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PHILOSOPHIA BOTANICA

IN QVA
EXPLICANTUR

FUNDAMENTA BOTANICA

CUM

DEFINITIONIBUS PARTIUM,
EXEMPLIS TERMINORUM,
OBSERVATIONIBUS RARIORUM,

ADJECTIS

FIGURIS ÆNEIS.

STOCKHOLMIÆ apud GODOFR KIESEWETTER,
AMSTELODAMI apud Z. CHATELAIN.
1751.

Washtubbia Circularis.

Tigerlillia Terribilis.

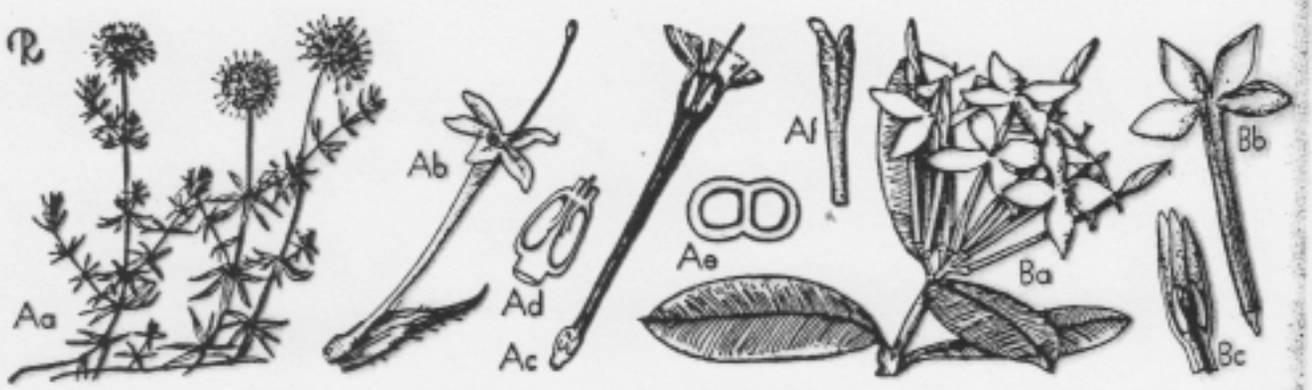


Fig. 288. RUBIACEAE. A, *Crucianella stylosa*: Aa, flowering stems, × ⅛; Ab, flower with subtending bract, × 1½; Ac, same, vertical section(corolla-lobes excised), × 2; Ad, ovary, vertical section, × 5; Ae, ovary, cross-section, × 8; Af, stigma, × 4. B, *Ixora coccinea*: Ba, flowering twig, × ½; Bb, flower, perianth expanded, × ½; Bc, opening bud tip, vertical section, showing stamens, × 1. (From L. H. Bailey, *Manual of cultivated plants*, The Macmillan Company, 1949. Copyright 1924 and 1949 by Liberty H. Bailey.)

The Rubiaceae are a large pantropical and subtropical family of nearly 400 genera (of which nearly half are monotypic) and 4800 to 5000 species. Species and genera of the tribes Galieae, Anthospermeae, and Oldenlandieae are predominantly herbaceous, and extend into temperate zones (*Nertera* extends from the equator to Cape Horn, and *Galium* from the equator to the arctic). The family is especially abundant in northern South America. About 50 genera occur indigenously in Mexico, and 14 in the United States. Notable among the latter are *Houstonia, Galium,* and *Cephalanthus* in the cooler parts, and *Hedyotis* (*Oldenlandia*), *Diodia, Pentodon, Pinckneya,* and *Bouvardia* primarily in the warmer areas. Other genera in the southwest include *Kelloggia* and *Crusea.*

The Madder family is closely allied to the Caprifoliaceae, and there is no single character distinguishing them. In general, the presence of stipules in the Rubiaceae and the usual lack of them in Caprifoliaceae is a good field character.

The Rubiaceae are of economic importance primarily for several tropical crops, notably coffee (*Coffea*), quinine (*Cinchona*), and ipecac (*Cephaelis*). In addition to these a number of ornamentals grown in this country include gardenia (*Gardenia*), madder (*Rubia*), bead plant (*Nertera*), partridgeberry (*Mitchella*), and species of *Galium, Asperula, Ixora, Bouvardia, Manettia, Coprosma,* and *Serissa.*

V. SEXUS.

132. Initio rerum, ex omni ſpecie viventium (3) unicum ſexus par creatum fuiſſe contendimus.

V. SEX

132. We maintain that, in the beginning of things, a single sexual pair of every species of living [being] (3) was created.

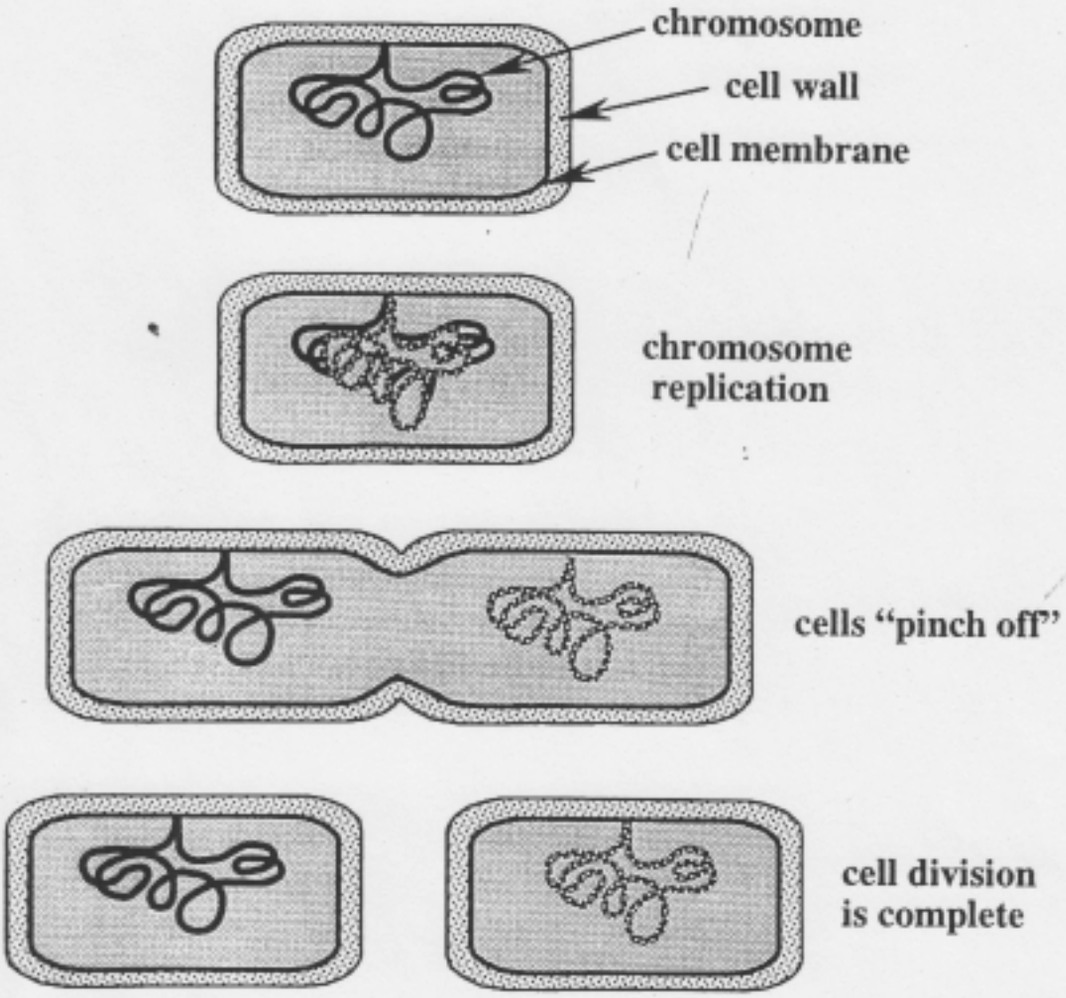


Figure 3.12. Bacterial cell division by binary fission. The circular bacterial chromosome is attached to the cell membrane, it replicates, and its two copies are drawn into two future cells resulting from the invagination and "pinching in" of the dividing cell membrane.

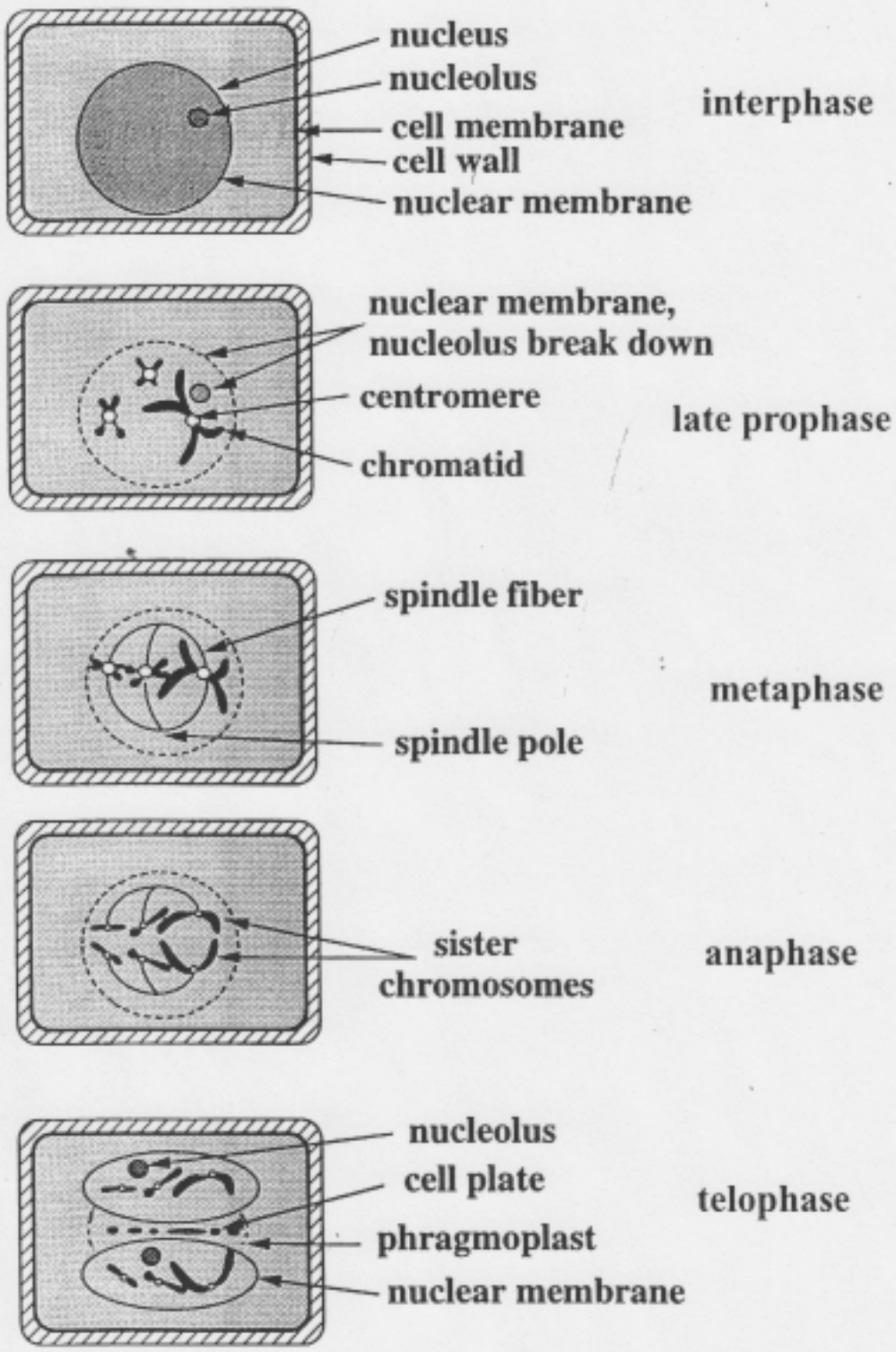


Figure 3.13. Diagrammatic rendition of the mitotic cell division of a land plant cell. The cell division cycle is divided into five phases (interphase, prophase, metaphase, anaphase, and telophase). Each phase is distinguishable in terms of the condition of the nuclear contents. During mitosis, chromosomes replicate to form sister chromatids that normally are genetically identical (see fig. 1.9). Sister chromatids are drawn toward opposing poles that will later be the sites of two nuclei, each containing the same number of chromosomes as the original cell.

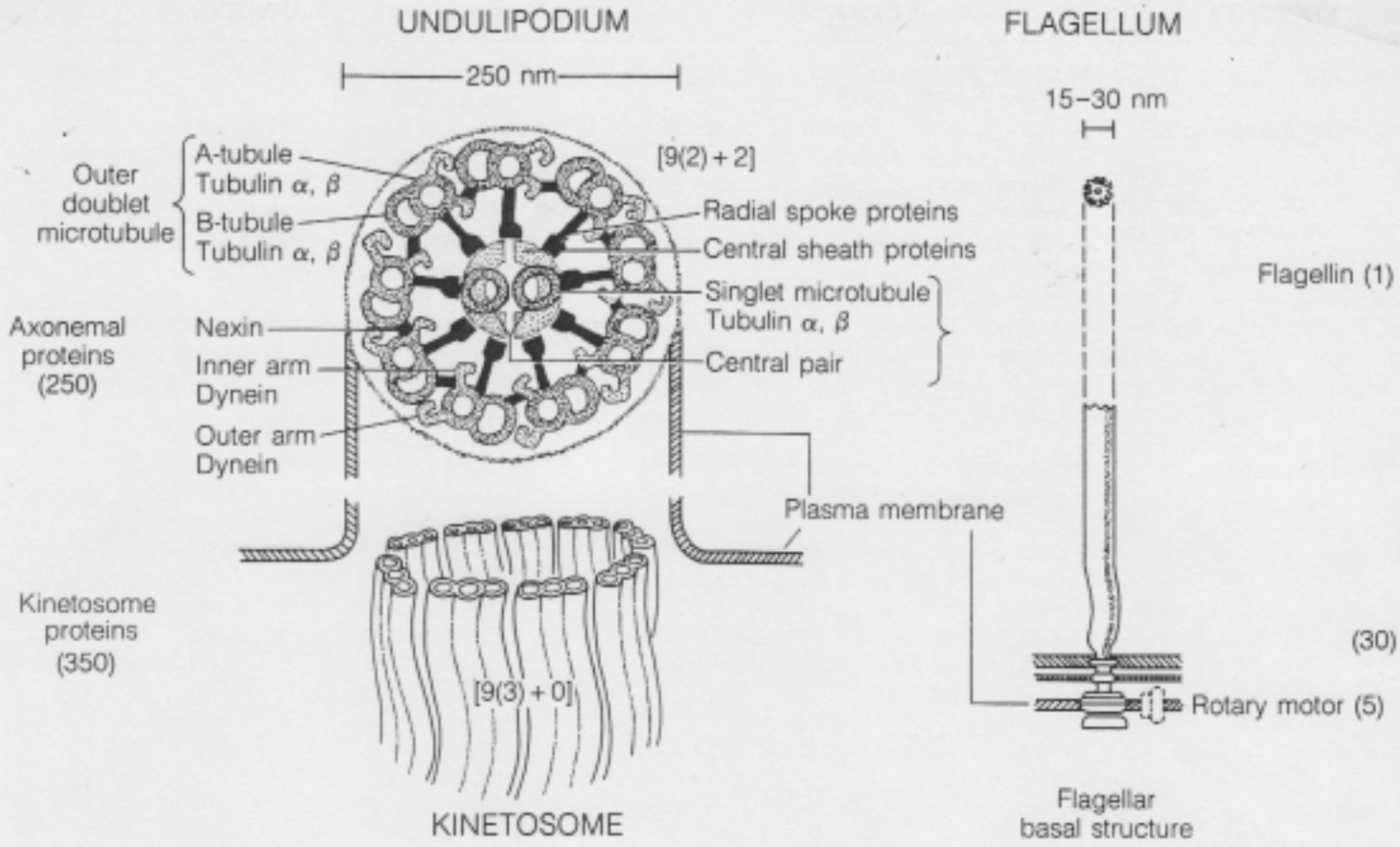


FIGURE 2-4

Comparison of undulipodium underlain by kinetosome and flagellum moved by rotary motor. The approximate number of different proteins comprising each structure is indicated in parentheses. [Based on an original drawing by Kathryn Delisle.]

"…. an old term, undulipodium, replaces cilia, flagella, and related organelles of eukaryotes (for example, shafts of sperm tails, the units of cirri, and other [9(2) + 2] structures and their derivatives that develop from kinetosomes -- which themselves show a [9(3) + 0] structure in cross section. The term flagella is reserved for the solid, thin, bacterial flagella and homologous structures such as spirochete axial fibrils."[1]

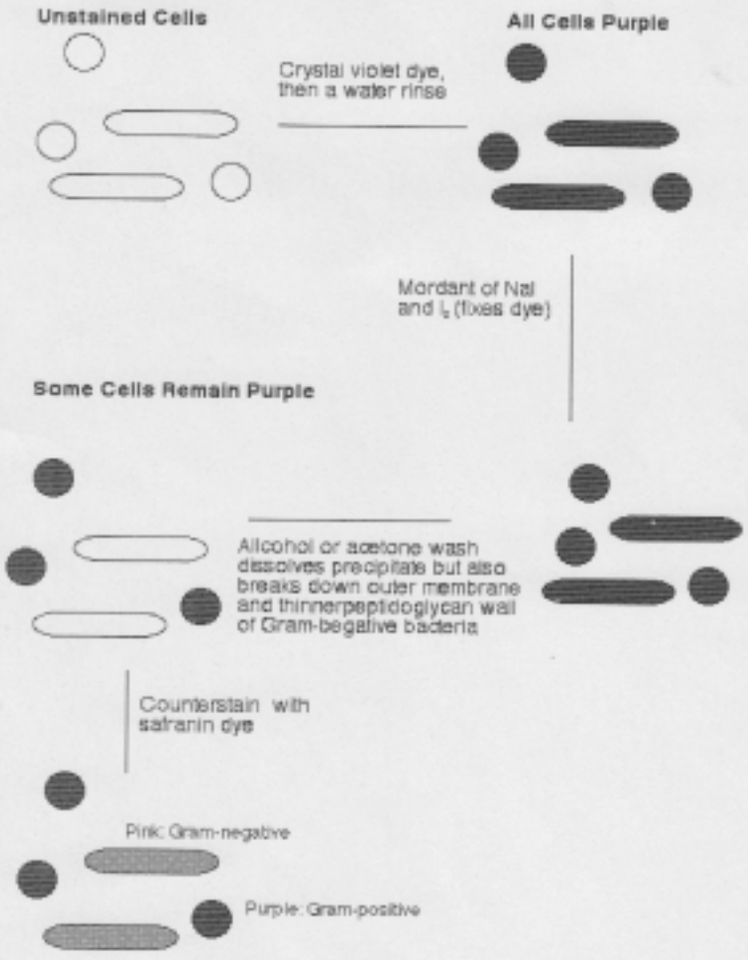
[1] Margulis, Lynn (1993) Symbiosis in Cell Evolution. Microbial Communities in the Archean and Proterozoic Eons. Second Edition. WH Freeman and Company, New York.

CHAPTER 11 - BACTERIA AND VIRUSES

The classification of bacteria relies on four or so general techniques / properties:

Differential Staining [e.g. Gram positive / Gram negative]
Morphology [bacilli / cocci / spirilla]
Metabolism [heterotrophs / chemotrophs / phototrophs]
Genome sequence

Differential Staining: About 1900, a Danish microbiologist developed a staining procedure using crystal violet and safranin dyes.



As one example, from the Difco Manual of Dehydrated Culture Media and Reagents for Microbiological and Clinical Laboratory Procedures. Ninth Edition. 1966:

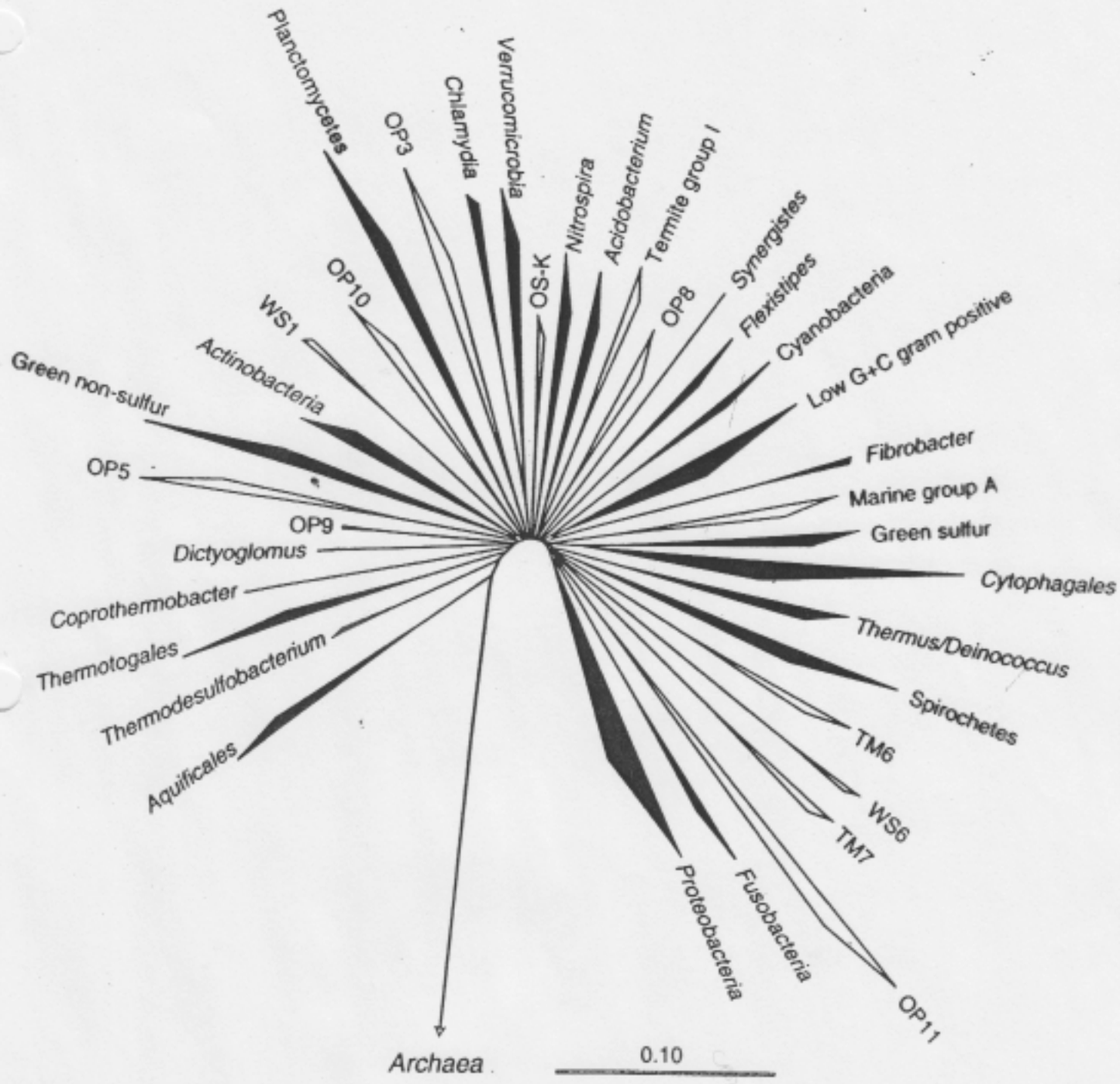
Bacto Lactose Broth

Bacto-Beef Extract	3 grams
Bacto-Peptone	5 grams
Bacto-Lactose	5 grams

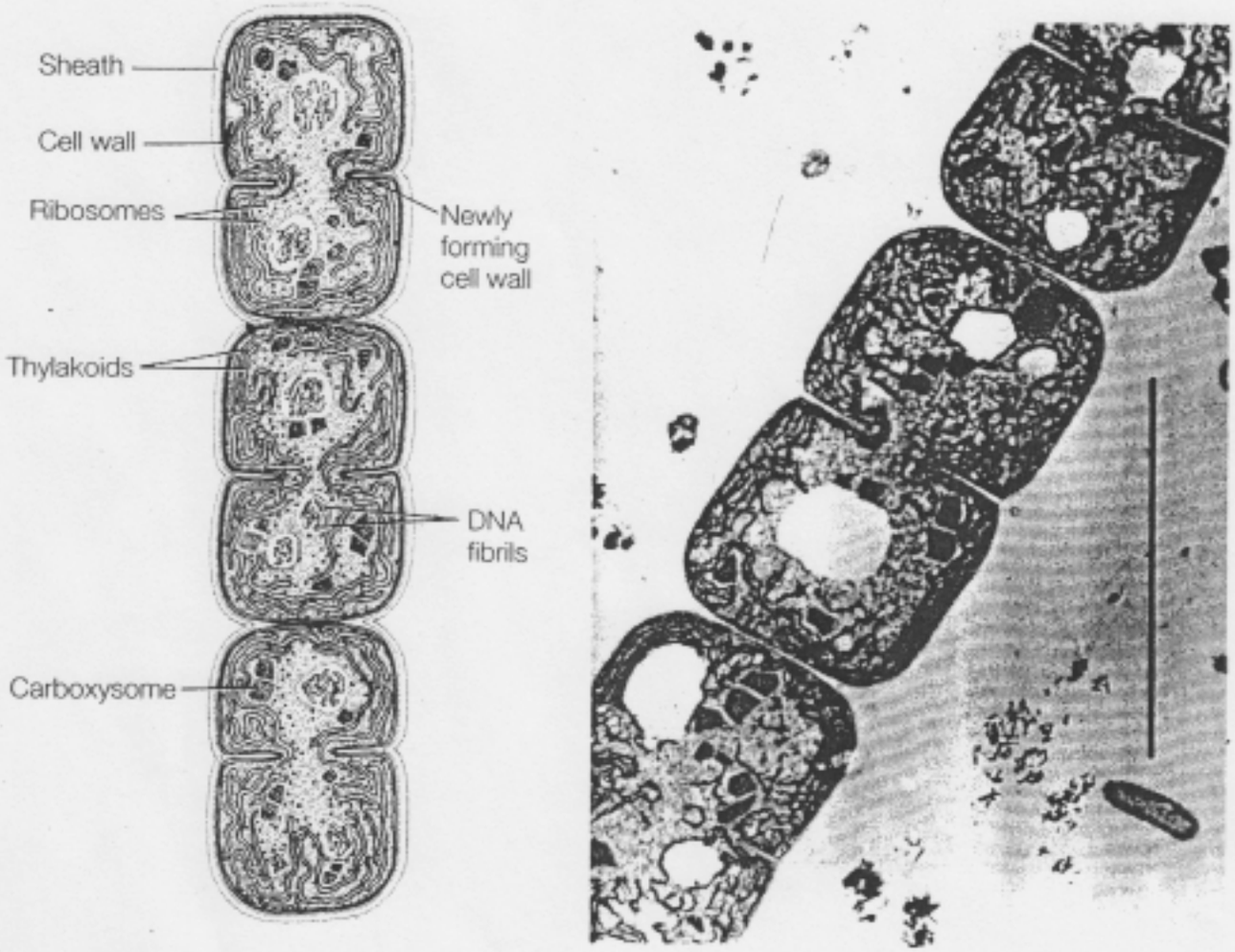
The demonstration of the presence of coliform bacteria (Escherichia-Aerobacter group) relies upon the following standard methods (a procedure in place since at least 1917):

1) the determination of gas production in lactose broth resulting from the direct inoclulation of water
2) the inoculation of differential or selective media from tubes of fermented Lactose Broth (confirmed test)
3) the identification of Gram-negative, non-sporulating, aerobic oeganisms capable of producing gas when re-inoculated into Lactose Broth (completed test).

Note that this is only one of many standard testing methods. The key component of this particular test is lactose, preferentially fermented by coliform bacteria such as *Escherichia coli*.



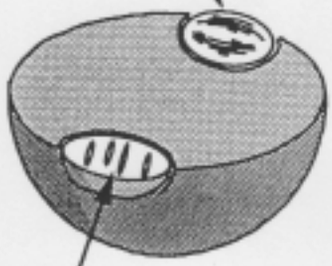
Phylogenetic tree displaying bacterial diversity. The open wedges represent microbial groups that are known only from small subunit rRNA genes cloned from nature. The black wedges represent the major divisions of cultivated bacteria. Reprinted with permission from reference 2.



A *Anabaena*. This common filamentous cyanobacterium grows in freshwater ponds and lakes. Within the sheath, the cells divide by forming cross walls. TEM, bar = 5 μm. [Photograph courtesy of N. J. Lang; drawing by R. Golder.]

Endosymbiotic hypothesis

Photoautotroph



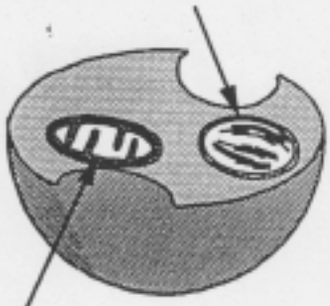
Aerobic heterotroph

Autogenous hypothesis

Cytoplasmic invagination

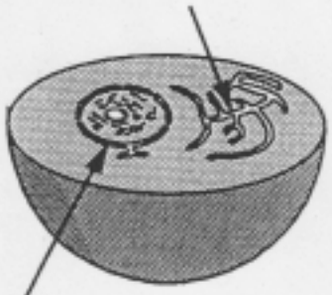
Prokaryotic "host" DNA

Chloroplast



Mitochondrion

Endoplasmic reticulum



Nuclear envelope

Eukaryotic plant cell

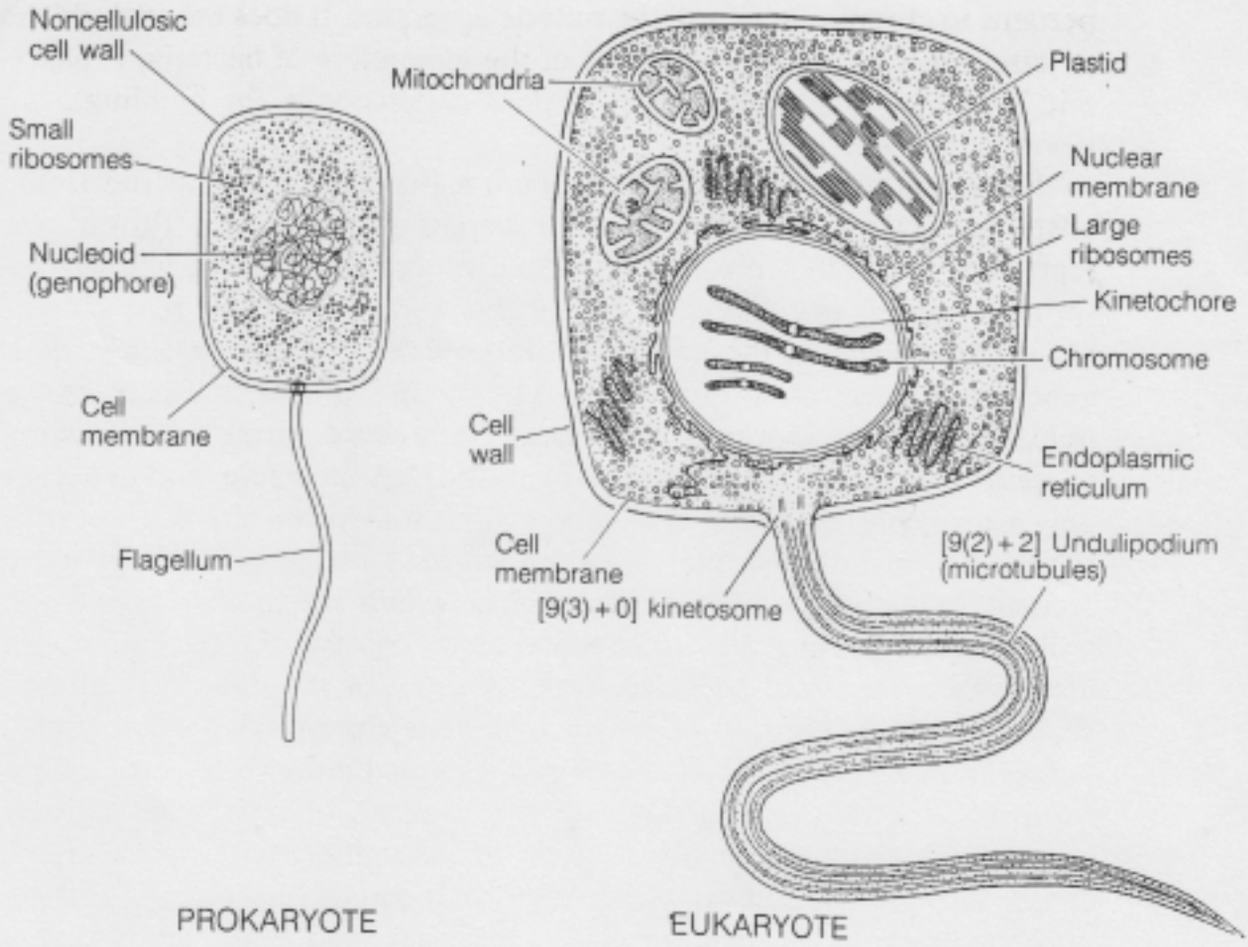


FIGURE 2-3

Comparison of prokaryotic and eukaryotic cell structure. Composite diagrams based on observations at the light- and electron-microscopic levels.

from: Margulis, Lynn (1993) Symbiosis in Cell Evolution. Microbial Communities in the Archean and Proterozoic Eons. Second Edition. WH Freeman and Company, New York.