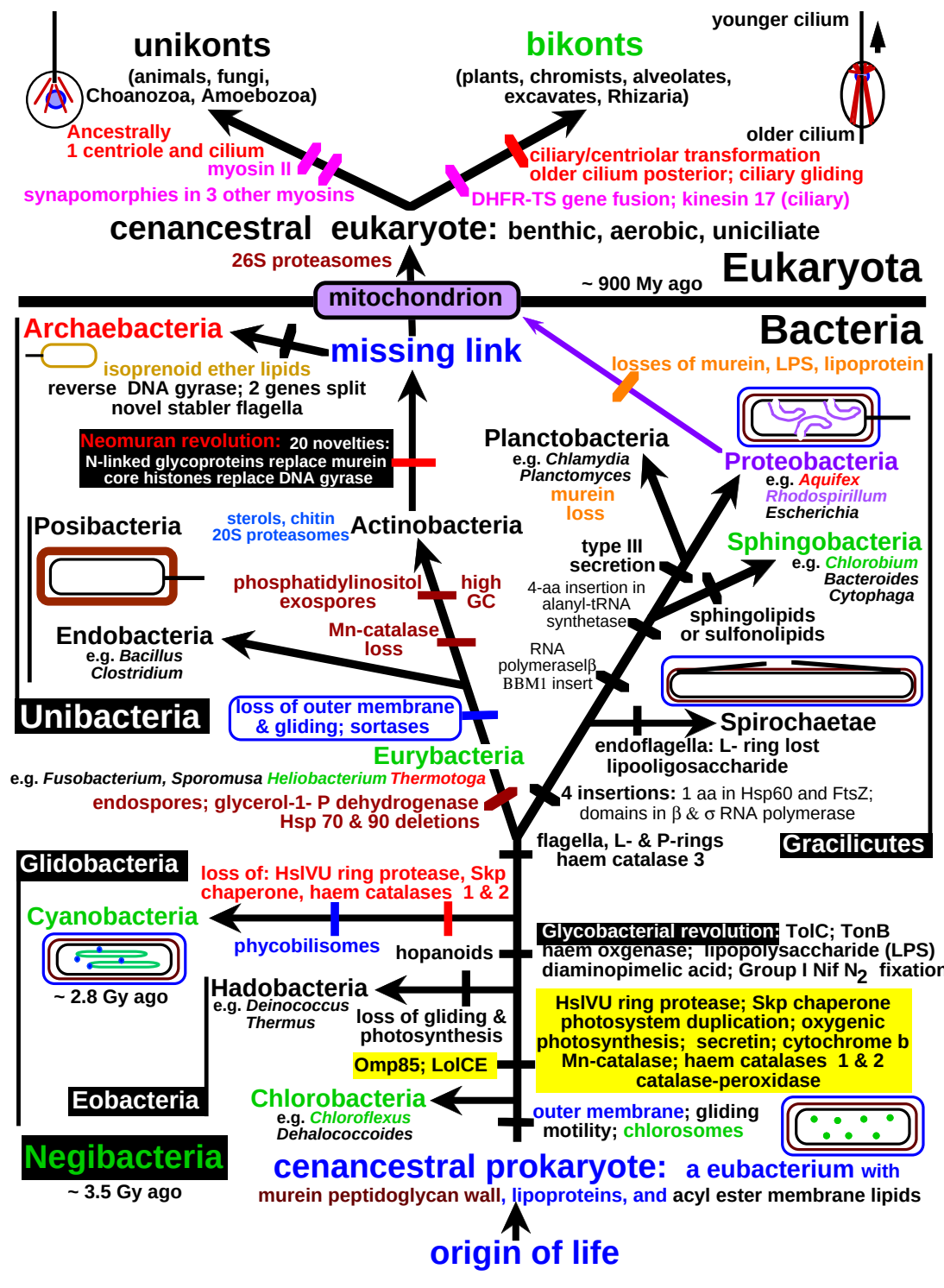
unikonts
(animals, fungi, Choanozoa, Amoebozoa)
bikonts
(plants, chromists, alveolates, excavates, Rhizaria)
younger cilium
older cilium
Ancestrally 1 centriole and cilium
myosin II
synapomorphies in 3 other myosins
ciliary/centriolar transformation
older cilium posterior; ciliary gliding
DHFR-TS gene fusion; kinesin 17 (ciliary)
cenancestral eukaryote: benthic, aerobic, uniciliate
26S proteasomes
~ 900 My ago
Eukaryota
mitochondrion
Bacteria
Archaebacteria
missing link
isoprenoid ether lipids
reverse DNA gyrase; 2 genes split
novel stabler flagella
losses of murein, LPS, lipoprotein
Neomuran revolution: 20 novelties:
N-linked glycoproteins replace murein
core histones replace DNA gyrase
Planctobacteria
e.g. Chlamydia
Planctomyces
murein loss
Proteobacteria
e.g. Aquifex
Rhodospirillum
Escherichia
Posibacteria
sterols, chitin
20S proteasomes
Actinobacteria
type III secretion
Sphingobacteria
e.g. Chlorobium
Bacteroides
Cytophaga
phosphatidylinositol exospores
high GC
4-aa insertion in alanyl-tRNA synthetase
sphingolipids or sulfonolipids
Endobacteria
e.g. Bacillus
Clostridium
Mn-catalase loss
RNA polymeraseIβ BBM1 insert
Unibacteria
loss of outer membrane & gliding; sortases
Spirochaetae
endoflagella: L- ring lost
lipooligosaccharide
Eurybacteria
e.g. Fusobacterium, Sporomusa Heliobacterium Thermotoga
endospores; glycerol-1- P dehydrogenase
Hsp 70 & 90 deletions
4 insertions: 1 aa in Hsp60 and FtsZ; domains in β & σ RNA polymerase
flagella, L- & P-rings
haem catalase 3
Gracilicutes
Glidobacteria
loss of: HslVU ring protease, Skp chaperone, haem catalases 1 & 2
Cyanobacteria
phycobilisomes
hopanoids
~ 2.8 Gy ago
Glycobacterial revolution: TolC; TonB
haem oxgenase; lipopolysaccharide (LPS)
diaminopimelic acid; Group I Nif N2 fixation
Hadobacteria
e.g. Deinococcus
Thermus
loss of gliding & photosynthesis
HslVU ring protease; Skp chaperone
photosystem duplication; oxygenic photosynthesis; secretin; cytochrome b
Mn-catalase; haem catalases 1 & 2
catalase-peroxidase
Omp85; LolCE
Eobacteria
Chlorobacteria
e.g. Chloroflexus
Dehalococcoides
outer membrane; gliding motility; chlorosomes
Negibacteria
~ 3.5 Gy ago
cenancestral prokaryote: a eubacterium with
murein peptidoglycan wall, lipoproteins, and acyl ester membrane lipids
origin of life