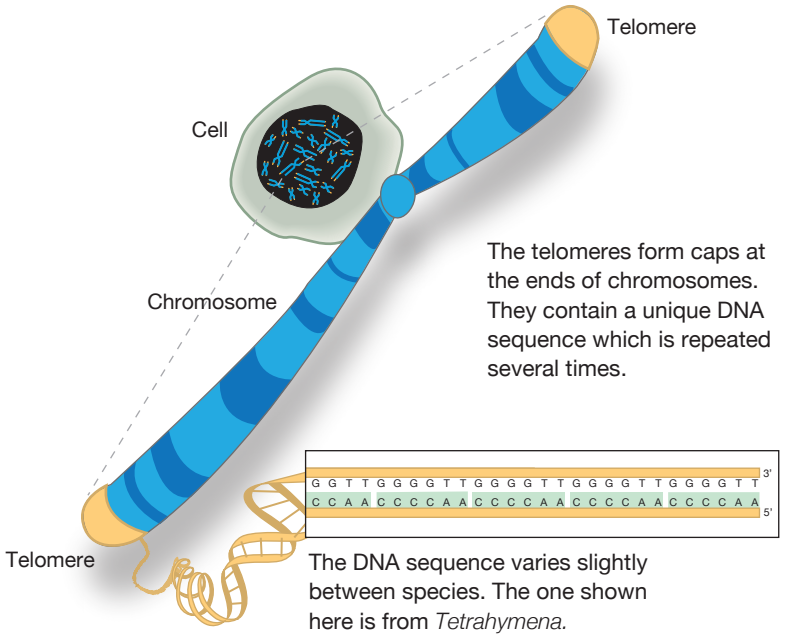
The Telomere
– Function and Synthesis

1. The mysterious telomere
The telomeres appear to protect the chromosomes from damage. But how?

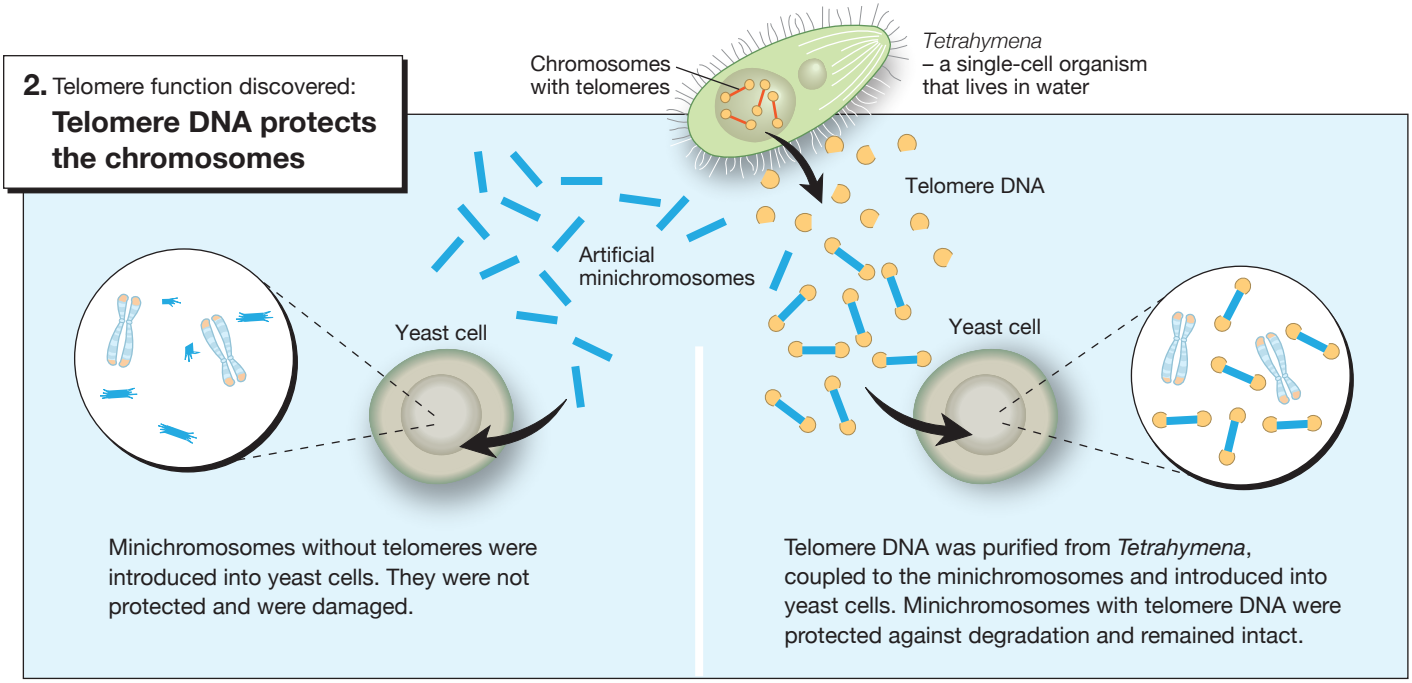
Telomere = Greek for “end” (*telos*) and “part” (*meros*)



The telomeres form caps at the ends of chromosomes. They contain a unique DNA sequence which is repeated several times.

The DNA sequence varies slightly between species. The one shown here is from *Tetrahymena*.

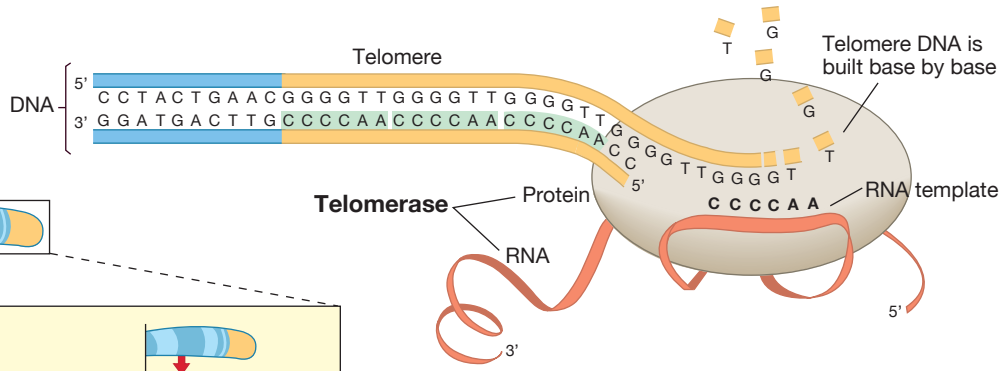
2. Telomere function discovered: Telomere DNA protects the chromosomes



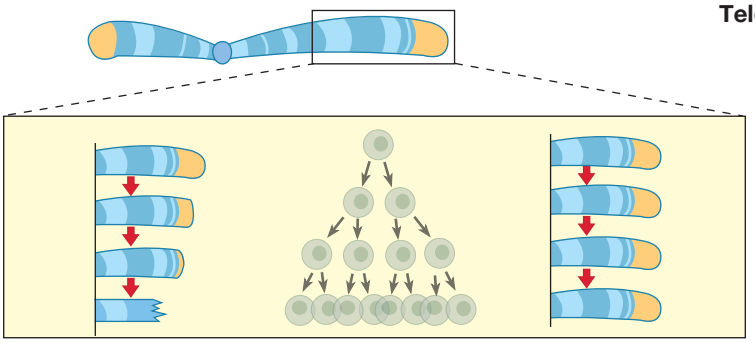
Minichromosomes without telomeres were introduced into yeast cells. They were not protected and were damaged.

Telomere DNA was purified from *Tetrahymena*, coupled to the minichromosomes and introduced into yeast cells. Minichromosomes with telomere DNA were protected against degradation and remained intact.

3. Telomere synthesis elucidated: Telomerase builds telomere DNA



Telomerase operates at the end of the chromosome. It is an enzyme consisting of a protein and an RNA sequence. The RNA serves as a template for synthesizing telomere DNA.



Without telomerase present, the chromosome is shortened each time the cell divides. Finally the telomere DNA is eroded and the chromosome is damaged.

Telomerase maintains the telomeres at the ends of the DNA thread. This makes it possible to copy the entire chromosome to its very end each time the cell divides.