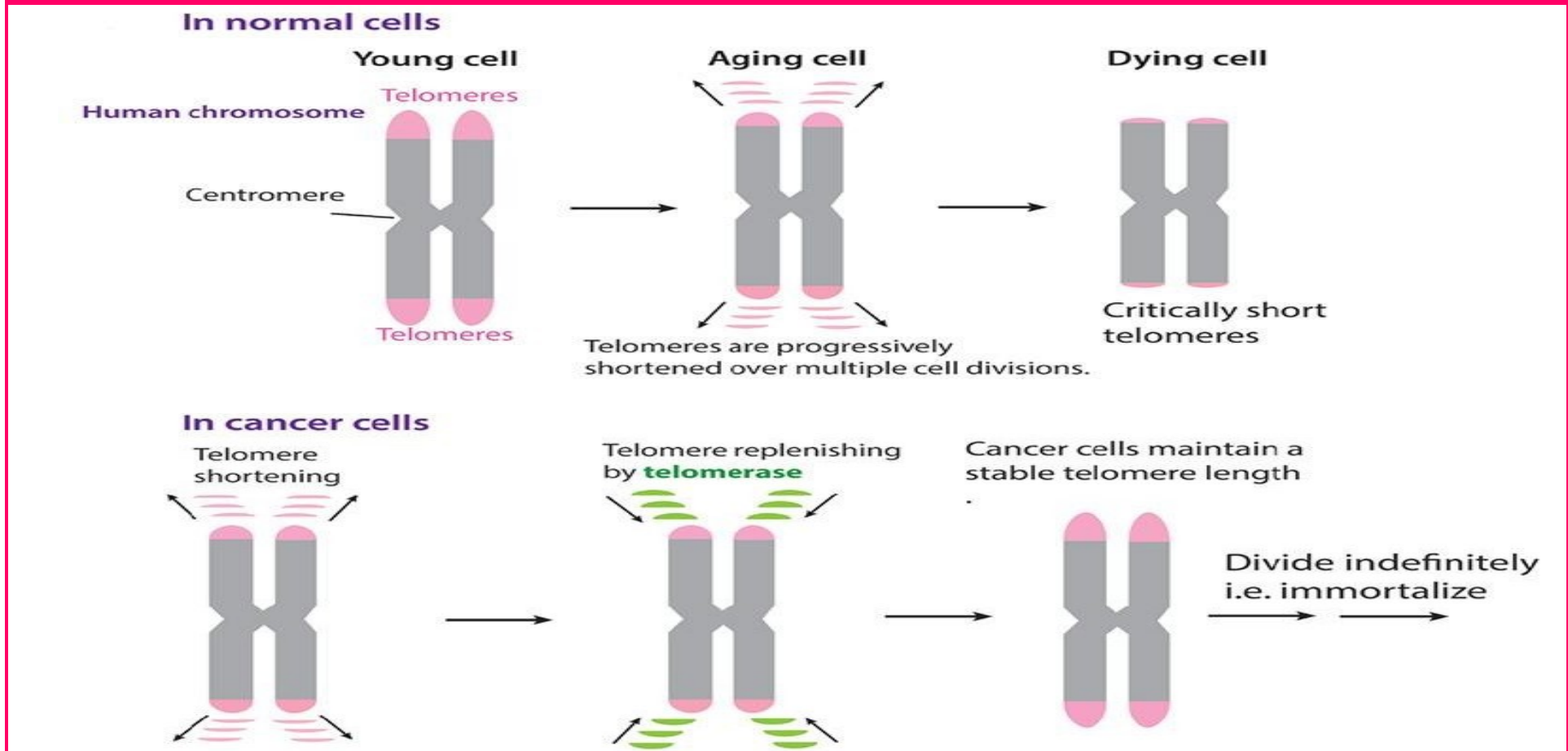


Replication always takes place from 5' to 3' direction in the new strand. The DNA polymerase enzyme is not able to synthesize the new strand at the end of 5' end of the new strand. In other words, a small portion of (about 300 nucleotides couldn't be replicated).

Importance of Telomeres

- Replication always takes place from 5' to 3' direction in the new strand. The DNA polymerase enzyme is not able to synthesize the new strand at the end of 5' end of the new strand. In other words, a small portion of (about 300 nucleotides couldn't be replicated).
- This end piece of chromosome is called as **Telomeres**. Therefore enzyme **Telomerase** or **Telomere Terminal transferase** takes up the job of replication of the end piece of chromosomes. The **Telomeres** are **noncoding repetitive sequences**.
- After the normal replication, there is a single strand in this region, so the portion is degraded by exonucleases. This broken end leads to aberrant recombination or end to end fusions.
- Unless there is some mechanism to replicate telomeres, the length of the chromosome will go on reducing at each cell division. The stability of the chromosomes is thus lost. Many genes might be lost in the process.
- The shortening of **Telomeres end** is prevented by an enzyme **Telomerase**. It contains **an RNA component**, which provides the template for telomeric repeat synthesis.

Telomeres and aging



Terminal restriction fragments from 70 years old individuals are shorter than those from 20 years old individuals. Thus in old age, the **Telomerase** activity is lost, leading to chromosome instability and cell death. Telomerase may be responsible for the