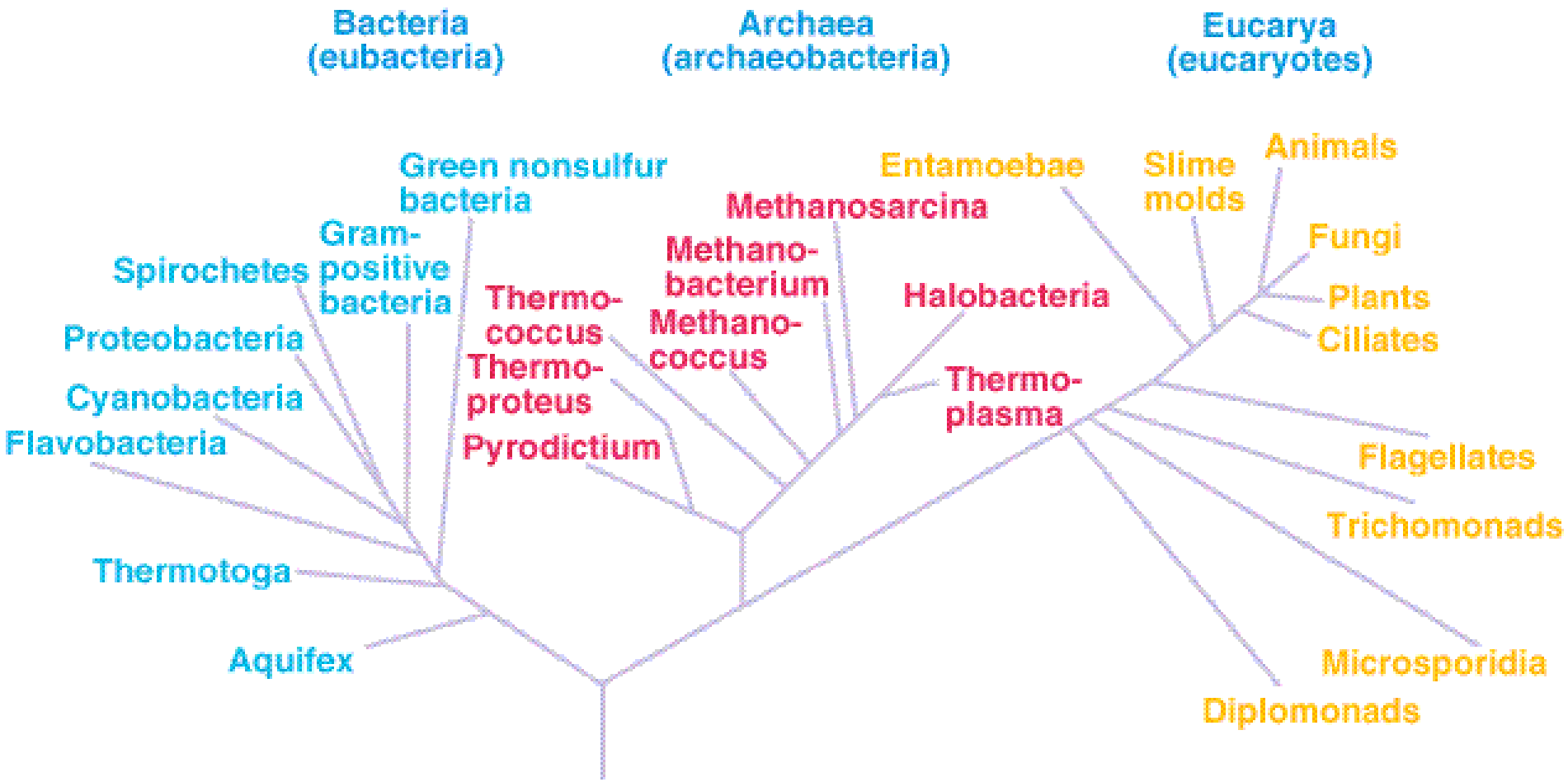
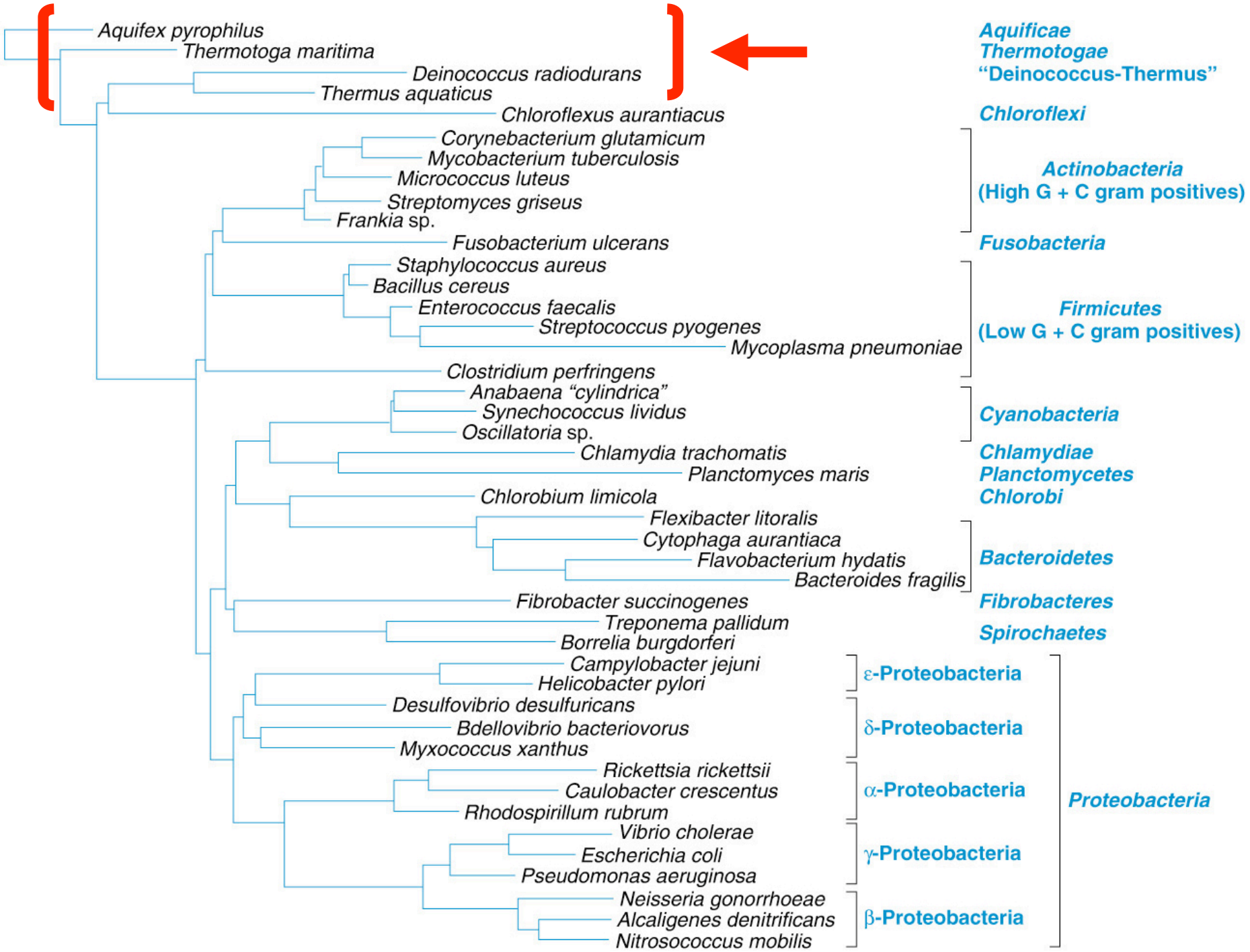
Prokaryotic Diversity

- Environment
- Morphological
- Developmental cycles
- Metabolic
- Role

Universal Phylogenetic Tree

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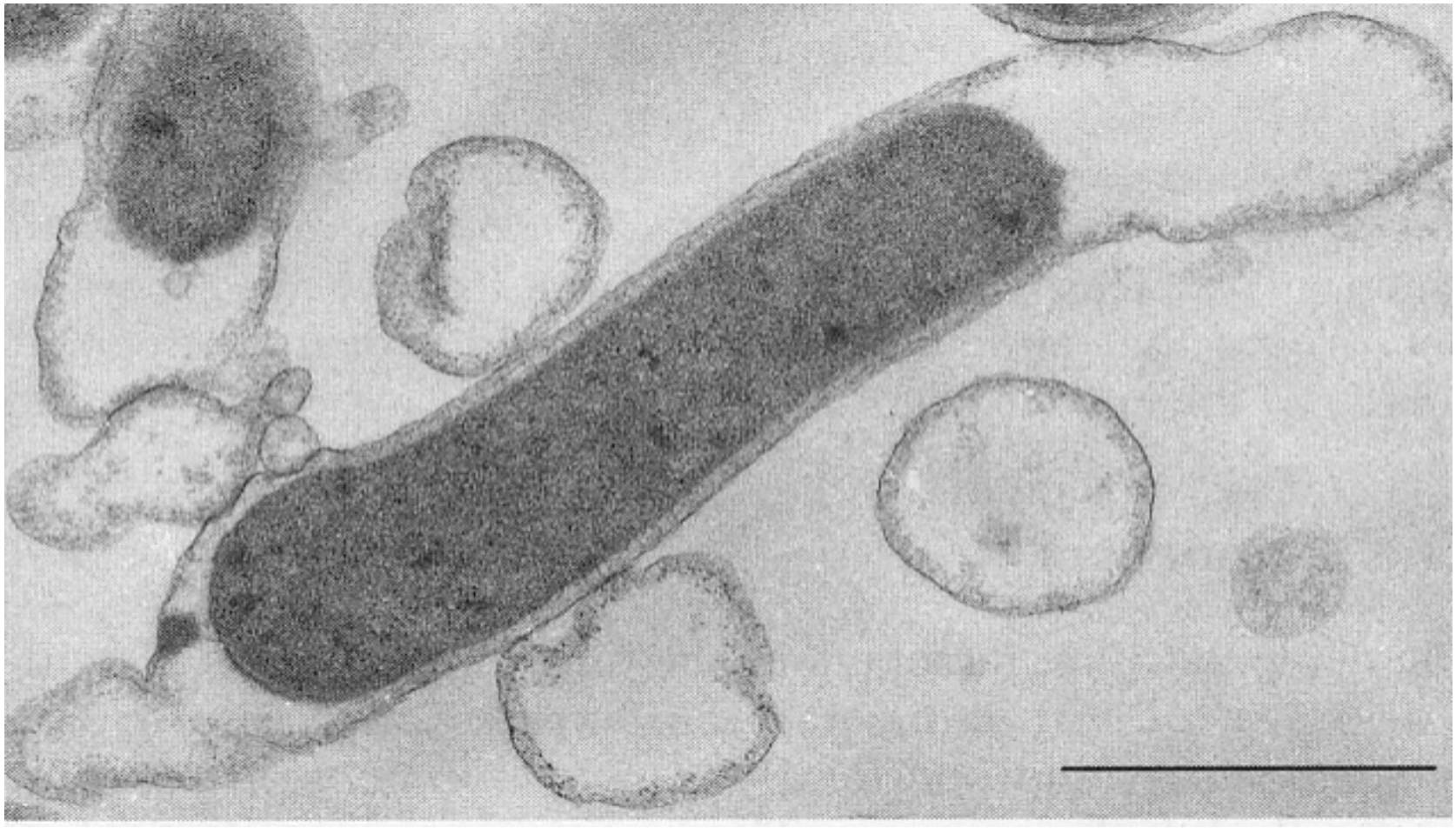
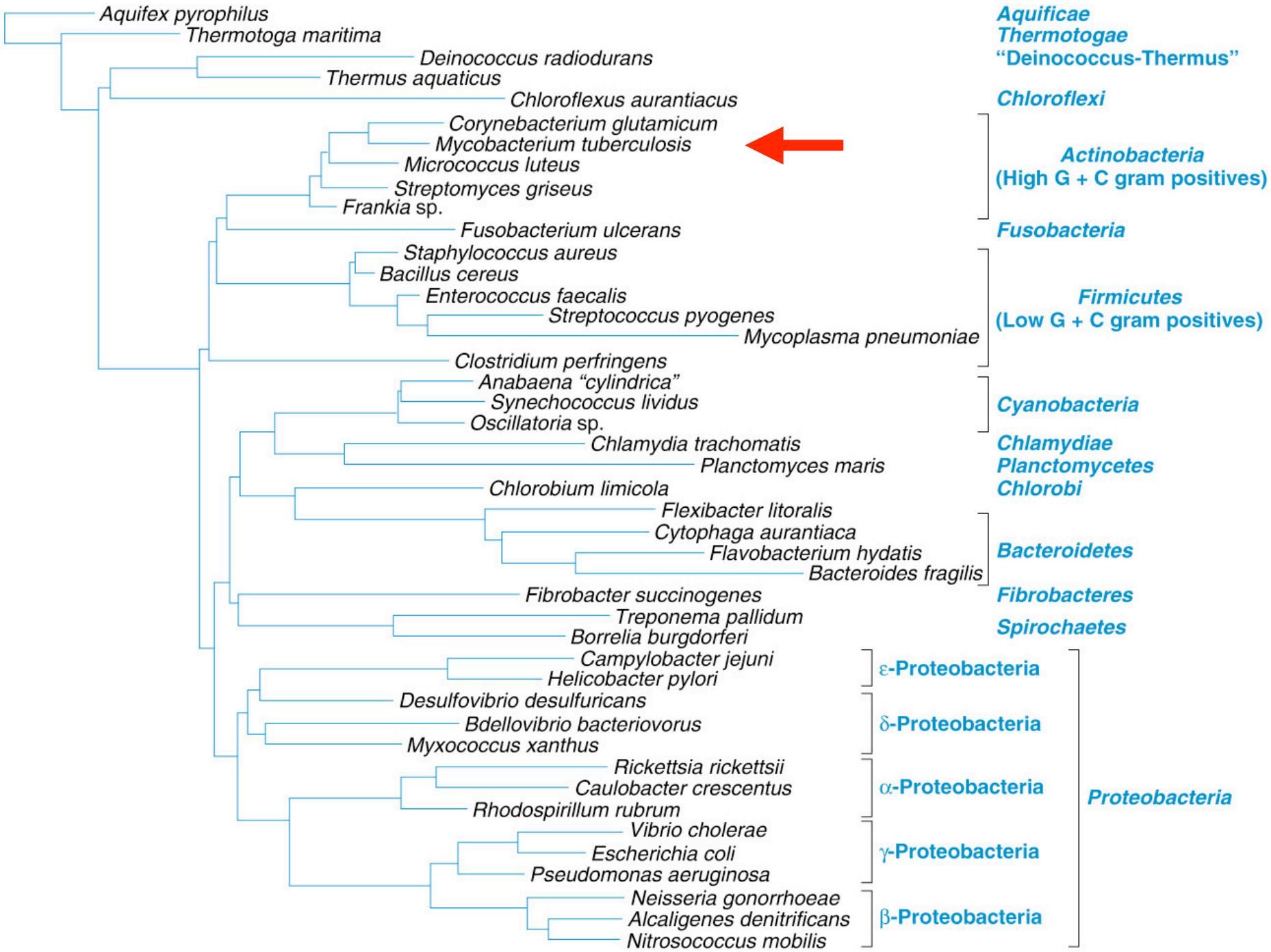
α-Proteobacteria
γ-Proteobacteria
β-Proteobacteria
Proteobacteria

Thermatoga maritima

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Mycobacterium tuberculosis

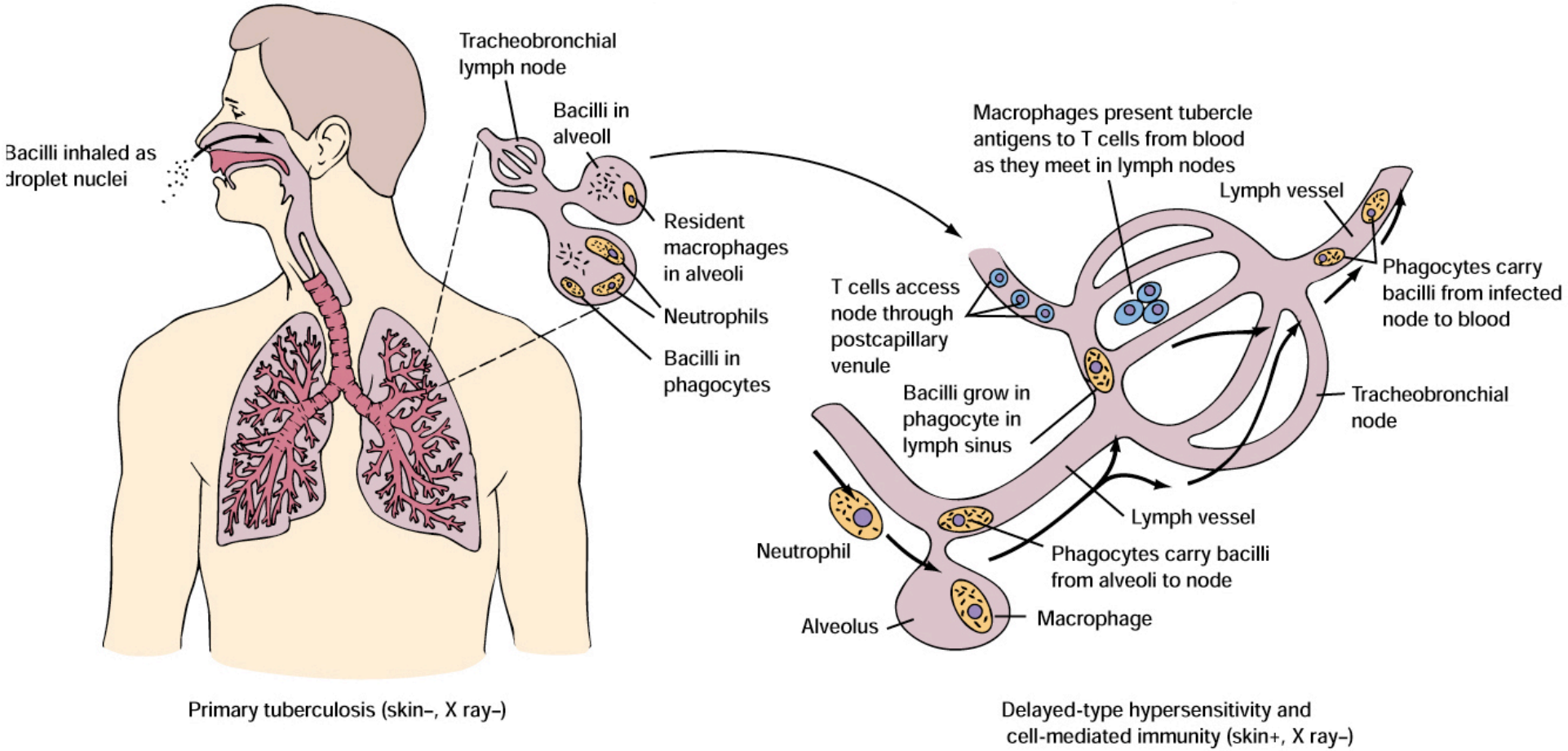
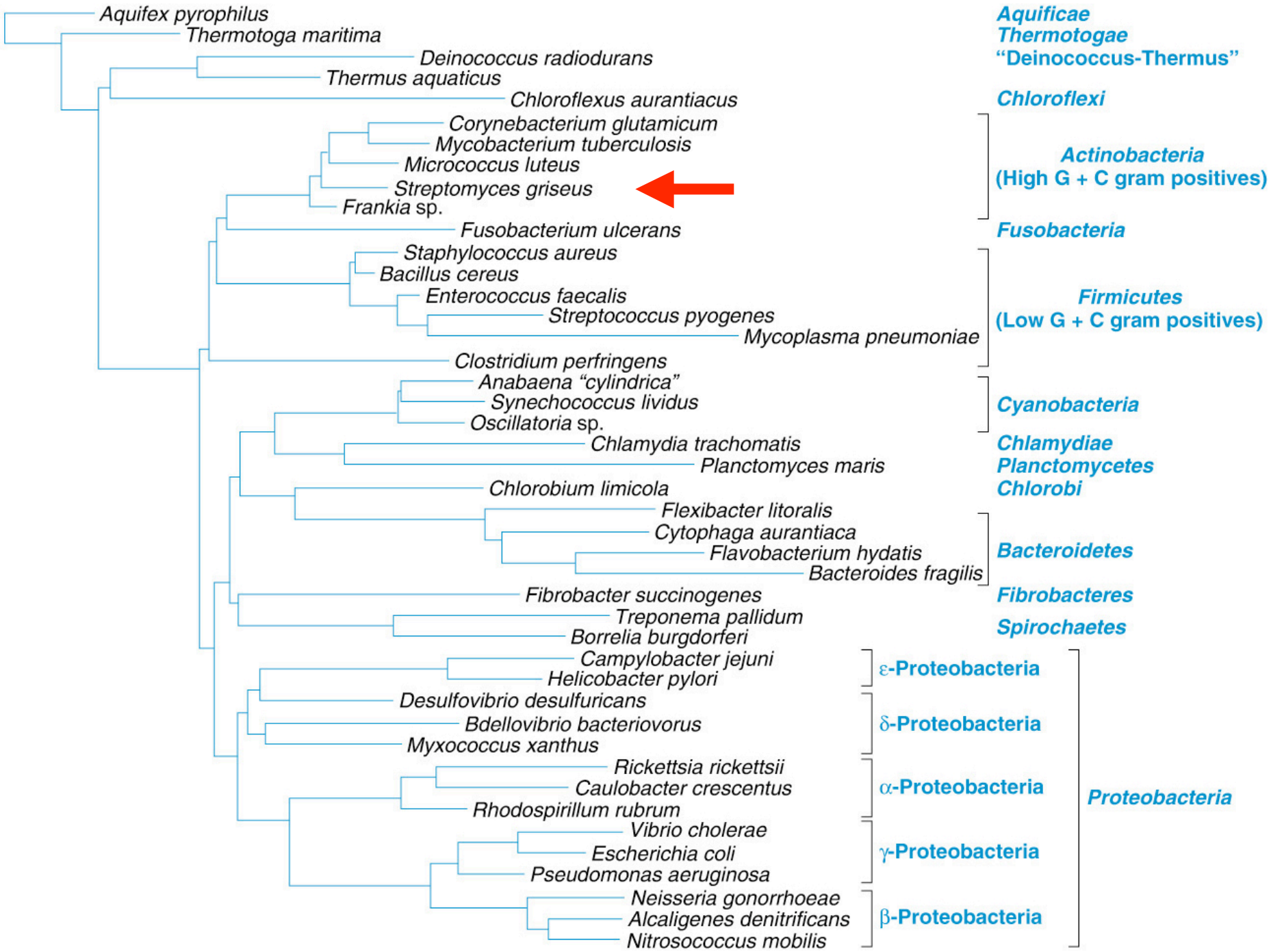


Fig. 39.7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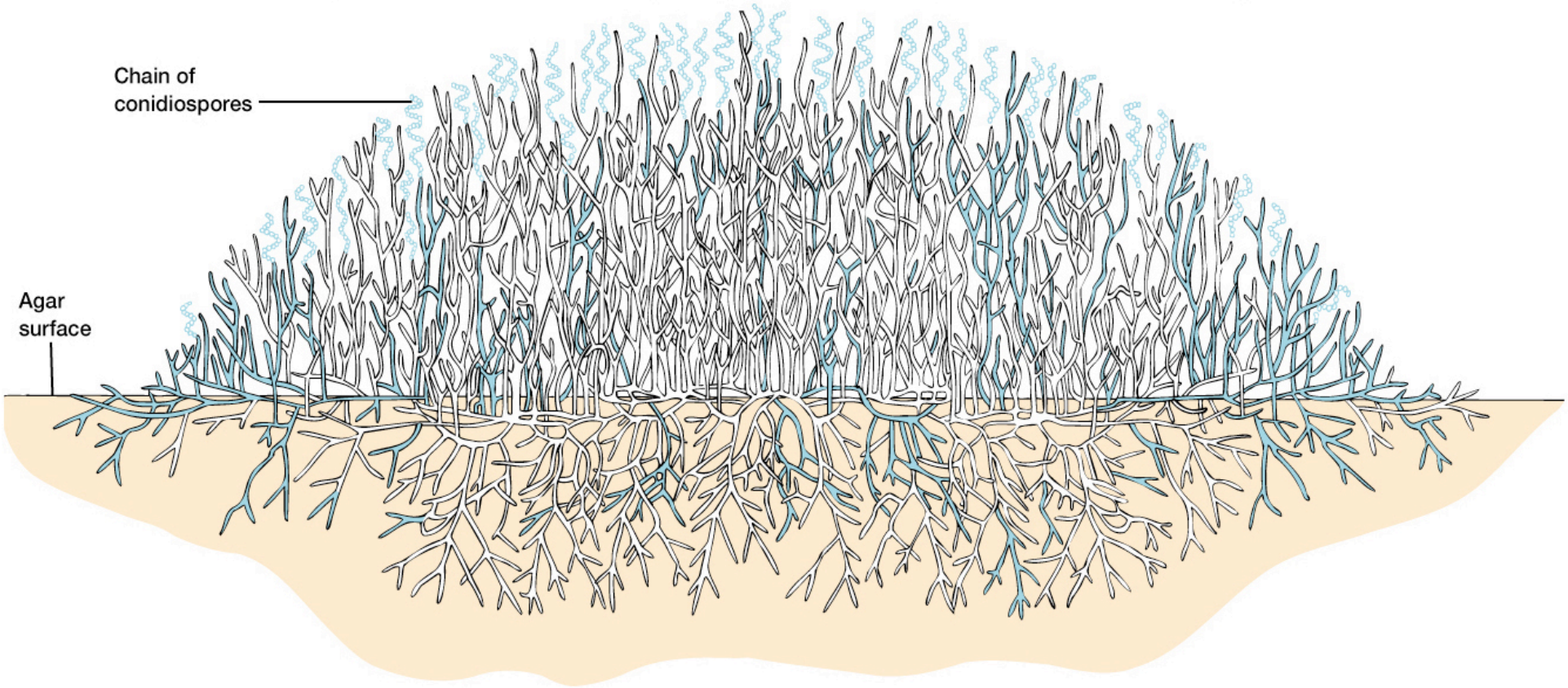
Actinomycete colony



Streptomyces

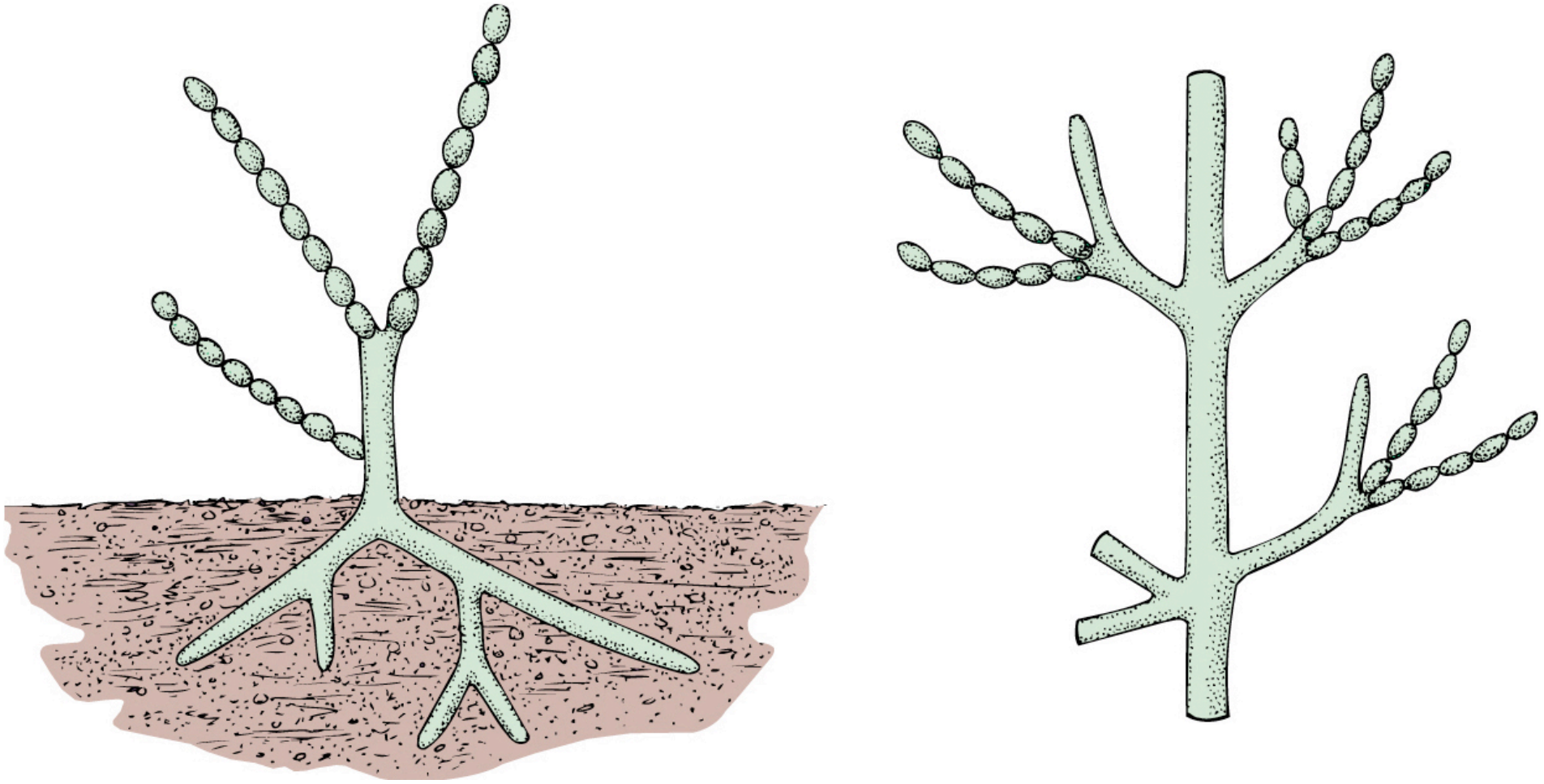
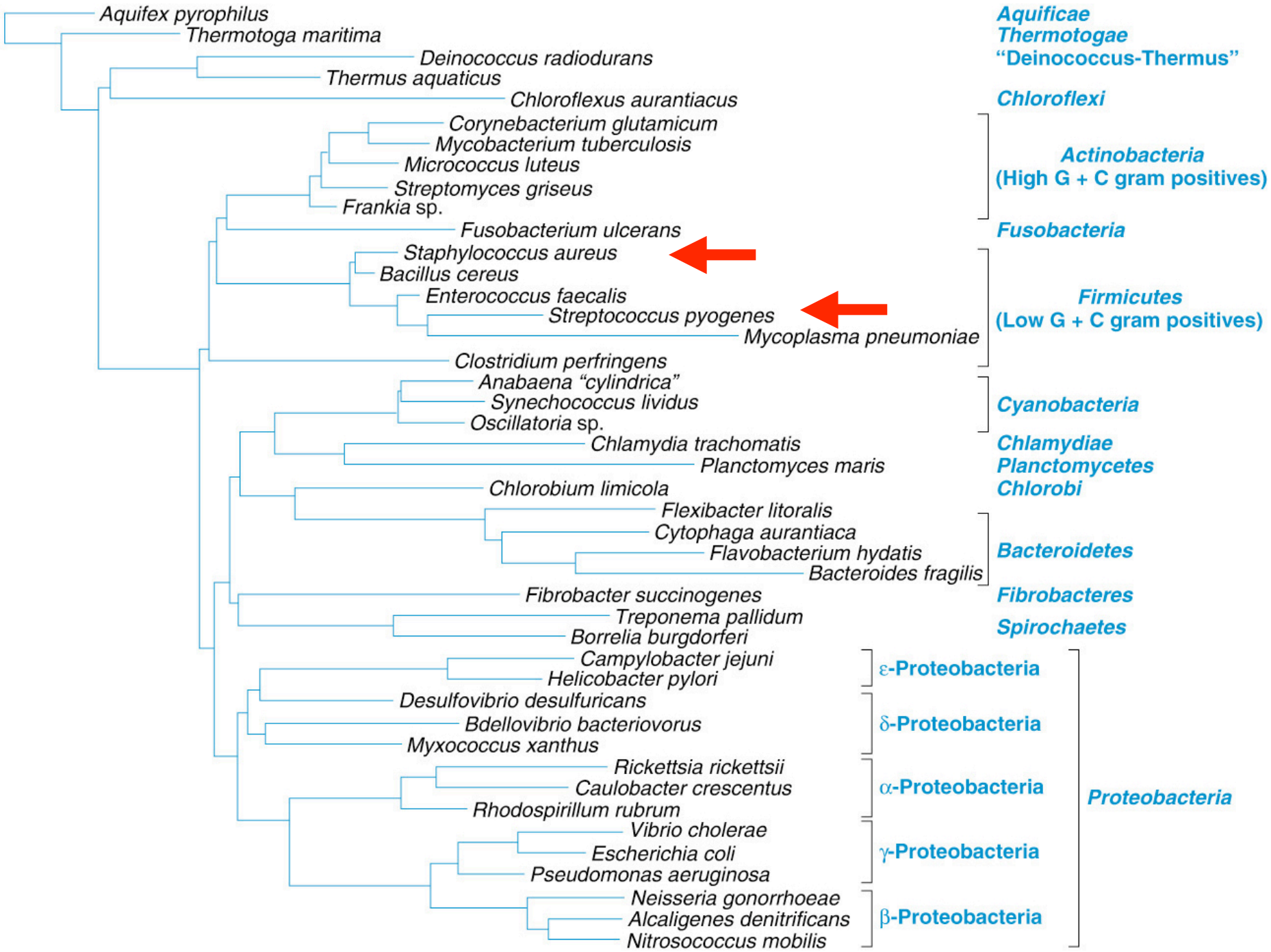


Fig.24.13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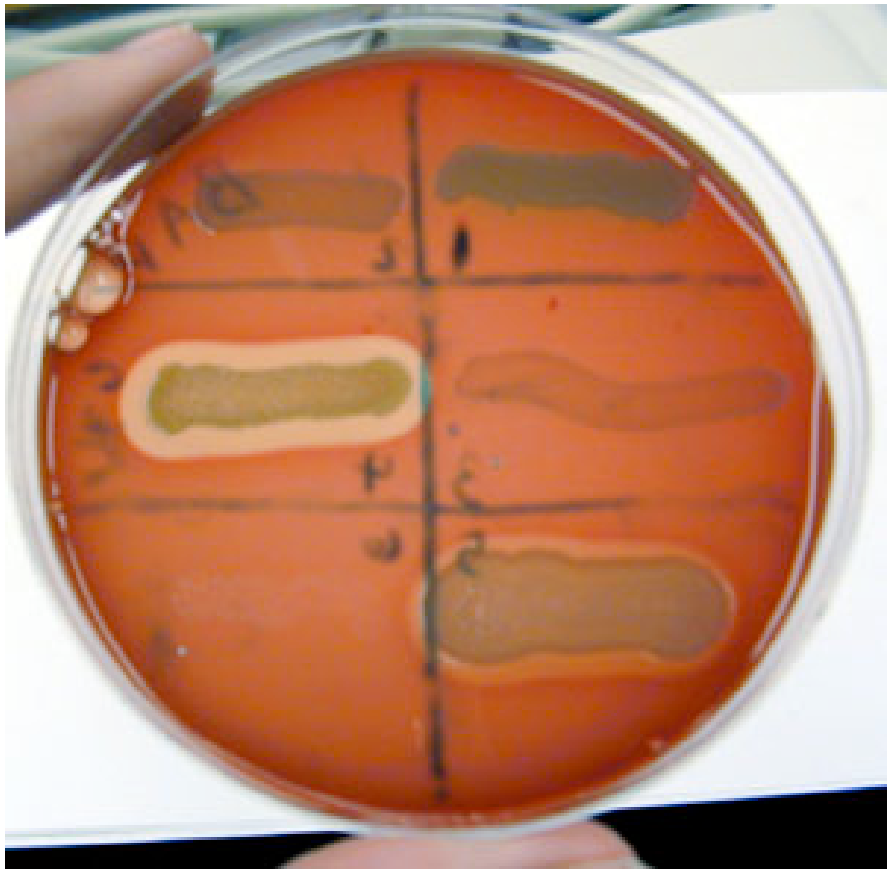
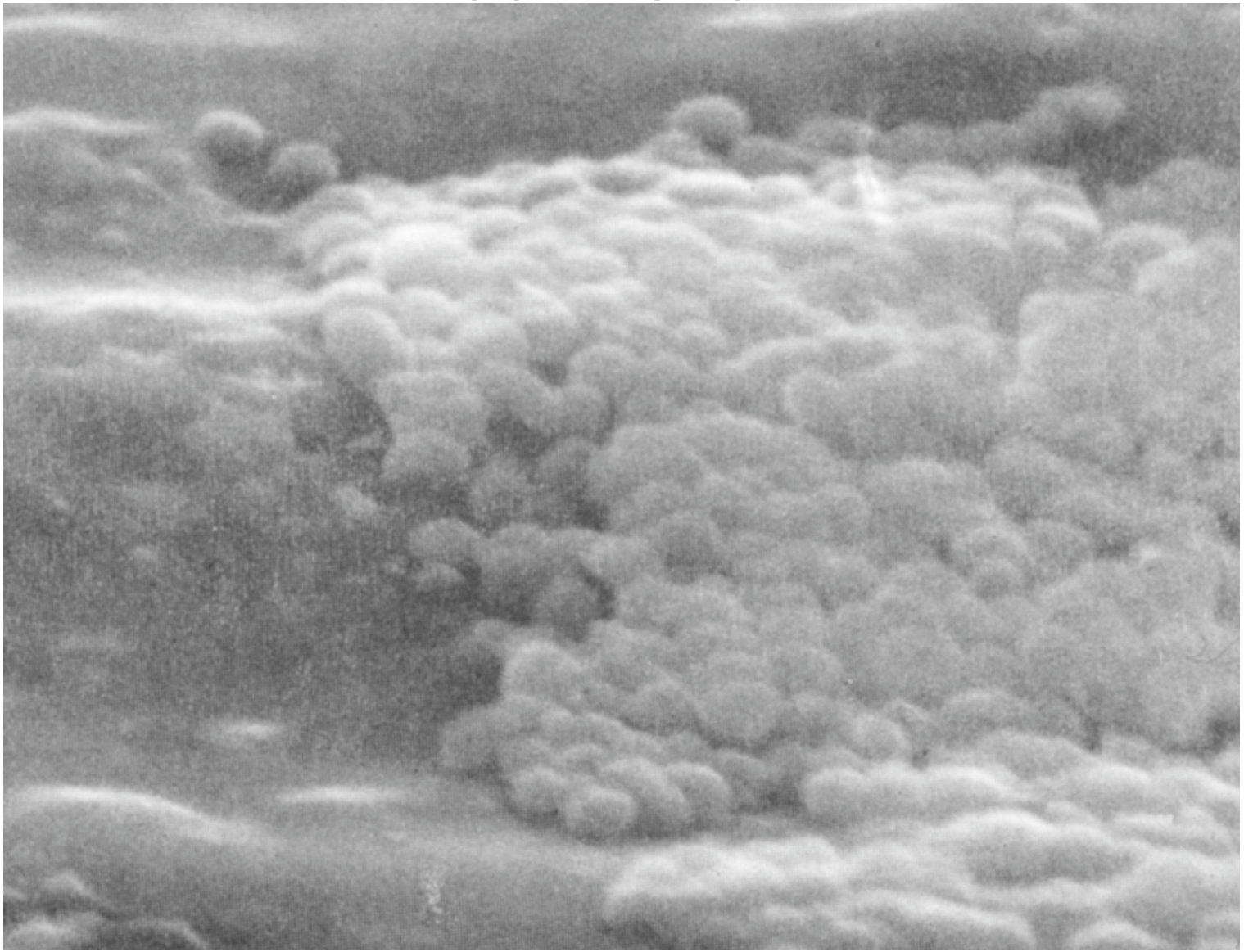
Hemolysis



Staphylococcus biofilm on catheter



Dental plaque

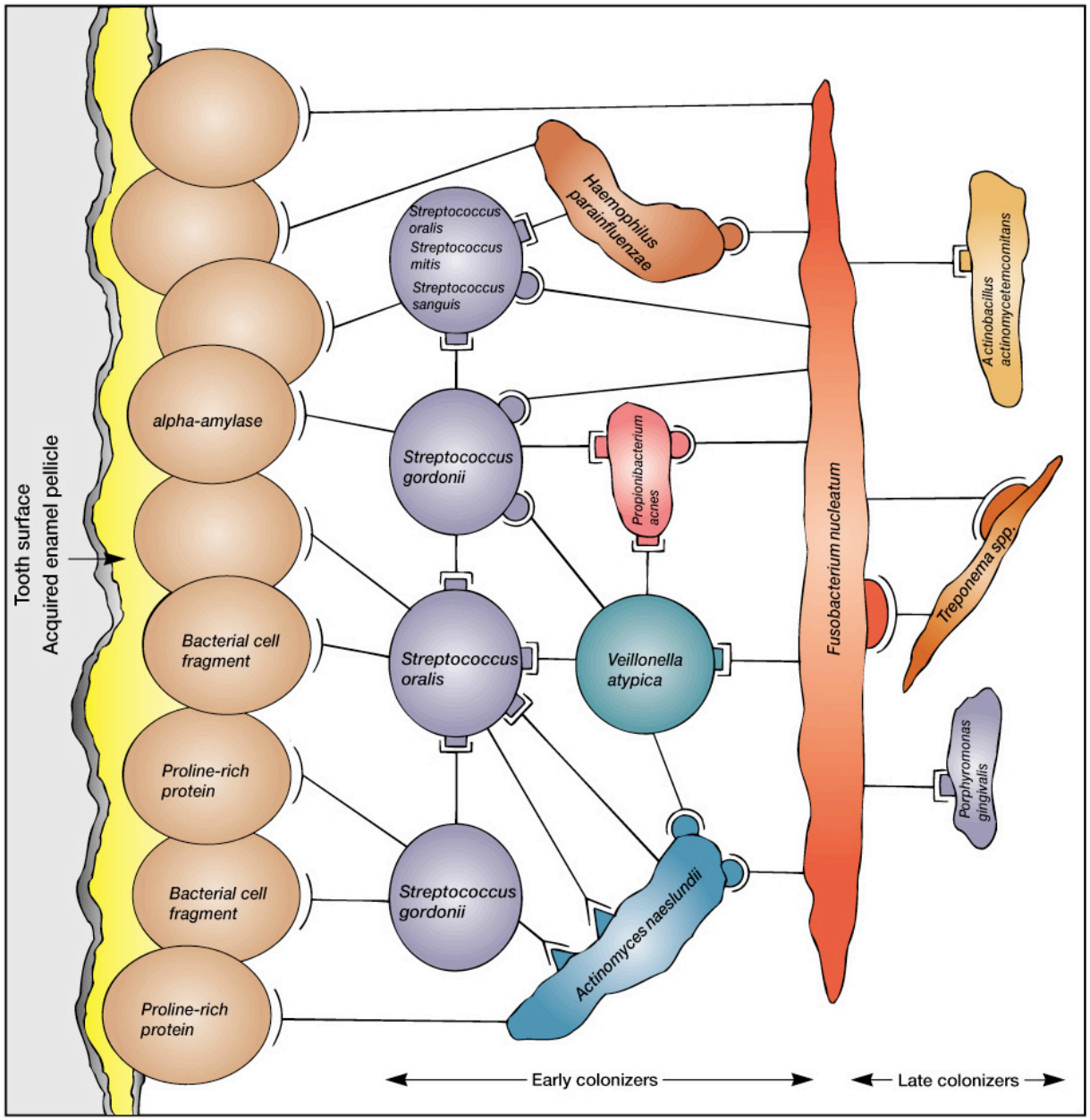
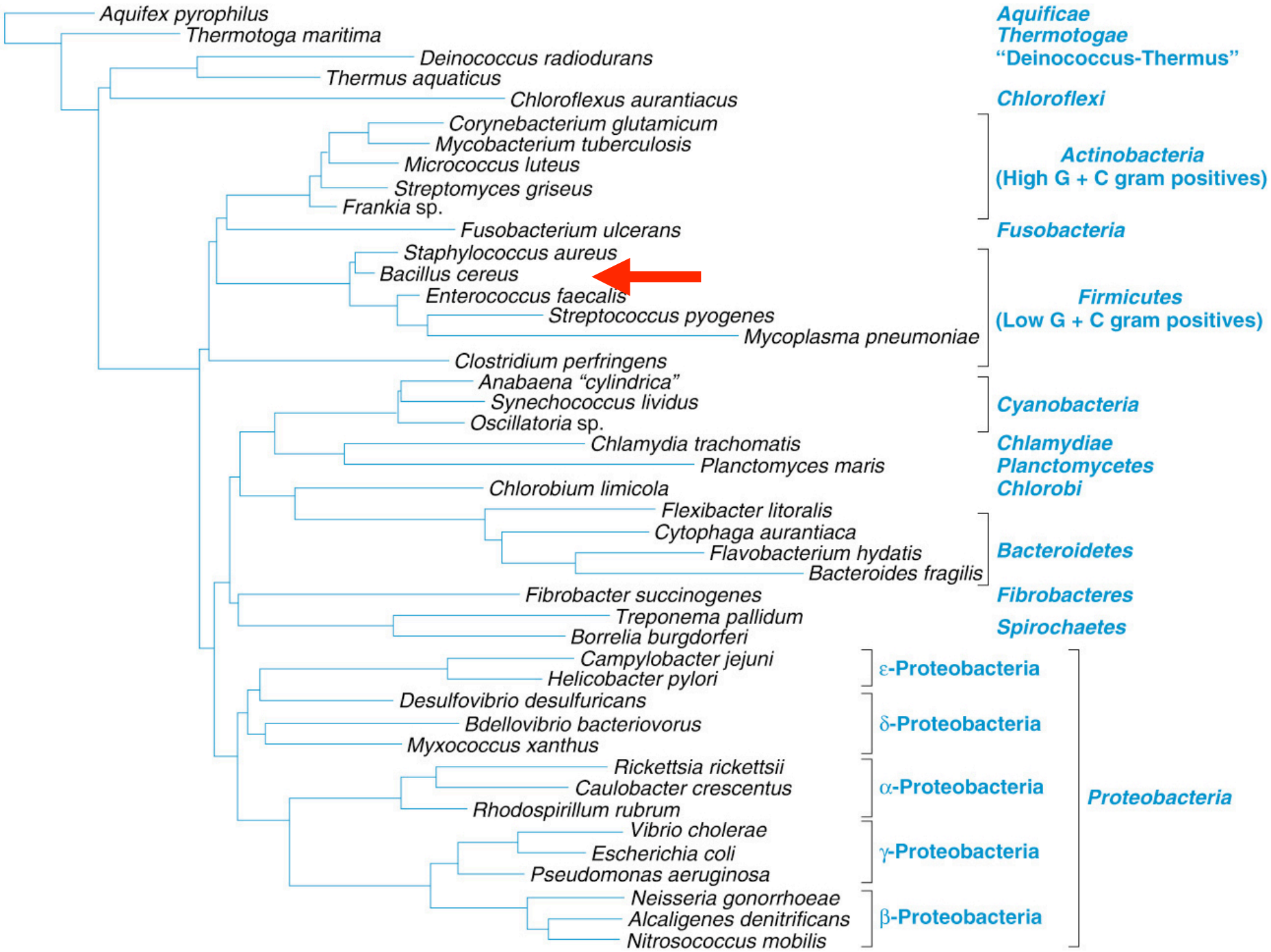


Fig. 39.25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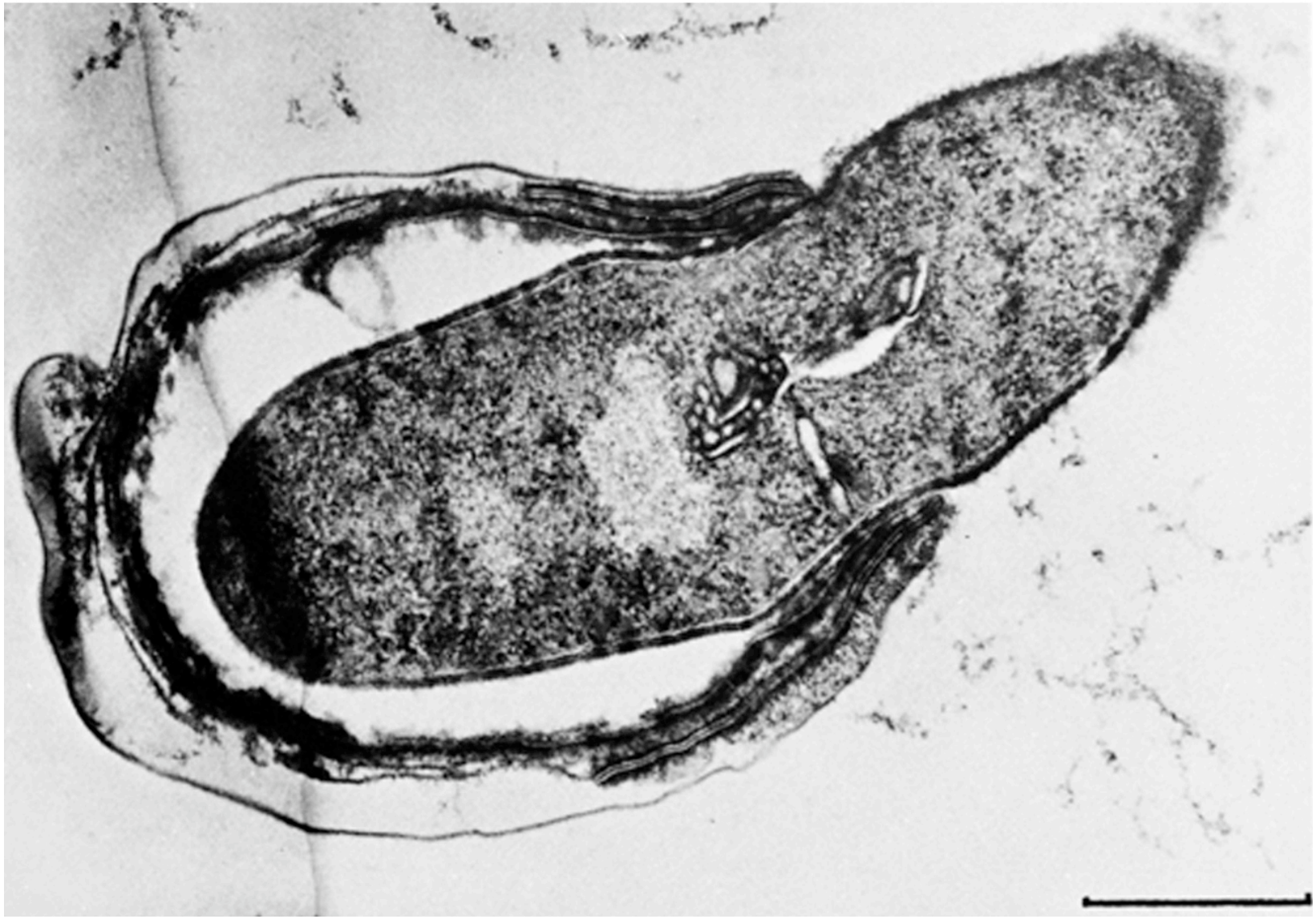
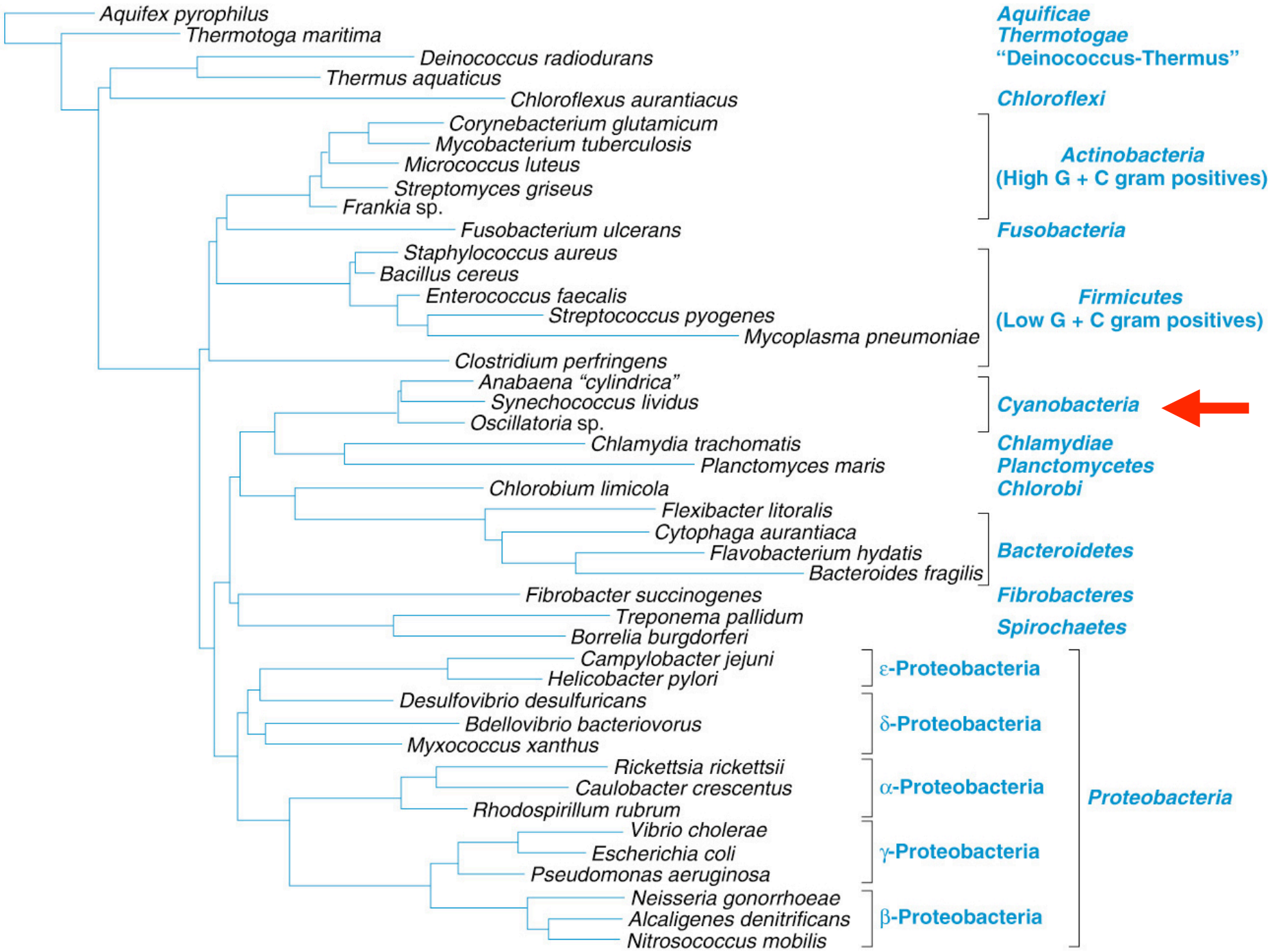
Gram+ spore formers

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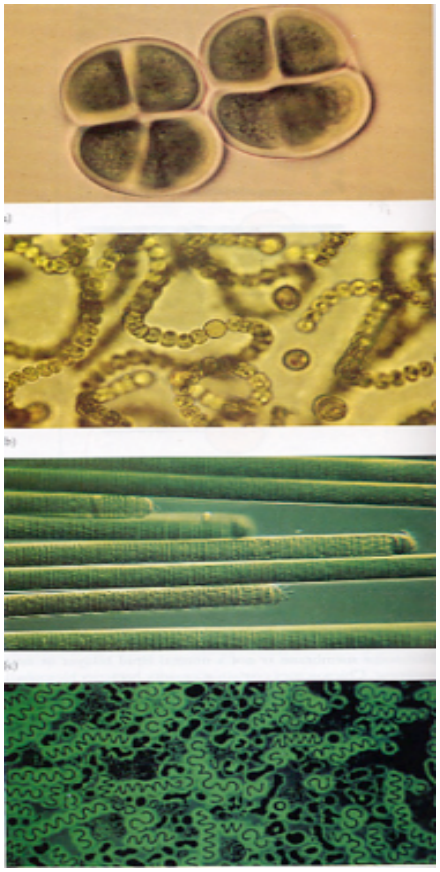
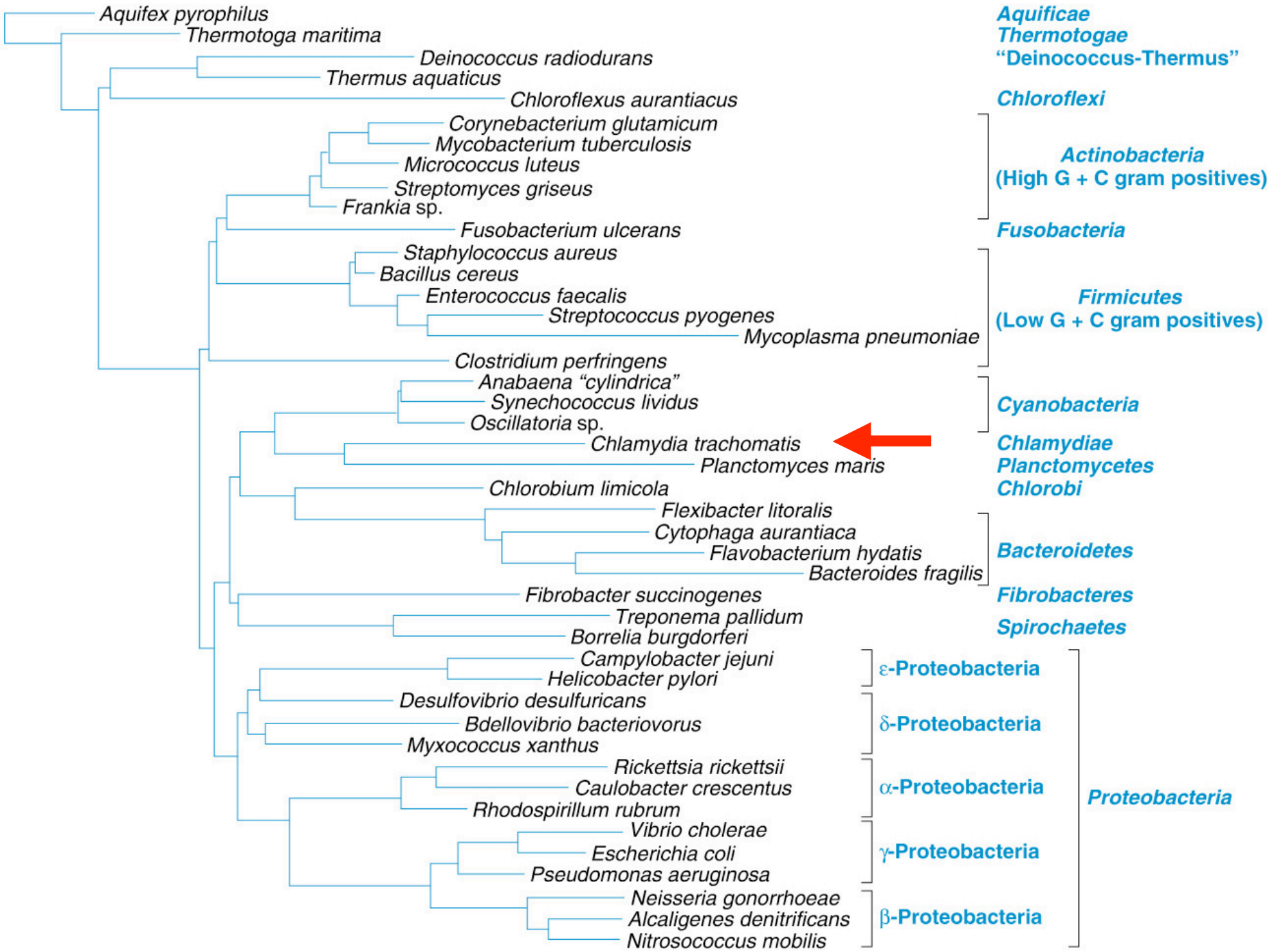
Cyanobacteria



- Chroococcus
- Nostoc
- Oscillatoria
- Anabaena

Fig. 21.7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Proteobacteria

Chlamydia life cycle

Elementary body	Reticulate body (initial body)
Size about 0.3 μm	Size 0.5–1.0 μm
Rigid cell wall	Fragile cell wall
Relatively resistant to sonication	Sensitive to sonication
Resistant to trypsin	Lysed by trypsin
Subunit in cell envelope	No subunit in envelope
RNA:DNA content = 1:1	RNA:DNA content = 3:1
Toxic for mice	Nontoxic for mice
Isolated organisms infectious	Isolated organisms not infectious
Adapted for extracellular survival	Adapted for intracellular growth

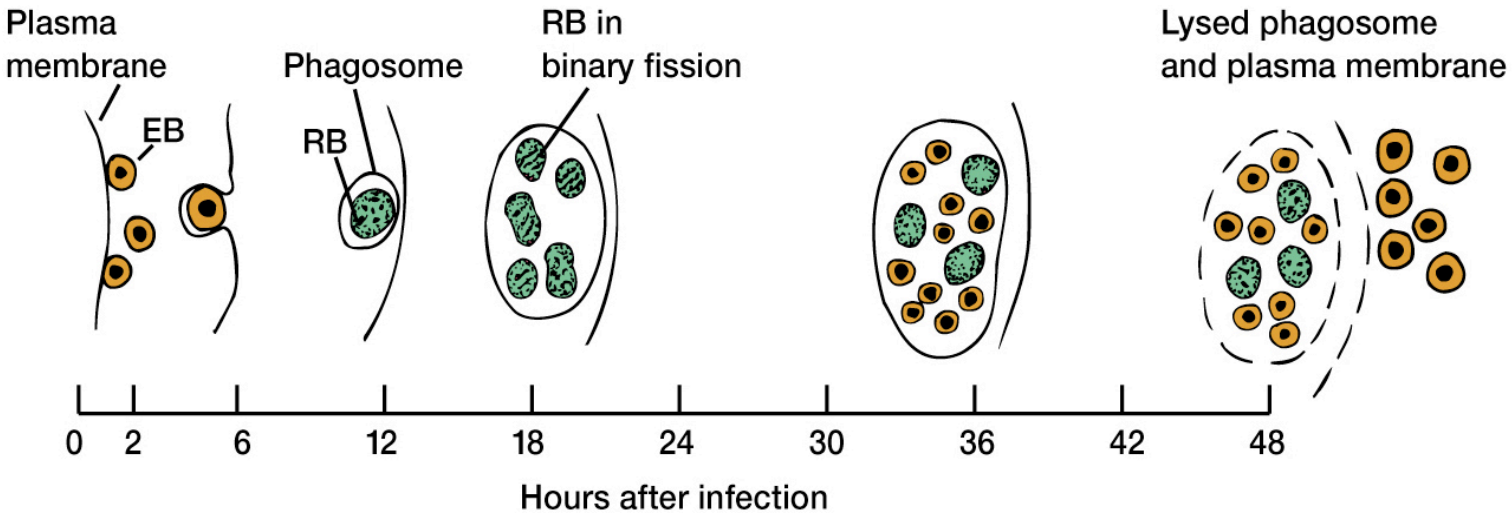
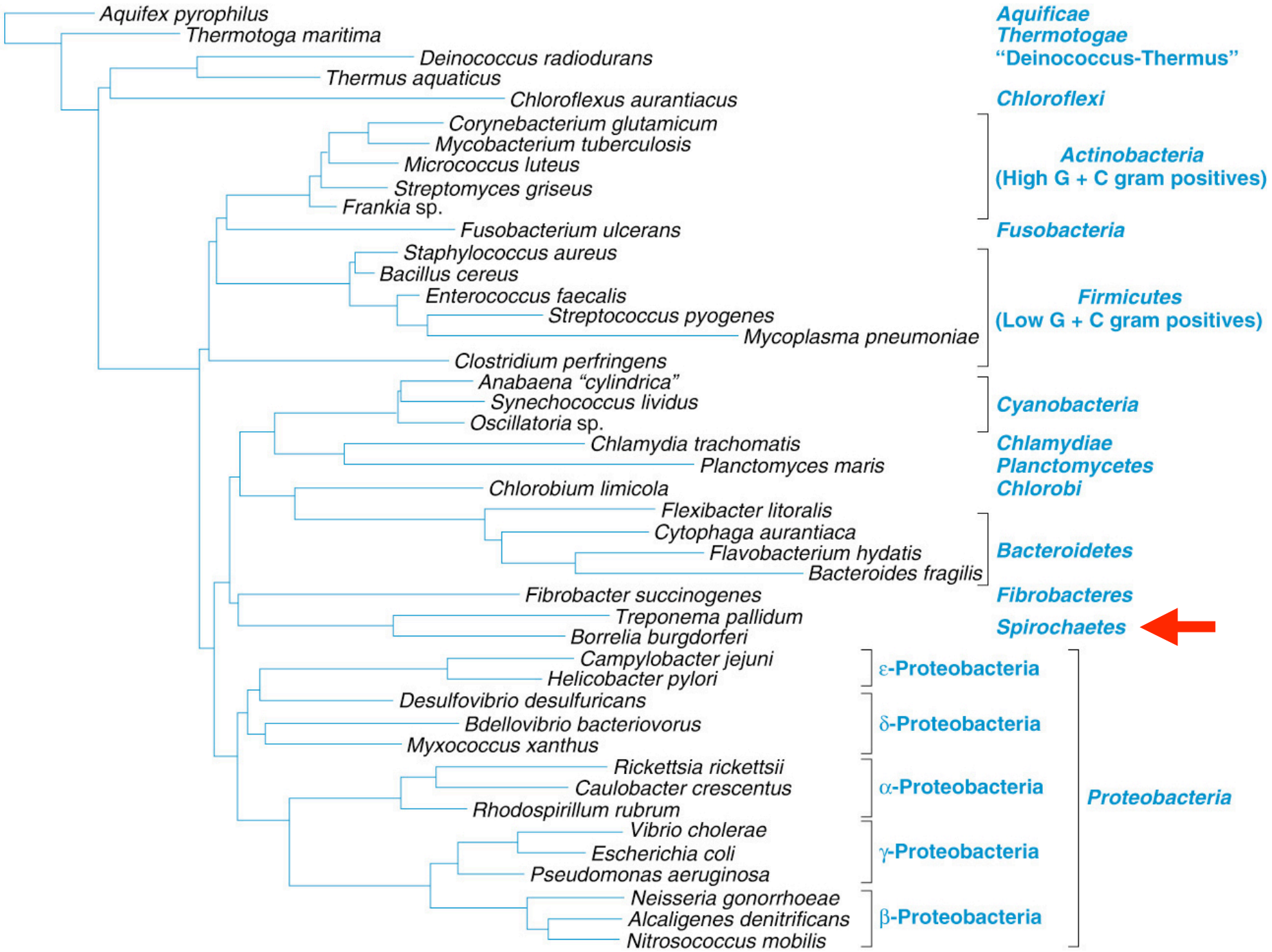


Fig. 21.14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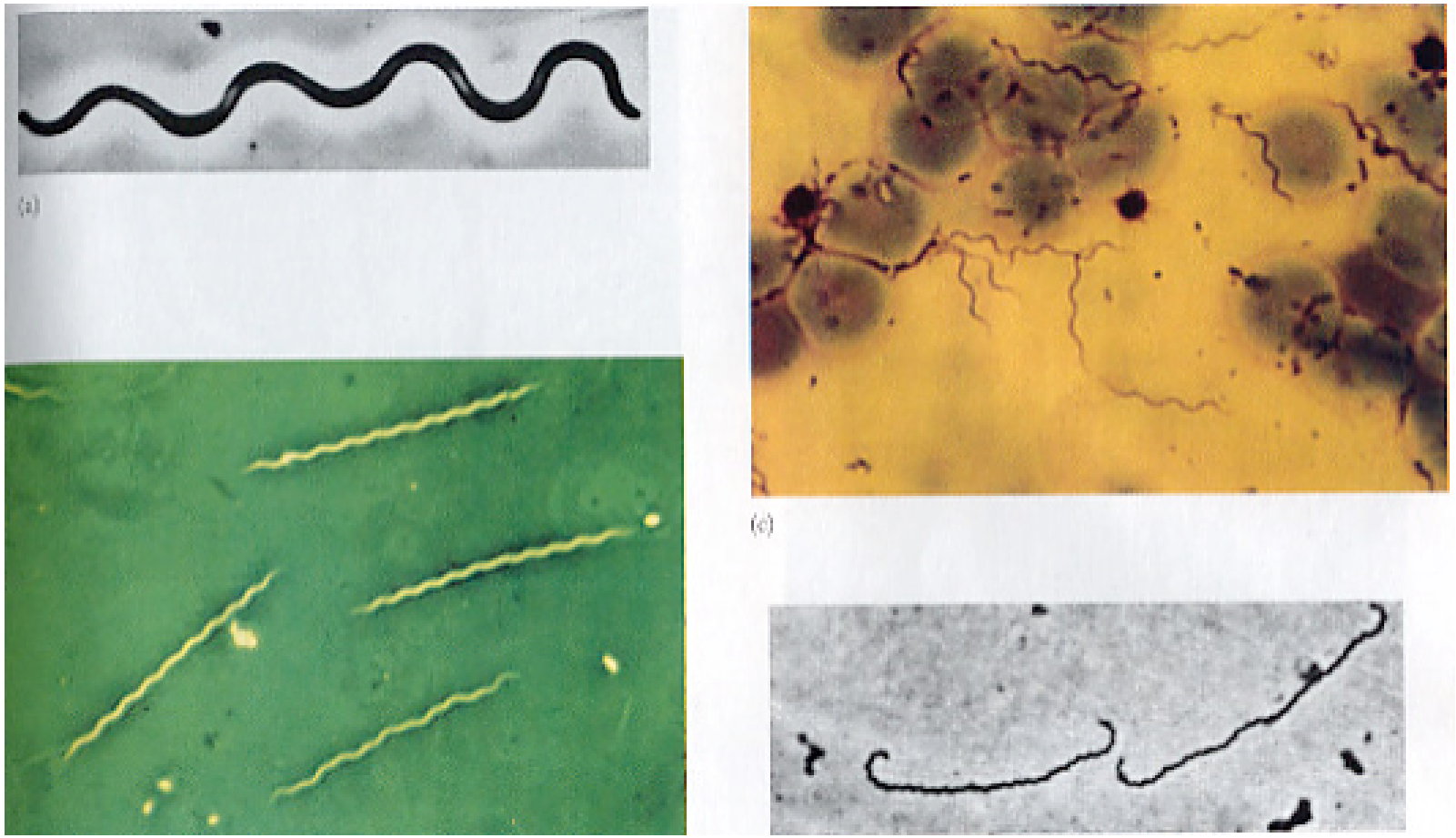
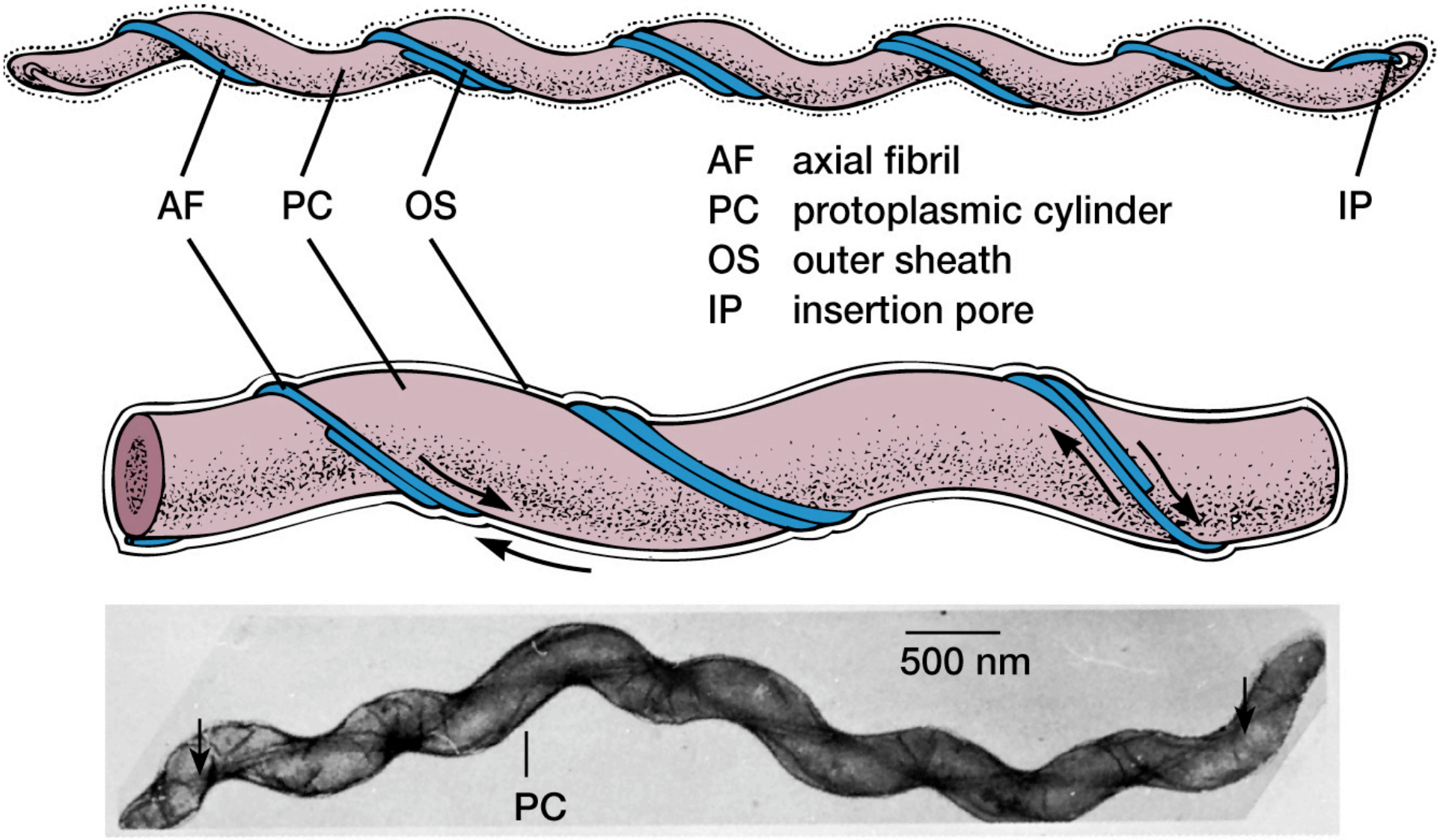
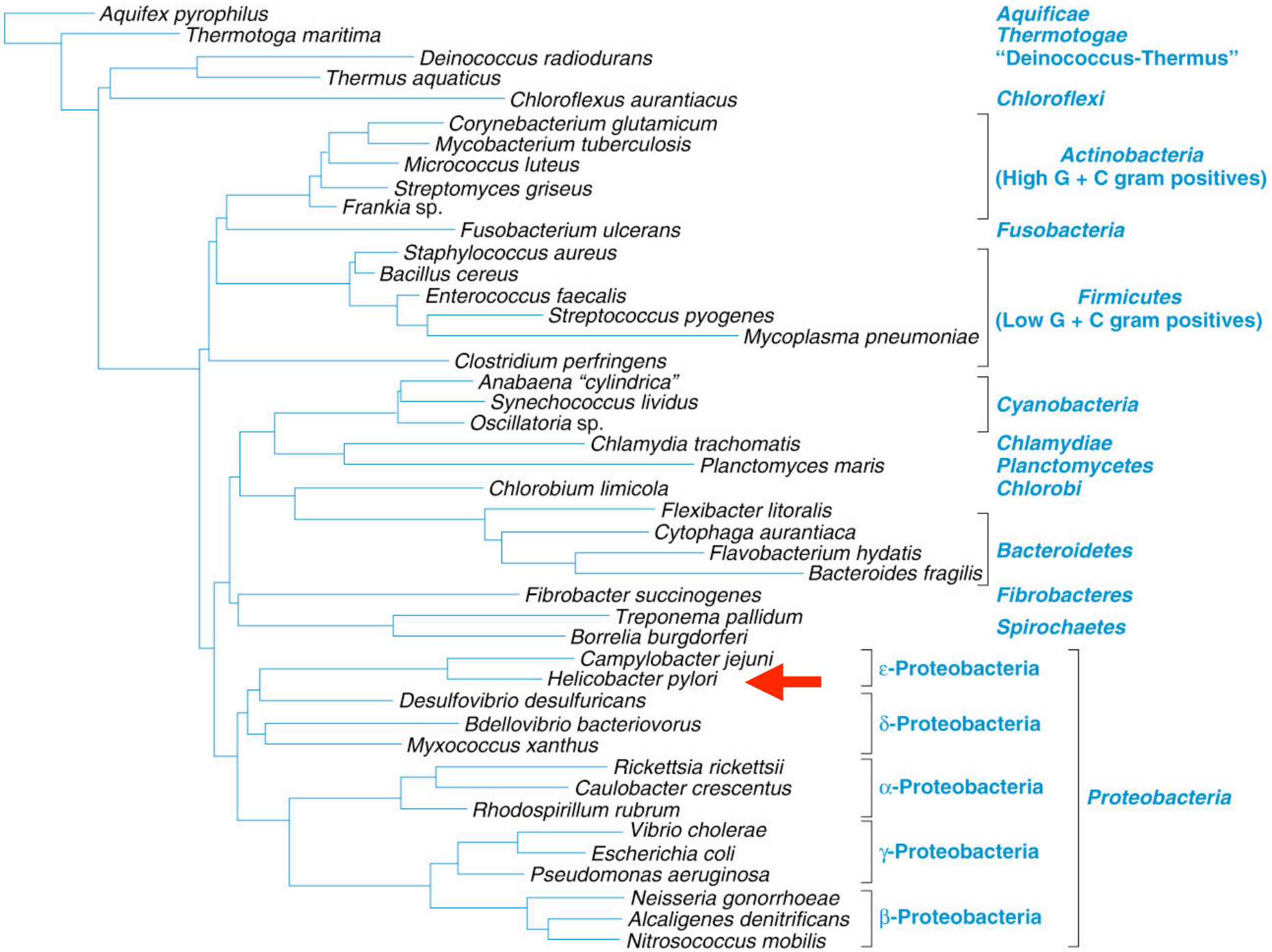
Spirochetes




AF
PC
OS
IP
AF axial fibril
PC protoplasmic cylinder
OS outer sheath
IP insertion pore
500 nm
PC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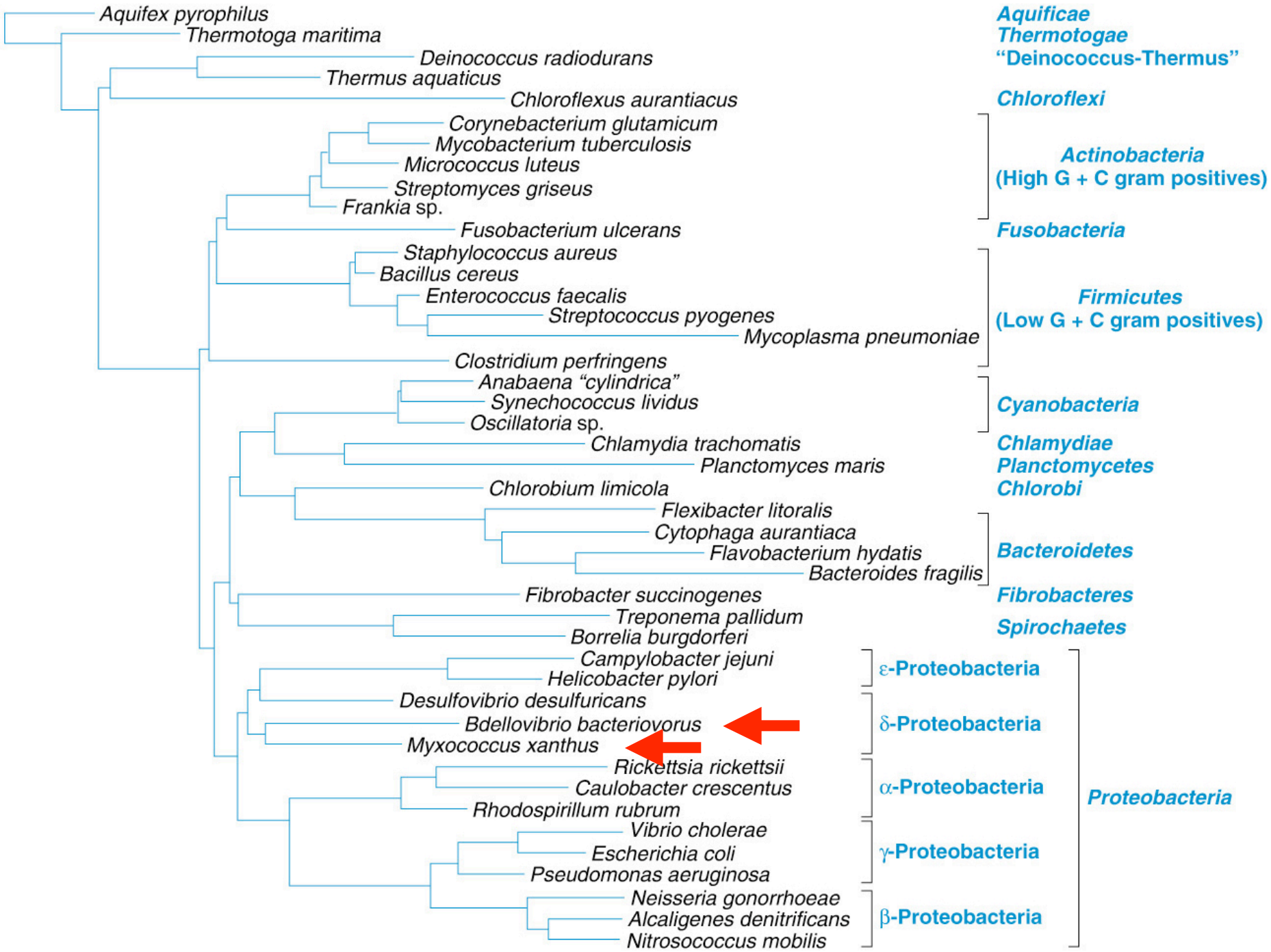
Helicobacter pylori adhering to gastric cells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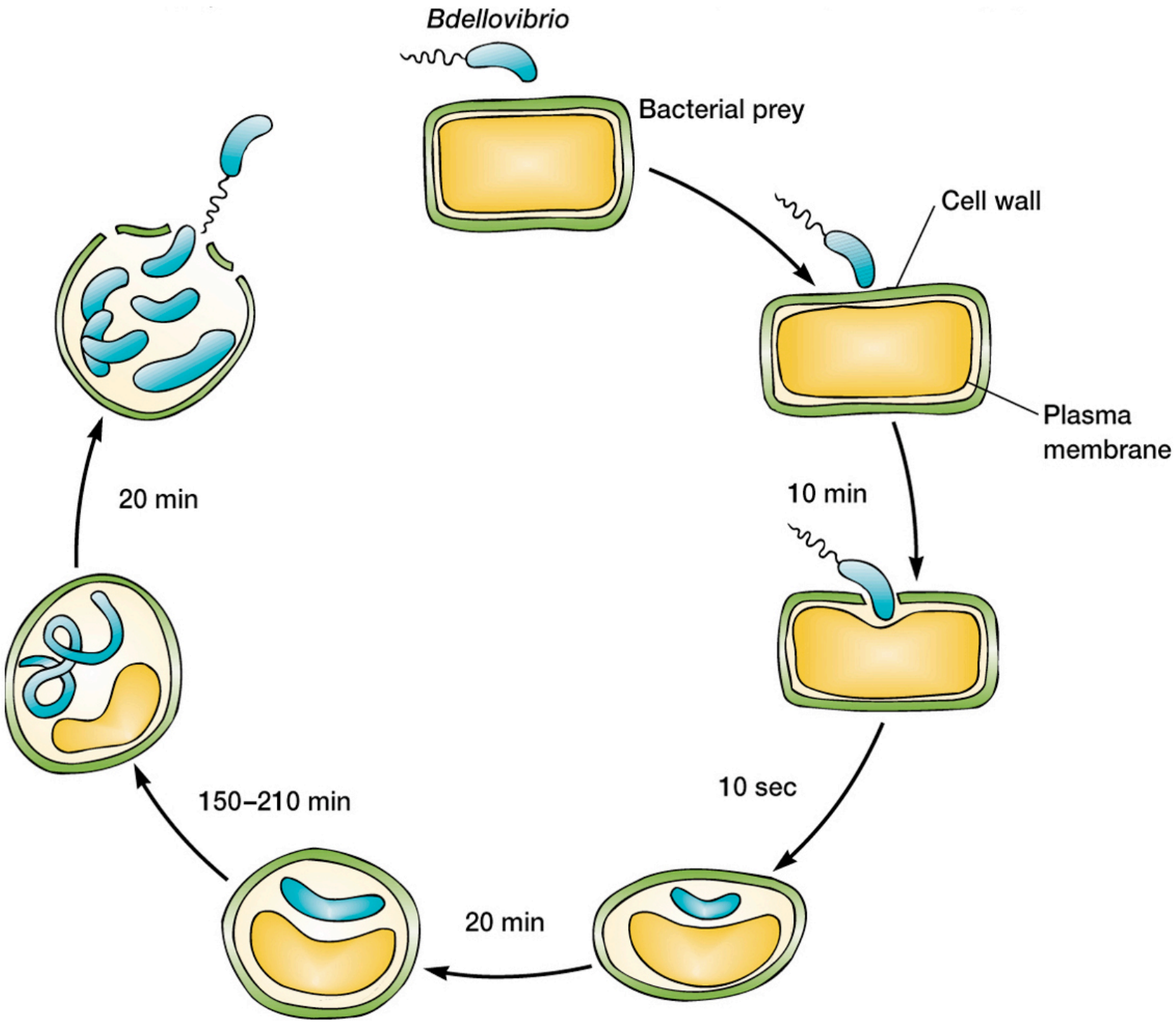
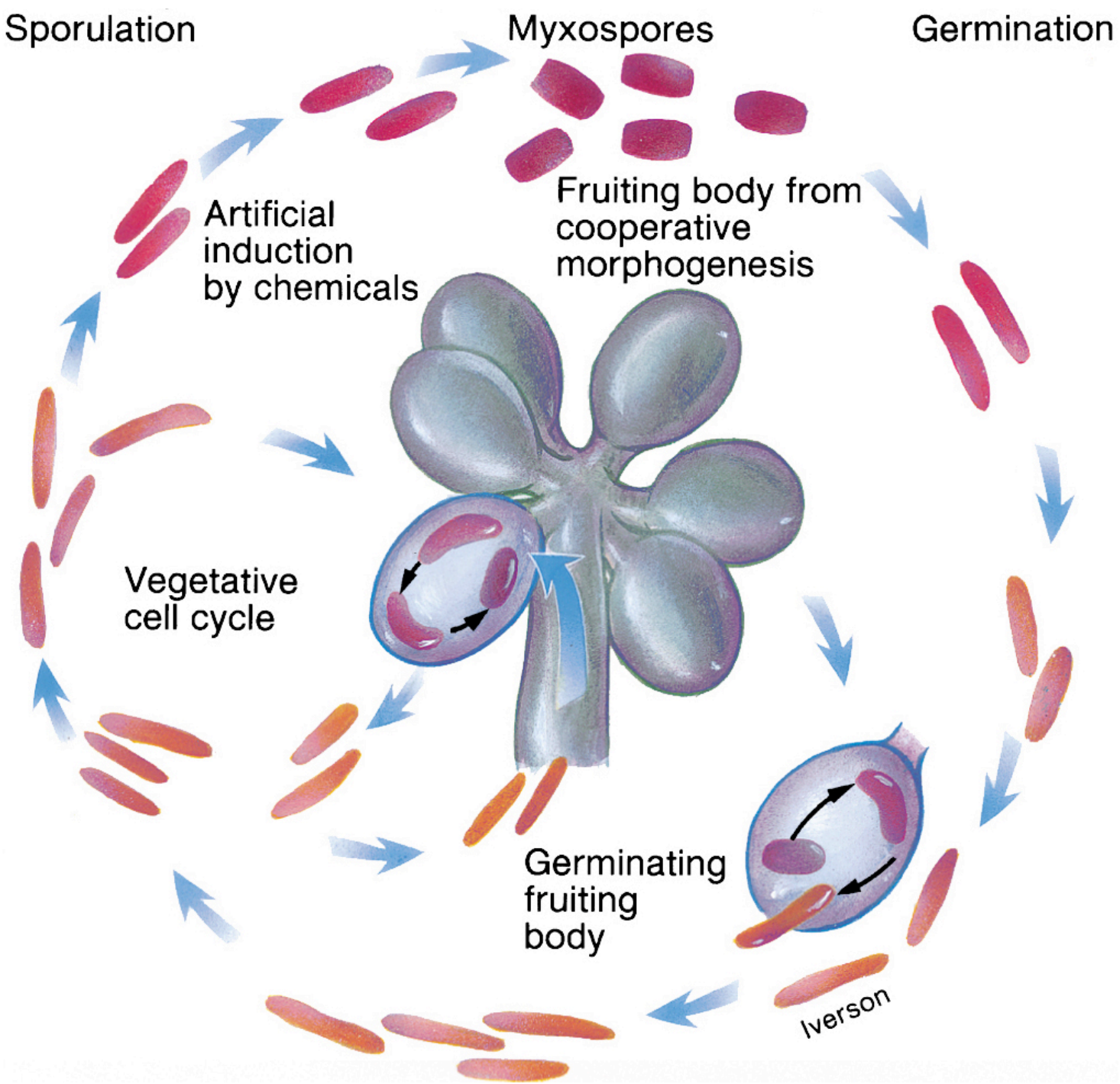
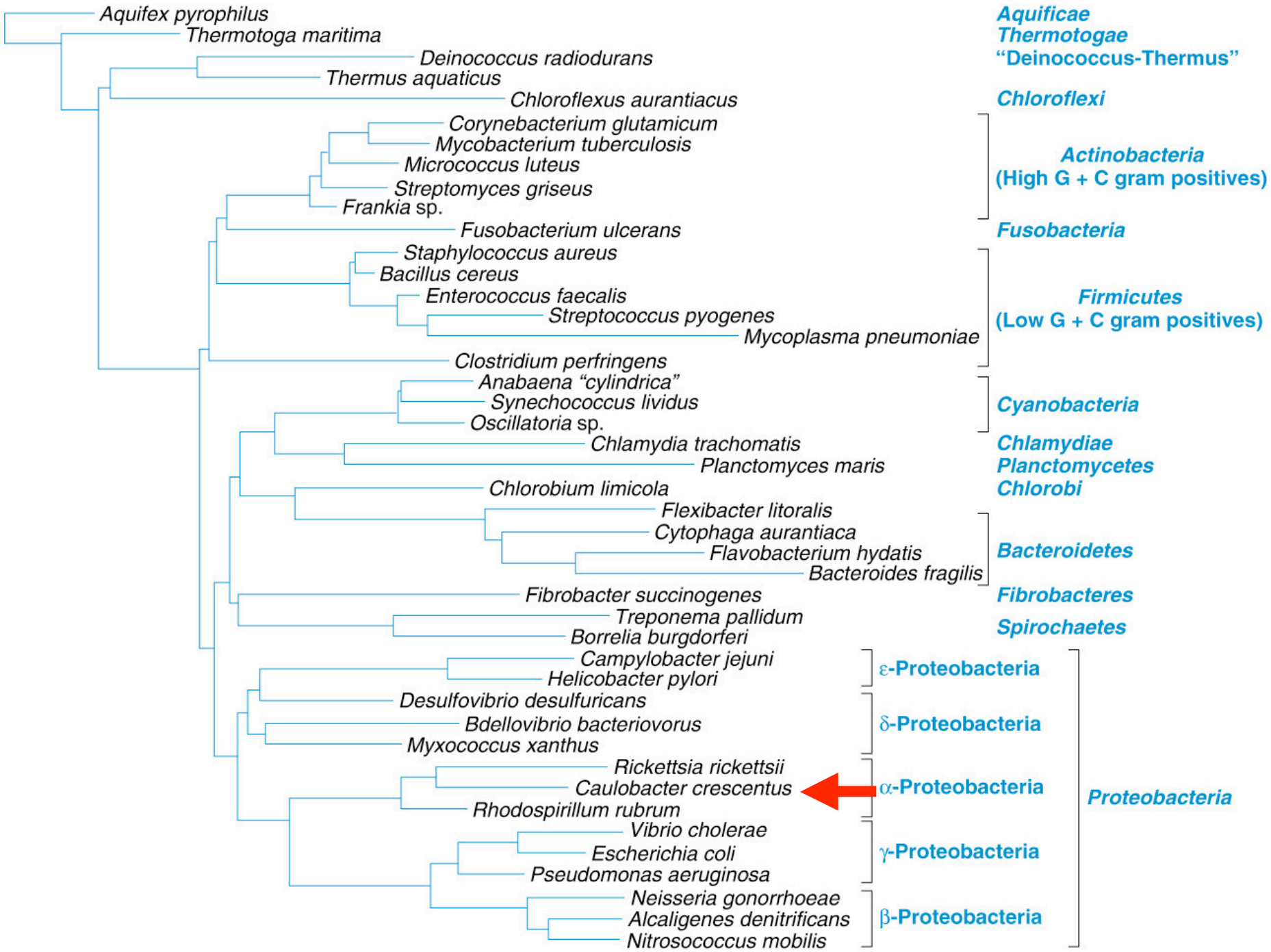
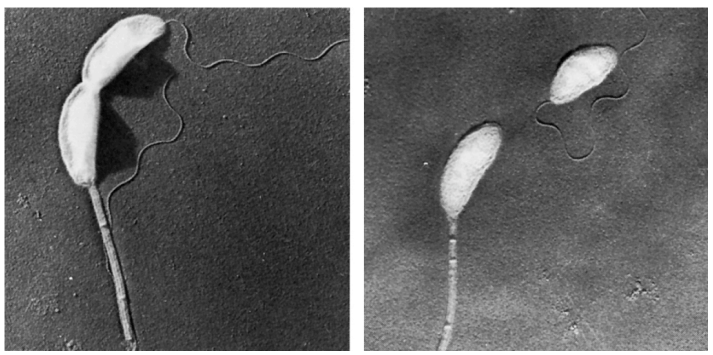
Cyanobacteria
Chlamydiae
Planctomycetes
Chlorobi
Bacteroidetes
Fibrobacteres
Spirochaetes
ε-Proteobacteria
δ-Proteobacteria
α-Proteobacteria
γ-Proteobacteria
β-Proteobacteria
Proteobacteria


Bdellovibrio
Bacterial prey
Cell wall
Plasma membrane
10 min
10 sec
20 min
150–210 min
20 min


Sporulation
Myxospores
Germination
Artificial induction by chemicals
Fruiting body from cooperative morphogenesis
Vegetative cell cycle
Germinating fruiting body
Iverson


Aquifex pyrophilus
Thermotoga maritima
Deinococcus radiodurans
Thermus aquaticus
Chloroflexus aurantiacus
Corynebacterium glutamicum
Mycobacterium tuberculosis
Micrococcus luteus
Streptomyces griseus
Frankia sp.
Fusobacterium ulcerans
Staphylococcus aureus
Bacillus cereus
Enterococcus faecalis
Streptococcus pyogenes
Mycoplasma pneumoniae
Clostridium perfringens
Anabaena "cylindrica"
Synechococcus lividus
Oscillatoria sp.
Chlamydia trachomatis
Planctomyces maris
Chlorobium limicola
Flexibacter litoralis
Cytophaga aurantiaca
Flavobacterium hydatis
Bacteroides fragilis
Fibrobacter succinogenes
Treponema pallidum
Borrelia burgdorferi
Campylobacter jejuni
Helicobacter pylori
Desulfovibrio desulfuricans
Bdellovibrio bacteriovorus
Myxococcus xanthus
Rickettsia rickettsii
Caulobacter crescentus
Rhodospirillum rubrum
Vibrio cholerae
Escherichia coli
Pseudomonas aeruginosa
Neisseria gonorrhoeae
Alcaligenes denitrificans
Nitrosococcus mobilis
Aquificae
Thermotogae
"Deinococcus-Thermus"
Chloroflexi
Actinobacteria
(High G + C gram positives)
Fusobacteria
Firmicutes
(Low G + C gram positives)
Cyanobacteria
Chlamydiae
Planctomycetes
Chlorobi
Bacteroidetes
Fibrobacteres
Spirochaetes
ε-Proteobacteria
δ-Proteobacteria
α-Proteobacteria
γ-Proteobacteria
β-Proteobacteria
Proteobacteria

Caulobacter life cycle



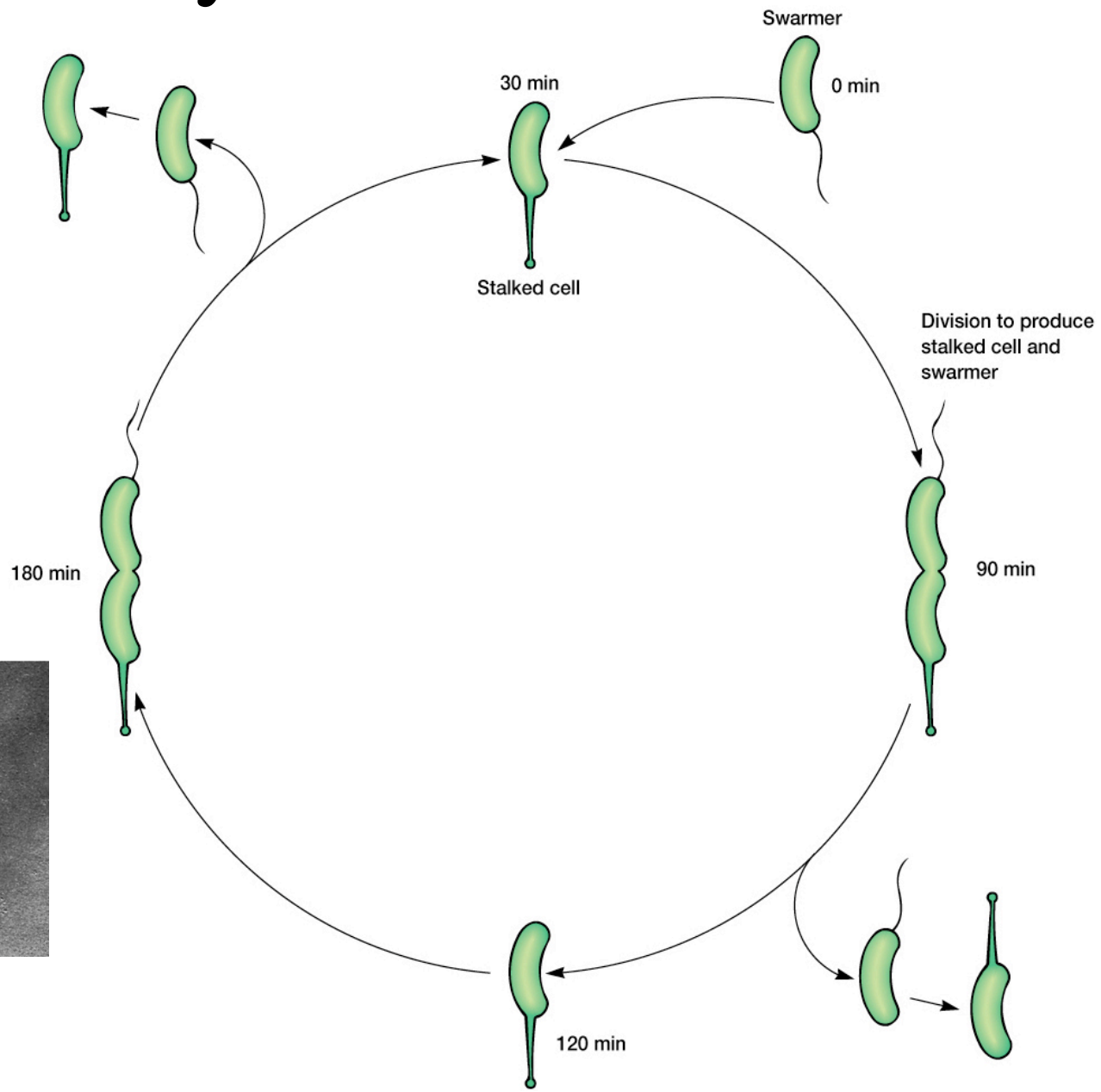
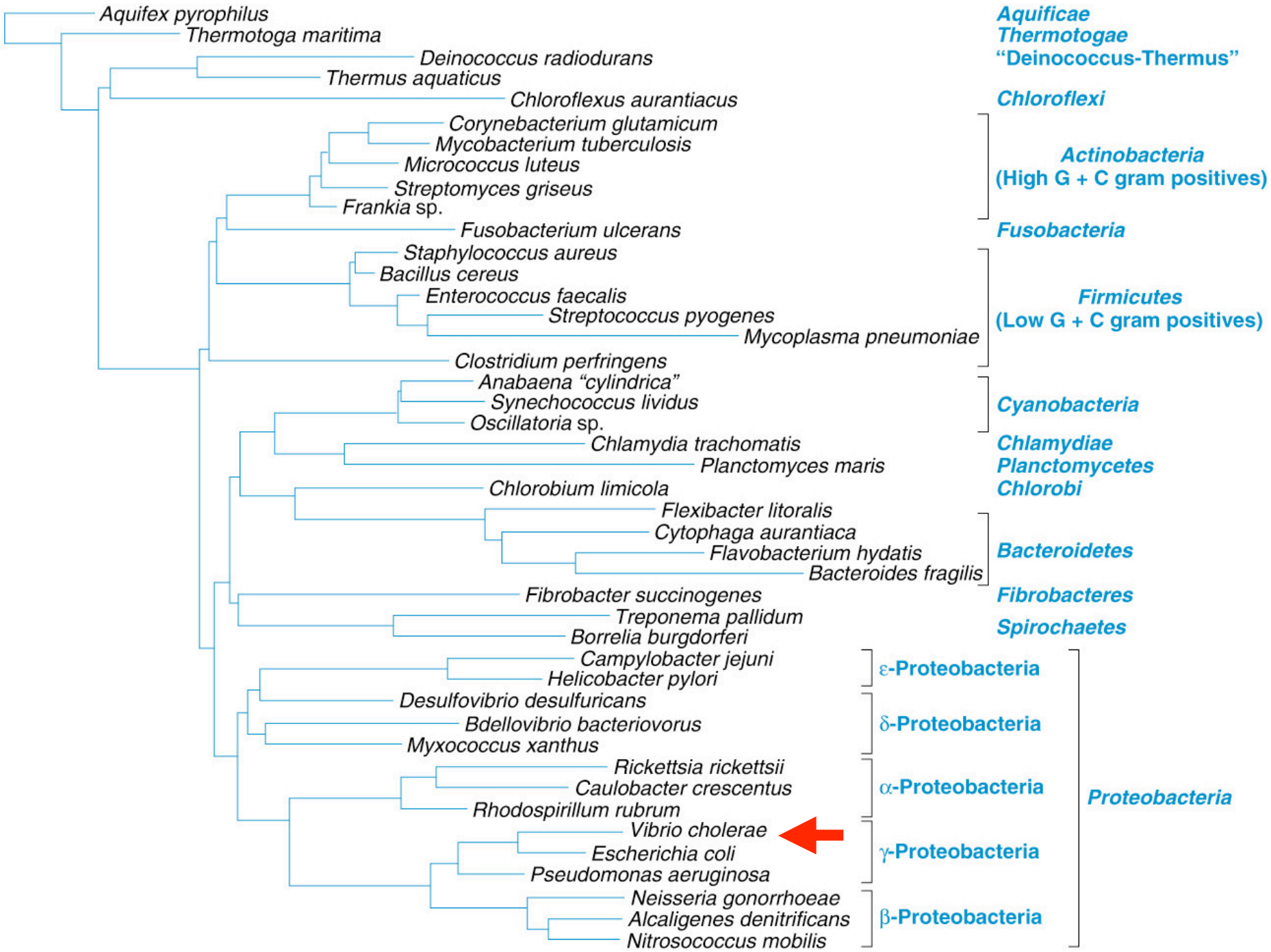


Fig. 22.7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Mycobacterium tuberculosis
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Fusobacterium ulcerans
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Bacillus cereus
Enterococcus faecalis
Streptococcus pyogenes
Mycoplasma pneumoniae
Clostridium perfringens
Anabaena "cylindrica"
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Chlamydia trachomatis
Planctomyces maris
Chlorobium limicola
Flexibacter litoralis
Cytophaga aurantiaca
Flavobacterium hydatis
Bacteroides fragilis
Fibrobacter succinogenes
Treponema pallidum
Borrelia burgdorferi
Campylobacter jejuni
Helicobacter pylori
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Bdellovibrio bacteriovorus
Myxococcus xanthus
Rickettsia rickettsii
Caulobacter crescentus
Rhodospirillum rubrum
Vibrio cholerae
Escherichia coli
Pseudomonas aeruginosa
Neisseria gonorrhoeae
Alcaligenes denitrificans
Nitrosococcus mobilis
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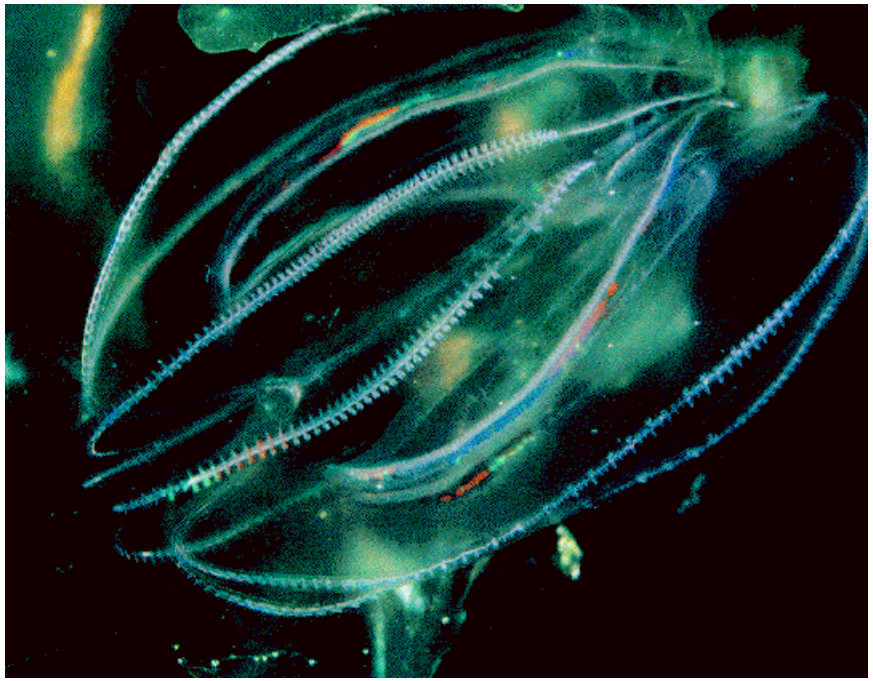
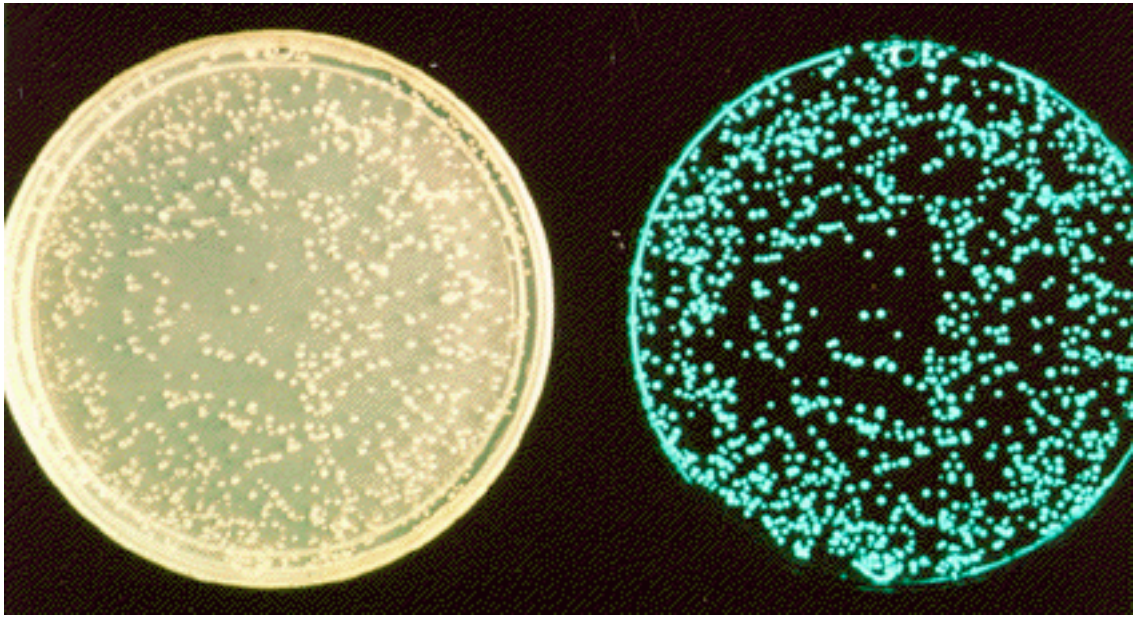
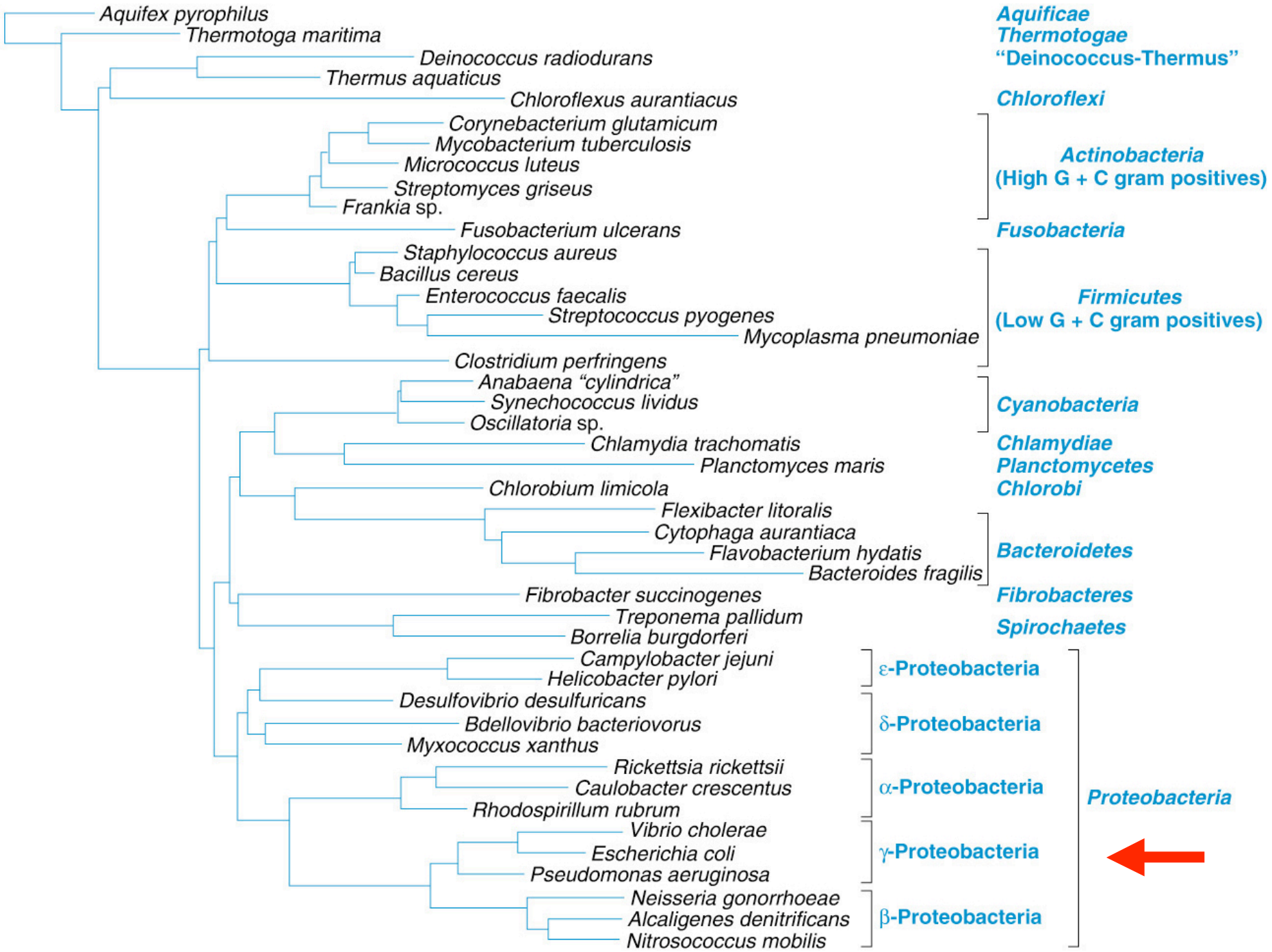
Chlorobi
Bacteroidetes
Fibrobacteres
Spirochaetes
ε-Proteobacteria
δ-Proteobacteria
α-Proteobacteria
γ-Proteobacteria
β-Proteobacteria
Proteobacteria

Bioluminescence



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Fibrobacter succinogenes
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Campylobacter jejuni
Helicobacter pylori
Desulfovibrio desulfuricans
Bdellovibrio bacteriovorus
Myxococcus xanthus
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Caulobacter crescentus
Rhodospirillum rubrum
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ε-Proteobacteria
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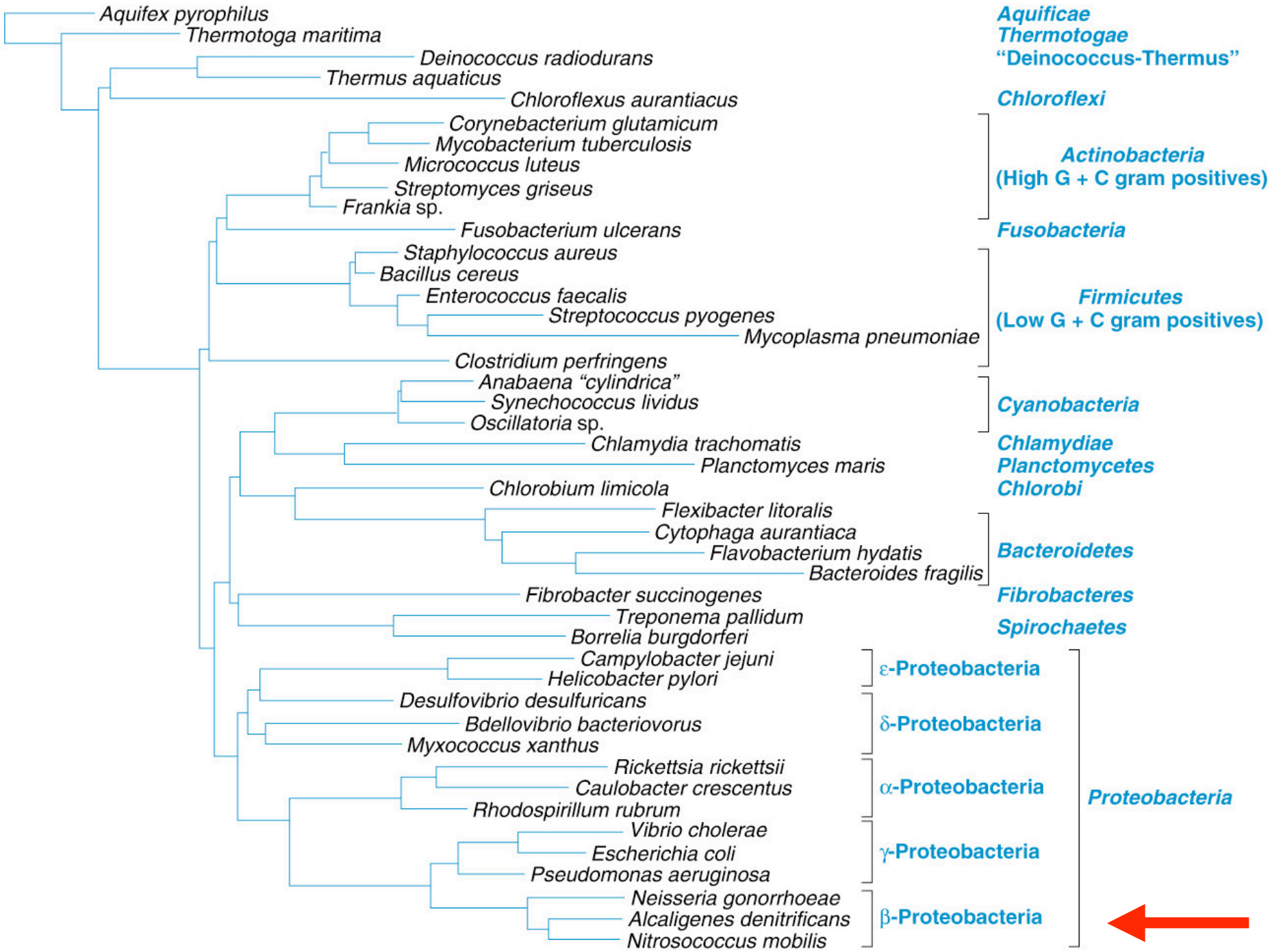
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Chlorobi
Bacteroidetes
Fibrobacteres
Spirochaetes
ε-Proteobacteria
δ-Proteobacteria
α-Proteobacteria
γ-Proteobacteria
β-Proteobacteria
Proteobacteria

Rhizobium

attachment to root hair

infection thread

Fig. 30.8

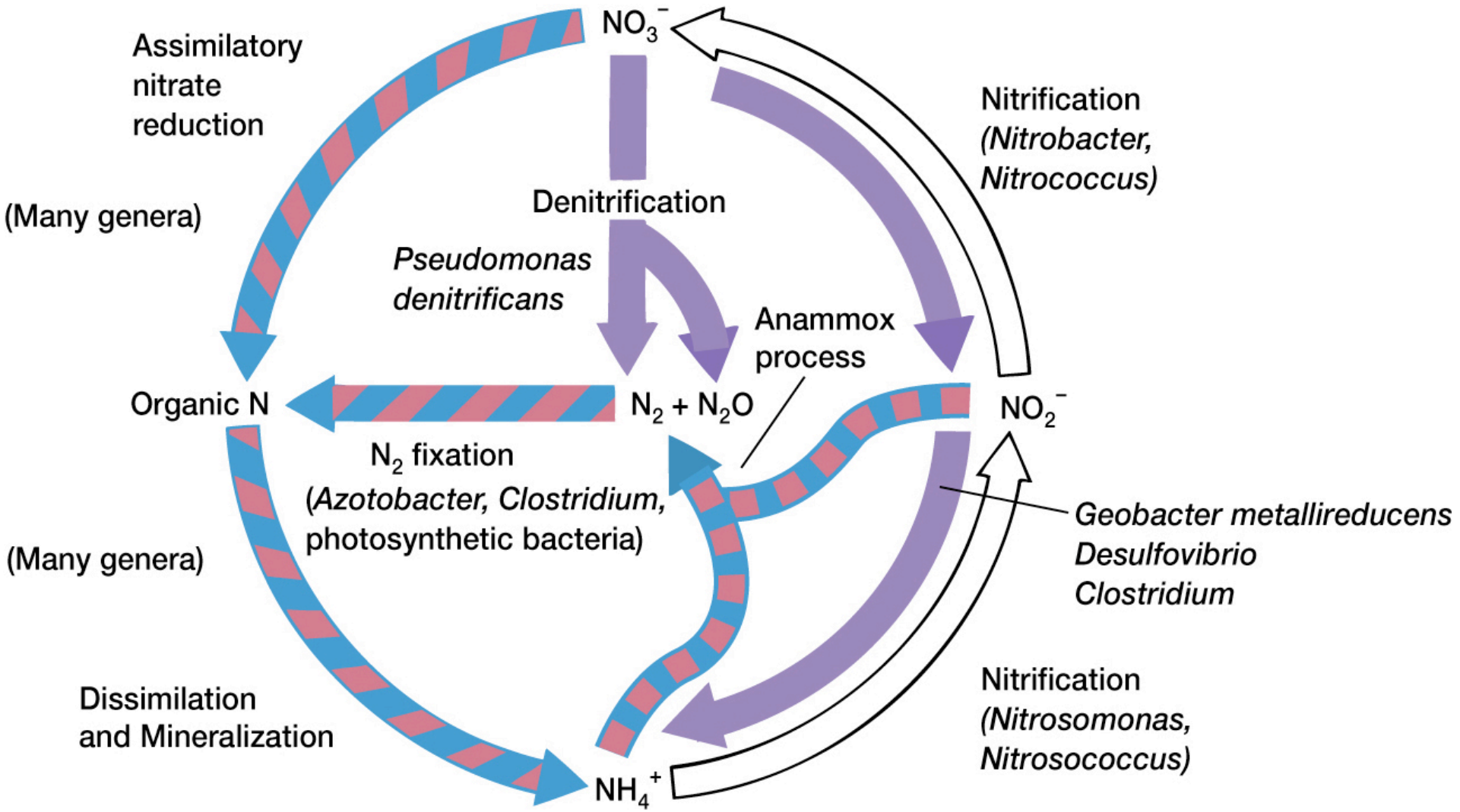
NO_3^-
Assimilatory nitrate reduction
(Many genera)
Denitrification
Pseudomonas denitrificans
Nitrification (Nitrobacter, Nitrococcus)
Anammox process
Organic N
$N_2 + N_2O$
NO_2^-
N_2 fixation (Azotobacter, Clostridium, photosynthetic bacteria)
(Many genera)
Geobacter metallireducens
Desulfovibrio
Clostridium
Dissimilation and Mineralization
Nitrification (Nitrosomonas, Nitrosococcus)
NH_4^+

Fig. 28.22