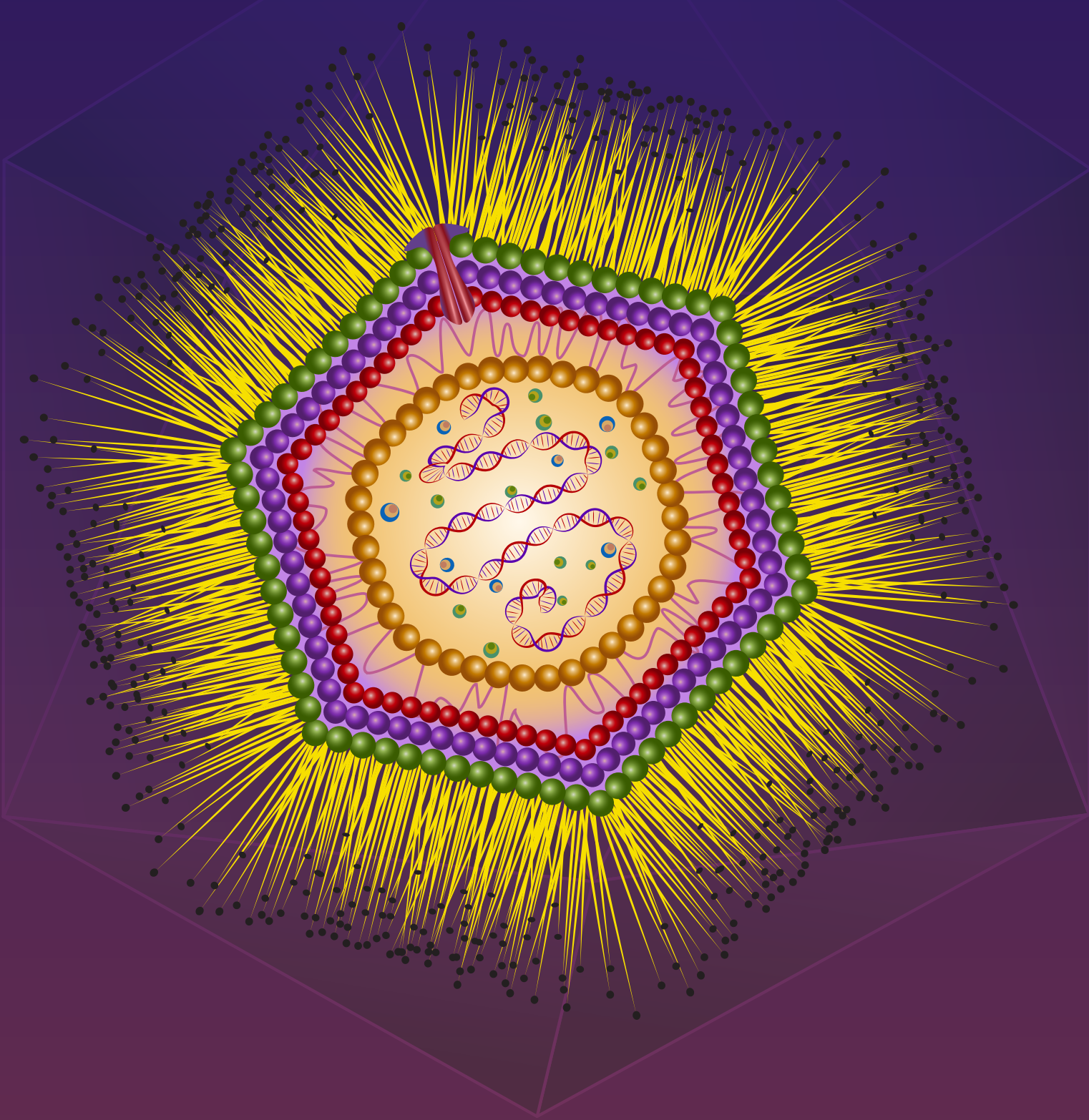




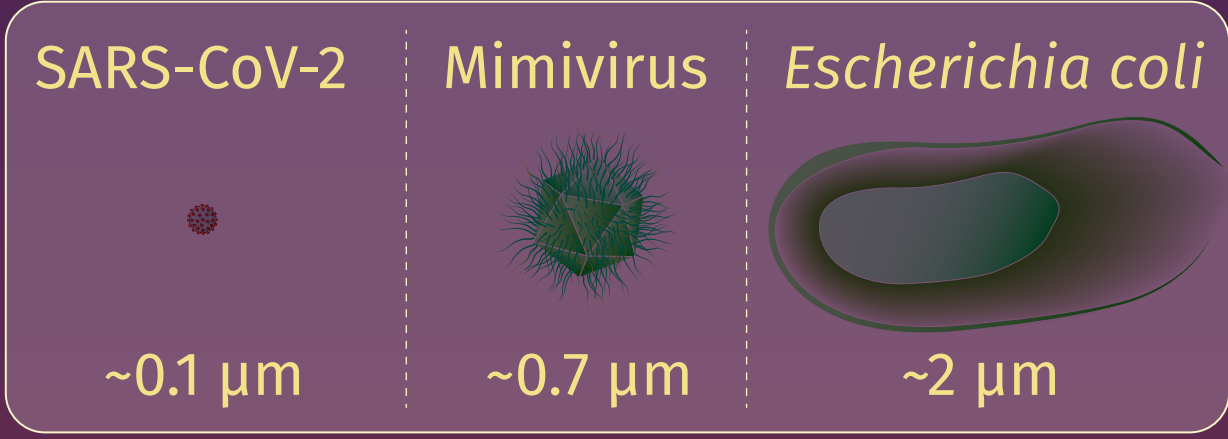


Origin of the Giant Mimivirus

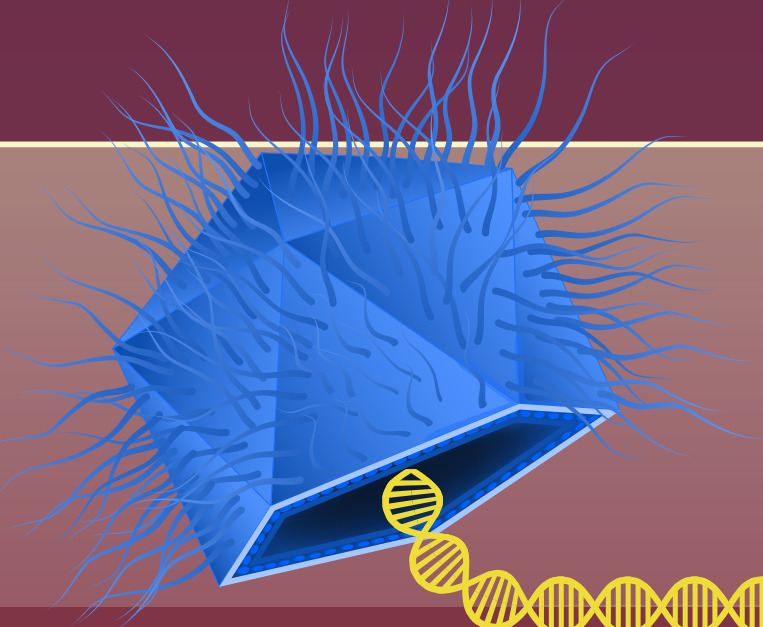
Giant viruses such as Mimivirus are unique life forms with molecular complexity matching that of bacteria



-  Larger than 0.2 μm in size
-  Double-stranded DNA as genetic material
-  First identified in 2003
-  Abundant in oceans and seas



Comparative genomics suggest that these viruses have a role in the evolution of DNA replication machinery, which are quintessential for the transmission of genetic information in most life forms



Origin hypotheses for giant viruses

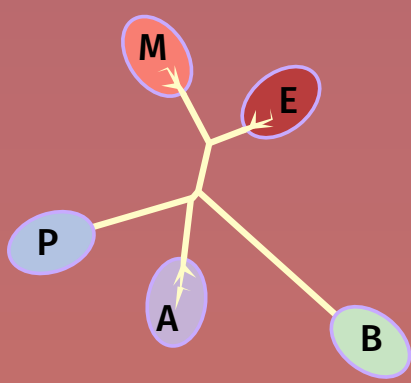
Accretion

Reductive evolution

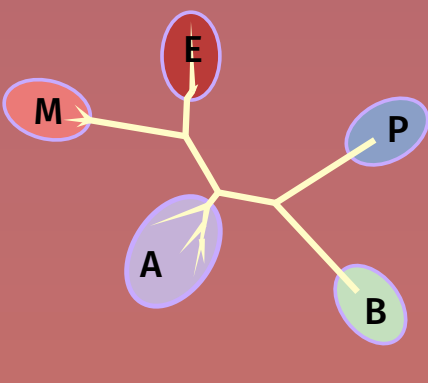
Which hypothesis of mimiviral origin is supported by coevolutionary analysis of DNA replication machinery?

Phylogenetic trees

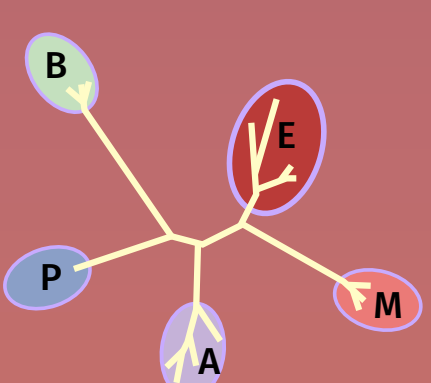
Components of DNA replication machinery show...



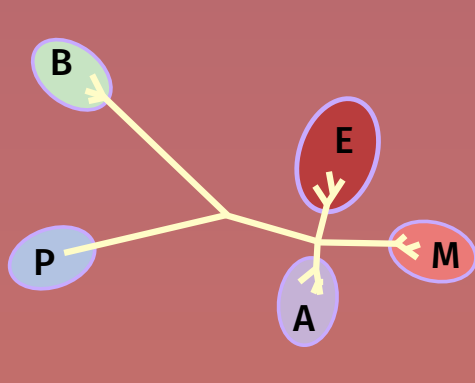
DNA polymerase



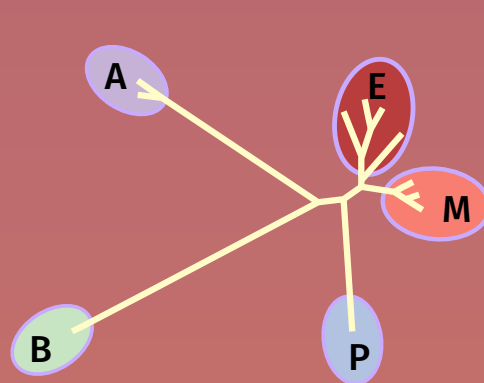
Sliding clamp



Clamp loader 1



Clamp loader 2

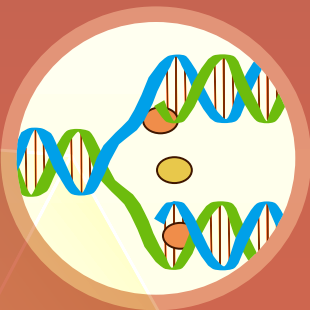


Topoisomerase II

...strong affinity toward eukaryote-like forms

Multidimensional scaling

Mimivirus proteins show evidence of coevolution



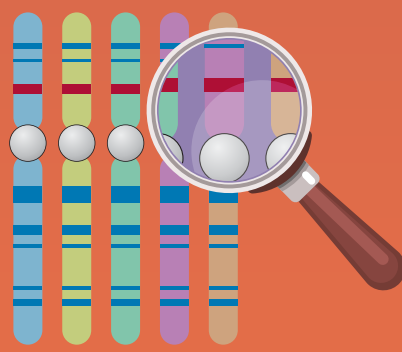
DNA replication machinery



Other essential DNA processes

Evolutionary selection analysis

DNA replication genes are homogeneous and under purifying selection



Mimiviruses and other giant viruses appear to have evolved from a complex cellular ancestor, supporting reductive evolution