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January 1914

Revisions of Some Plant Phyla

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II.—REVISIONS OF SOME PLANT PHYLA

BY CHARLES E. BESSEY

In the time that has elapsed since the publication of my "Synopsis of Plant Phyla" (University Studies, Vol. VII, No. 4) it has been possible to make many changes in the arrangement of the orders and families of several of the phyla. On account of their considerable number it is desirable to present these changes in one paper so as to accomplish the revision of the original paper with as little confusion as possible.

The Plant World is here regarded as readily separable into fourteen Phyla (often called "Branches" or "Divisions"). These are subdivided into Classes, and these again into Orders, and the latter into Families. The latest enumeration of the species of plants shows that we now know approximately a quarter of a million recognizable forms. These numerical data may be shown concisely in tabular form as follows:

	Classes.	Orders	Families	Approximate No Species
1. Myxophyceae	2	4	18	2,020
2. Protophyceae	2	7	16	1,090
3. Zygomyceteae	2	4	21	7,000
4. Siphonophyceae	3	9	26	1,260
5. Phaeophyceae	3	5	24	1,030
6. Rhodophyceae	2	7	24	3,050
7. Carpomyceteae	3	29	146	64,000
8. Bryophyta	2	7	65	16,600
9. Pteridophyta	2	5	13	3,800
10. Calamophyta	3	3	4	24
11. Lepidophyta	2	3	7	700
12. Cycadophyta	4	6	13	140
13. Strobilophyta	1	2	9	400
14. Anthophyta	2	32	300	132,500
Total	33	123	686	233,614

These phyla may be characterized in a general way as follows by means of an analytical key, in which only the general or typical characters are indicated. In making use of it, it must be remembered that many variations ("exceptions") occur in every phylum.

KEY TO THE PHyla OF PLANTS

- A. Cells typically with poorly developed nuclei and chromatophores; reproducing by fission and spores; mostly blue-green, brown-green or fuliginous (or colorless), never chlorophyll-green.
- I. Unicellular to filamentous plants Phylum 1. MYXOPHYCEAE.
- B. Cells typically with well-developed nuclei and chromatophores (chloroplasts); reproducing by fission and spores, and mostly by gametes also; chlorophyll-green, sometimes hidden by other coloring matter (or colorless).
- I. Plants usually of but one obvious generation, typically aquatic.
- a. The fertilized egg developing into a zygote only.
1. Unicellular, to filamentous, many-celled plants (rarely a plate of cells); isogamic to heterogamic, one or both gametes ciliated. Phylum 2. PROTOPHYCEAE.
2. Filamentous many-celled plants, mostly breaking up early into single cells; isogamic, gametes not ciliated. Phylum 3. ZYGOPHYCEAE.
3. Tubular filamentous (or saccate) coenocytic plants, usually attached basally by rhizoids; isogamic to heterogamic. Phylum 4. SIPHONOPHYCEAE.
4. Cellular filamentous (rarely unicellular) to massive plants, attached basally by rhizoids (or roots); isogamic to heterogamic; the green color hidden by a brownish pigment. Phylum 5. PHAEOPHYCEAE.
- b. The fertilized egg developing into a spore-fruit.
1. Cellular filamentous to massive holophytic plants, attached basally by rhizoids (or roots); heterogamic; the green color mostly hidden by a red or purple pigment. Phylum 6. RHODOPHYCEAE.
2. Cellular filamentous hysterozytic plants, often much degenerated, without chlorophyll; heterogamic. Phylum 7. CARPOMYCETAE.
- II. Plants of two obvious, alternating generations, typically terrestrial.
- a. Gametophyte generation larger, and longer-lived than the dependent sporophyte generation.
- I. Gametophytes from prostrate and thalloid to erect leafy shoots; sporophytes globose to cylindrical or stalked, neither expanded nor rooted. Phylum 8. BRYOPHYTA.

- b. Gametophyte generation smaller and shorter-lived than the independent sporophyte generation.
 - i. Both generations mostly holophytic, independent of one another.
 - (a) Gametophytes typically flat and thalloid, normally attached by rhizoids, mostly monoecious; sporophytes consisting of large-leaved, solid stems, which are rooted below.

Phylum 9. PTERIDOPHYTA.

- (b) Gametophytes typically flat and thalloid, normally attached by rhizoids, mostly monoecious; sporophytes consisting of mostly solid, cylindrical, jointed and fluted stems, bearing small, whorled leaves at the nodes, and rooted below.

Phylum 10. CALAMOPHYTA.

- (c) Gametophytes typically tubular or globose, with few rhizoids or none, often dioecious; sporophytes consisting of solid, cylindrical, continuous (not jointed) and not fluted stems, bearing small spirally arranged (or opposite) leaves, and rooted below.

Phylum 11. LEPIDOPHYTA.

- 2. Gametophytes hysterozytic, dependent upon and nourished by the sporophyte.

- (a) Sporophylls open, ovules and seeds naked (gymnospermous).
 - (1) Gametophytes dioecious; sperms ciliated and motile; sporophytes producing microspores and megaspores in spiral or whorled sporophylls, or these aggregated into cones.

Phylum 12. CYCADOPHYTA.

- (2) Gametophytes dioecious; sperms not ciliated, not motile; sporophytes with sporophylls in cones.

Phylum 13. STROBILOPHYTA.

- (b) Sporophylls closed, ovules and seeds covered (angiospermous).

- (1) Gametophytes dioecious; sperms not ciliated, not motile; sporophytes with sporophylls in flowers.

Phylum 14. ANTHOPHYTA.

In this paper only the 4th, 6th, 7th, 12th and 14th phyla stand sufficiently in need of revision to warrant rewriting in this article. As in the original the figures in parentheses refer to volume, parts and pages of Engler and Prantl's "Natürlichen Pflanzenfamilien." In a few cases the citation is to Engler's "Syllabus," seventh edition.

Phylum IV. **SIPHONOPHYCEAE.** The Tube Algae.

Plants coenocytic, filamentous, or saccate, often much branched, and usually basally attached by rhizoids, from septate (consisting of rows of coenocytes) to non-septate, the filaments single or aggregated into a plant body of definite form; chromatophores discoid or reticulated, parietal; propagation by (1) the internal division of the protoplasm of a part (sporangium), or of the whole plant into spores,—in water into zoospores,—in the air into walled spores; or by (2) the contraction of definite masses of protoplasm into agamic resting-spores (aplanospores or chlamydo-spores); generation by the union of (1) ciliated isogametes, (2) ciliated heterogametes, or (3) sperms with non-ciliated gynogametes (eggs), or of (4) antherid nuclei (non-ciliated) with eggs, in all cases producing zygotes. Typically freshwater and marine algae (holophytes), from which many filamentous fungi (hysterophytes) have been derived.

Class 7. **VAUCHERIOIDEAE.** Lower Tube Algae. Plants filamentous, septate or tubular. (About 800 species.)

Order **CLADOPHORALES.** The Cladophoras. Filaments septate, the segments coenocytic.

Family 1. **Cladophoraceae.** Filaments simple or branched, basally attached; isogamic. *Rhizoclonium*, *Cladophora*, *Pithophora*. (Pf. I, 2, 114.)

Family 2. **Sphaeropleaceae.** Filaments simple, unattached, heterogamic. *Sphaeroplea*. (Pf. I, 2, 121.)

Order **SIPHONALES.** Green Felts. Filaments tubular, irregularly branched; chlorophyllose holophytes.

Family 3. **Phyllosiphonaceae.** Endophytic and parasitic in the tissues of higher plants. *Phyllosiphon*. (Pf. I, 2, 125.)

Family 4. **Codiaceae.** Compound Green Felts. Filaments compacted into a large plant body; isogamic; marine. *Codium*, *Penicillus*, *Udotca*, *Halimeda*. (Pf. I, 2, 138.)

Family 5. **Vaucheriaceae.** Simple Green Felts. Filaments single, free; heterogamic; in fresh or brackish waters, or on wet earth. *Vaucheria*. (Pf. I, 2, 131.)

Class 8. PHYCOMYCETEAE. Tube Fungi. Lower Fungi. Filaments tubular, irregularly branched, chlorophyll-less.

Order SAPROLEGNIALES. Typically aquatic; mostly saprophytic; forming zoospores in zoosporangia.

Family 6. **Monoblepharidaceae**. Filaments simple or branched, septate above, tubular below, colorless; propagation by uniciliated zoospores; generation heterogamic, the sperms uniciliated, the eggs non-ciliated, and remaining in the oogone. Small, saprophytic aquatic fungi. *Monoblepharis*. (Pf. I, 1, 106.)

Family 7. **Saprolegniaceae**. Water Molds. Aquatic, well-developed, free branched, parasitic or saprophytic filaments, attached by endogenous rhizoids; zoospores biciliated; eggs 1 to several in each oogone; antherids not producing sperms. *Saprolegnia*, *Achlya*. (Pf. I, 1, 93.)

Family 8. **Pythiaceae**. Aquatic or terrestrial, saprophytes or parasites, the slender filaments without rhizoids; zoospores biciliated; eggs single; antherids not producing sperms. *Pythium*. (Pf. I, 1, 104.)

Family 9. **Cladochytriaceae**. Aquatic, endogenous, branched parasitic filaments, with no rhizoids. *Cladochytrium*. (Pf. I, 1, 80.)

Family 10. **Ancylistaceae**. Aquatic, endogenous, simple, few celled parasitic filaments, with no rhizoids. *Lagenidium*, *Rhizomyxa*. (Pf. I, 1, 89.)

Order PERONOSPORALES. Non aquatic, mostly parasitic in the tissues of higher plants, usually forming zoospores in conidia.

Family 11. **Albuginaceae**. White Rusts. Conidia in chains, forming zoospores; parasites in the tissues of higher plants. *Albugo*. (Pf. I, 1, 110.)

Family 12. **Peronosporaceae**. Downy Mildews. Conidia singly terminal on branched conidiophores, mostly forming zoospores; parasitic in the tissues of higher plants. *Phytophthora*, *Plasmopara*, *Peronospora*. (Pf. I, 1, 112.)

Order MUCORALES. Typically non aquatic; saprophytic or parasitic on other fungi; not producing zoospores, but spores in sporangia, or singly, or in chains.

Family 13. **Mucoraceae.** Black Molds. Sporangia with a columella. *Rhizopus*, *Mucor*, *Pilobolus*. (Pf. I, 1, 123.)

Family 14. **Mortierellaceae.** Sporangia without a columella. *Mortierella*. (Pf. I, 1, 130.)

Family 15. **Chaetocladiaceae.** Spores single, or more or less clustered on much branched conidiophores. *Chaetocladium*. (Pf. I, 1, 131.)

Family 16. **Piptocephalidaceae.** Spores in chains, clustered on the ends of branches. *Piptocephalis*, *Syncephalis*. (Pf. I, 1, 132.)

Order ENTOMOPHTHORALES. Non aquatic; mostly parasitic in the bodies of insects, not producing zoospores.

Family 17. **Entomophthoraceae.** With the characters of the order. *Entomophthora*. (Pf. I, 1, 134.)

Class 9. BRYOPSIDOIDEAE. Higher Tube Algae. Plants globular to stipitate, or dendroid, septate or continuous. (About 460 species.)

Order VALONIALES. Globular, mostly terrestrial coenocytes, to compound septate marine plants; isogamic.

Family 18. **Botrydiaceae.** Little Bladder Algae. Minute globular or ovoid, mostly terrestrial plants chlorophyll-bearing. *Botrydium*, *Protosiphon*. (Pf. I, 2, 123.)

Family 19. **Chytridiaceae.** Minute globular or ovoid colorless plants, mostly epiphytic. *Rhizidium*, *Chytridium*. (Pf. I, 1, 64.)

Family 20. **Valoniaceae.** Large Bladder Algae. Plants filamentous and non-septate when young, basally attached by rhizoids, usually becoming septate and branched, and often compound when mature, the segments coenocytic. *Valonia*, *Struvea*, *Halicystis*. (Pf. I, 2, 145.)

Order DASYCLADALES. Non-septate, regularly branched marine plants; isogamic.

Family 21. **Derbesiaceae.** Plants filamentous, sparingly dichotomous, erect, with basal rhizoids, zoospores multiciliated. *Derbesia*. (Pf. I, 2, 129.)

Family 22. **Bryopsidaceae.** Sea Ferns. Plants pinnately branched, erect, with basal rhizoids; gametes biciliated. *Bryopsis*. (Pf. I, 2, 127.)

Family 23. **Caulerpaceae.** Caulerpas. Plants large, branched, creeping, with lateral rhizoids and bearing erect, usually pinnate "leaves." *Caulerpa*. (Pf. I, 2, 134.)

Family 24. **Dasycladaceae.** Sea Umbrellas. Plants erect, regularly branched in whorls, with basal rhizoids. *Botryophora*, *Acctabularia*. (Pf. I, 2, 152.)

Order CHARALES. The Stoneworts. Green plants consisting of erect rooted, septate, dendroid stems, bearing whorled branches. Stems and branches composed of large, long coenocytes which are often covered (corticated) with smaller coenocytes. Antheridial branches compounded into a globular structure containing many sperm-bearing filaments, the true antherids; sperms biciliated; oogone rounded, covered with a twisted layer of protective cells, terminating in a 5 or 10 celled crown.

Family 25. **Nitellaceae.** Crown of oogone composed of ten cells. *Nitella*, *TolyPELLA*. (Pf. I, 2, 172.)

Family 26. **Characeae.** Crown of oogone composed of five cells. *Chara*, *TolyPELOPSIS*, *Lamprothamnus*, *Lychnothamnus*. (Pf. I, 2, 174.)

Phylum VI. **RHODOPHYCEAE.** The Red Algae.

Plants aquatic, from filamentous to erect, well differentiated stems, which are rooted below and sometimes bear flat, leaf-like structures; propagation by non-motile tetraspores, or by simple fragmentation of the plant body; generation by heterogametes, the fertilized egg developing into one or more (often many) spores, which are enclosed in a sterile tissue, the whole constituting a primitive fruit. In addition to chlorophyll the plants of

this phylum, nearly all of which are marine, contain phycoerythrin in their cells, which gives them a red or purple color.

Class 13. BANGIOIDEAE. Antherids and oogones developed from ordinary cells of the plant body by a slight enlargement, the former producing non-ciliated sperms, and the latter scarcely differentiated single eggs; no trichogyne. Species about 50, doubtfully referred to this phylum.

Order BANGIALES. Plants filamentous or stratose; propagation by monospores (undivided tetraspores); chromatophore one in each cell, stellate.

Family 1. **Bangiaceae**. Composed of a few genera, and from forty to fifty species, including the edible "laver" (species of *Porphyra*). (Pf. I, 2, 307.)

Order RHODOCHAETALES. Plants filamentous, erect, branched; propagation by monospores; chromatophores several to many in each cell.

Family 2. **Rhodochaetaceae**. Filaments not corticated. But one genus, *Rhodochaete*, containing a single marine species. (Pf. I, 2, 316.)

Family 3. **Campsopogonaceae**. Filaments corticated. But one genus, *Campsopogon*, containing a few freshwater species. (Pf. I, 2, 318.)

Class 14. FLORIDEAE. Red Seaweeds. Antherids composed of definite groups of cells, superficial or on branches, producing non-ciliated sperms; oogone a single cell prolonged above into a long fine hair, the trichogyne, and containing a definite egg in its base. (Species about 3,000.)

Order NEMALIONALES. Lower Red Seaweeds. Mostly filamentous plants: the fertilized oogone gives rise directly to the erect or more or less spreading, tufted sporophores ("gonimoblasts"), which are naked, or enclosed in a protective envelope.

Family 4. **Lemaneaceae**. Plants consisting of delicate branching threads, living in fresh water. *Lemanea*. (Pf. I, 2, 324.)

Family 5. **Helminthocladiaceae.** Plants filamentous, simple or parenchymatous, variously branched, usually slimy and sometimes encrusted with lime; mostly marine. *Batrachospermum* (in fresh water), *Nemalion*, *Liagora*. (Pf. I, 2, 327.)

Family 6. **Thoreaceae.** Plants erect, filamentous, simple or branched, covered with parallel hairs, living in fresh water. *Thorea* is the only genus. (Pf. I, 2, 321.)

Family 7. **Chaetangiaceae.** Plants varying from dichotomously branching, rounded stems to more or less flattened, massive, leaf-like structures; all marine. *Chaetangium*. (Pf. I, 2, 325.)

Family 8. **Gelidiaceae.** Plants ranging from minute epiphytes to slender and gracefully branched forms, and stout branched parenchymatous masses, all marine, and a few species (of *Choreocolax*) parasitic and colorless. *Wrangelia*, *Gelidium*. (Pf. I, 2, 340.)

Order CRYPTONEMIALES. Hard Red Seaweeds. Plants filiform, branched, often complanate; oogones and auxiliary cells separated; the fertilized egg conjugates with the remote auxiliary cell by means of its long branching filament ("ooblastema"); the auxiliary cell then gives rise to the sporophores.

Family 9. **Gloiosiphoniaceae.** Plants terete or complanate, forked or laterally branched, more or less filamentous internally. *Gloiosiphonia*, *Gloiopeltis*. (Pf. I, 2, 505.)

Family 10. **Grateloupiaceae.** Plants terete or angled, complanate or foliaceous, variously forked, or more commonly laterally branched, more or less filamentous internally. *Halymenia*, *Grateloupia*, *Cryptonemia*. (Pf. I, 2, 508.)

Family 11. **Dumontiaceae.** Plants terete, complanate, or foliaceous, forked or laterally branched, more or less tubular internally. *Dumontia*, *Dudresnaya*. (Pf. I, 2, 515.)

Family 12. **Nemastomacae.** Plants terete, complanate, or foliaceous, variously forked or laterally branched, more or less filamentous internally. *Schizymenia*, *Nemastoma*. (Pf. I, 2, 521.)

Family 13. **Rhizophyllidaceae.** Plants terete or compressed, sometimes articulate-constricted, sometimes creeping; structure mostly filamentous. *Chondrococcus*, *Rhizophyllis*. (Pf. I, 2, 527).

Family 14. **Squamariaceae.** Plants usually minute, foliaceous, or crustiform, attached by rhizoids on their lower surface, usually encrusted with lime. *Peyssonellia*. (Pf. I, 2, 532.)

Family 15. **Corallinaceae.** Corallines. Plants from filamentous, more or less branched (and then jointed) to foliaceous or crustaceous, always encrusted with lime. *Corallina*, *Melobesia*. (Pf. I, 2, 537.)

Order CERAMIALES. "Sea Mosses." Filiform to foliaceous plants: sporophores produced by nearby auxiliary cells. Here are to be found the most beautiful forms of the Red Seaweeds.

Family 16. **Delessariaceae.** Plants foliaceous, often with mid-ribs, and regular netted patterns. Here are some of the most beautiful of the red seaweeds. *Nitophyllum*, *Grinnellia*, *Delessaria*. (Pf. I, 2, 406.)

Family 17. **Bonnemaisoniaceae.** Plants consisting of long, slender main stems covered with filamentous branches. *Bonnemaisonia*. (Pf. I, 2, 417.)

Family 18. **Rhodomelaceae.** Plants cylindrical or flattened, mostly much branched, often foliaceous; structure mostly parenchymatous and polysiphonous. *Polysiphonia*, *Rhodomela*, *Dasya*. (Pf. I, 2, 421.)

Family 19. **Ceramiaceae.** Plants filiform, sometimes corticated, mostly laterally branched, complanate. *Lejolisia*, *Callithamnion*, *Ptilota*, *Ceramium*. (Pf. I, 2, 481.)

Order GIGARTINALES. Soft Red Seaweeds. Parenchymatous plants; the fertilized oogone conjugates with its nearby auxiliary cell; the latter then gives rise to the sporophores which branch copiously in the surrounding tissues of the plant body.

Family 20. **Acrotylaceae.** Plants parenchymatous, erect, branching, flattish; tetraspores zonate. *Acrotylus*. (Pf. I, 2, 350.)

Family 21. **Gigartinaceae.** Plants parenchymatous, erect or spreading, branching, cylindrical, flattened, or leaf-like; tetraspores cruciate. *Chondrus*, *Iridaea*, *Gigartina*, *Callophyllis*, *Calymenia*. (Pf. I, 2, 352.)

Family 22. **Rhodophyllidaceae.** Plants parenchymatous, erect or spreading, branching, flattened, or less commonly leaf-like; tetraspores zonate. *Rhodophyllis*, *Rhabdonia*. (Pf. I, 2, 366.)

Order RHODYMENIALES. Higher Red Seaweeds. Filiform to foliaceous and massive plants; the fertilized oogone conjugates with its nearby auxiliary cell; the latter then gives rise to the sporophores which grow outward in the plant body.

Family 23. **Sphaerococcaceae.** Plants not foliaceous, much branched, often robust and of dense texture. *Gracilaria*, *Hypnea*. (Pf. I, 2, 382.)

Family 24. **Rhodymeniaceae.** Plants from filiform to cylindrical-branched, flattened, and foliaceous. *Rhodymenia*, *Champia*, *Plocamium*. (Pf. I, 2, 396.)

Phylum VII. **CARPOMYCETEAE.** The Higher Fungi.

Plants terrestrial or aerial, filamentous, sometimes compacted into a definite plant body, always destitute of chlorophyll, and so parasitic or saprophytic; propagation by the separation of special cells (conidia), and the production of thick walled cells (chlamydospores) in the plant body; generation (where known) by the union of the protoplasm of an antherid with the protoplasm (egg) of an oogone, and the production of a fruit-body (spore-fruit, or sporocarp) consisting of sporogenous and sterile tissues.

Terrestrial or epiphytic plants for the most part, a few being aquatic, or epizoic. (About 64,000 species.)

Several years ago Dr. Ernst A. Bessey, then in the service of the United States Department of Agriculture in Miami, Florida, now Professor of Botany in the Michigan Agricultural College, in discussing the origin of the Higher Fungi made the suggestion that the earliest forms were probably of the "lichen" kinds, and that the phylum had reached its present development through them. In other words instead of considering the "lichens" as derived from the fungi by the adoption of a peculiar kind of parasitism, we are to look upon the ordinary fungi as derived from, that is, developed from, the "lichens." According to this view the "lichens"

are the primitive *Carpomyceteae*, and it is through them that the higher forms have been derived. Dr. Bessey presented these views in a paper entitled "A Suggestion as to the Phylogeny of the Ascomycetes" read before the Botanical Society of America in its meeting in Cleveland, on January 2, 1913, and subsequently published in *Mycologisches Centralblatt*, Vol. III.

Manifestly such a theory of the origin of the Higher Fungi necessitates a considerable rearrangement of their orders and families, so as to indicate their phyletic taxonomy. For several years I have given this matter consideration, and have ventured to construct a genealogical tree involving this theory of the "lichen" origin of the *Carpomyceteae*, and have arrived at a fairly satisfactory arrangement of the orders. I have not yet ventured upon a rearrangement of the families in these orders, because of the appalling multiplicity of details confronting me. In this tree the main stem is made up of the *Discolichenes*, from which are derived such fungal and "lichen" orders as *Caliciales*, *Phacidiales*, *Graphidales* and *Hysteriales*. These again give rise to other less primitive orders, all characterized by the production of ascospores, and constituting the lower class *Ascosporeae*. From this class by further modification have come the two classes *Basidiosporeae* and *Teliosporeae*.

The taxonomy of the *Carpomyceteae* in my paper entitled "A Synopsis of Plant Phyla," published in these Studies (Vol. VII, No. 4) nearly six years ago, was based upon the usual theory that the "lichens" are modified, or at least peculiar fungi. The time has now come for a rearrangement based upon the new theory. Accordingly on the pages following, such a rearrangement is given, with a few additions and some slight modifications of some of the descriptions.

Class 15. ASCOSPOREAE. Ascus Fungi. Spore-fruits spherical, cup-shaped, or irregular, simple or compound, always including one or more spore-sacs (asci) containing spores (ascospores). (About 29,000 species.)

Order LABOULBENIALES. Beetle Fungi. Plants minute, few-celled, erect, attached below, and bearing one or more antherids and oogones, which produce one or more simple, ascigerous fruits.

Family 1. **Laboulbeniaceae**. Plants parasitic upon insects (mostly upon beetles) or at least attached to them. More than fifty genera, and about five hundred species are known. *Laboulbenia*, *Ceratomyces*, *Dichomyces*. (Pf. I, 1, 491.)

Order DISCOLICHENES. Disk Lichens. Plants parasitic upon lower green plants (mostly Myxophyceae and Protophyceae) and thus constituting "lichens." Apothecia circular, typically cup-shaped or plate-shaped. (The hosts are still known as "gonidia.")

Family 2. **Lecanactidaceae**. Crustaceous lichens with *Trente-*

pohlia gonidia; apothecia sessile or sunken. *Lecanactis*. (Pf. I, 1*, 114.)

Family 3. **Pilocarpaceae**. Crustaceous lichens with *Protococcus* gonidia; apothecia at first sunken, later emergent. *Pilocarpon*. (Pf. I, 1*, 116.)

Family 4. **Chrysothricaceae**. Spongy lichens with *Palmella* gonidia; apothecia sunken, disk-form, with a margin. *Chrysothrix*. (Pf. I, 1*, 117.)

Family 5. **Thelotremataceae**. Crustaceous lichens with *Trentepohlia* gonidia; apothecia sunken, surrounded by a thalline margin. *Orcellularia*, *Thelotrema*. (Pf. I, 1*, 118.)

Family 6. **Diploschistaceae**. Crustaceous, stratified lichens with *Protococcus* gonidia; apothecia sunken or erumpent, margined. *Diploschistes*. (Pf. I, 1*, 121.)

Family 7. **Ectolechiaceae**. Crustaceous lichens with *Protococcus* gonidia; apothecia sunken to sessile, small, not margined. *Sporopodium*. (Pf. I, 1*, 122.) Growing on leaves.

Family 8. **Gyalectaceae**. Crustaceous lichens with *Trentepohlia*, *Phylactidium*, or rarely *Scytonema* gonidia; apothecia simple, sunken to sessile, margin weak, bright-colored to carbonaceous. *Gyalecta*. (Pf. I, 1*, 124.)

Family 9. **Coenogoniaceae**. Spongy lichens with *Trentepohlia* or *Cladophora* gonidia; apothecia margined, sessile or short-stalked. *Coenogonium*. (Pf. I, 1*, 127.)

Family 10. **Lecidiaceae**. Crustaceous lichens with *Gloeocapsa*-like, or *Protococcus* gonidia; apothecia sessile, less commonly sunken, or short-stalked. *Lecidia*, *Bacidia*, *Toninia*. (Pf. I, 1*, 129.)

Family 11. **Phyllopsoraceae**. Scaly to foliose lichens with *Pleurococcus* gonidia; apothecia sessile, with a bright-colored or dark margin. *Phyllopsora*. (Pf. I, 1*, 138.)

Family 12. **Cladoniaceae**. Crustaceous to scaly to foliose lichens with *Pleurococcus* gonidia (rarely with Cyanophyceae go-

nidia); apothecia mostly convex, terminal or lateral on vertical stalks (podetia). *Beomyces*, *Cladonia*, *Stereocaulon*. (Pf. I, 1*, 139.)

Family 13. **Gyrophoraceae**. Foliose, coriaceous lichens attached at a single point, with *Pleurococcus* gonidia; apothecia flat, sessile or stalked, margined. *Gyrophora*, *Umbilicaria*. (Pf. I, 1*, 147.)

Family 14. **Acarosporaceae**. Crustaceous, scaly to foliose lichens with *Pleurococcus* or *Protococcus* gonidia; the thallus poorly developed in most cases; apothecia in thalline warts in which they are sunken. *Thelocarpon*, *Acarospora*, *Biatorella*. (Pf. I, 1*, 150.)

Family 15. **Ephebaceae**. Dwarf-fruticose or filiform-branched, crustaceous to scaly lichens with *Scytonema* or *Stigonema* gonidia; apothecia small, sunken or superficial. *Spilonema*, *Ephebe*. (Pf. I, 1*, 154.)

Family 16. **Pyrenopsidaceae**. Crustaceous, foliose to fruticose lichens, with *Gloecocapsa*, *Chroococcus*, or *Xanthocapsa* gonidia; apothecia small, closed at first. *Pyrenopsis*, *Symalissa*, *Thyrea*. (Pf. I, 1*, 158.)

Family 17. **Lichinaceae**. Crustaceous to scaly or fruticose-branched lichens, with *Rivularia* gonidia; apothecia spheroidal, closed, sunken, with a bright-colored margin. *Pterygium*, *Lichina*. (Pf. I, 1*, 164.)

Family 18. **Collemataceae**. Gelatinous to crustaceous, scaly, foliose or fruticose lichens, with *Nostoc* gonidia; apothecia closed or open, sunken or sessile, not margined. *Physma*, *Collema*, *Lep-togium*. (Pf. I, 1*, 168.)

Family 19. **Heppiaceae**. Scaly, foliose, irregular or fruticose lichens with *Scytonema* gonidia; apothecia sunken, not margined. *Heppia*. (Pf. I, 1*, 176.)

Family 20. **Pannariaceae**. Crustaceous-corneous, to scaly and foliose lichens (not gelatinous), with *Nostoc* or *Scytonema* go-

nidia, rarely with *Pleurococcus* gonidia; apothecia superficial or marginal. *Pannaria*, *Psoroma*, *Coccocarpha*. (Pf. I, 1*, 178.)

Family 21. **Stictaceae**. Foliose lichens with *Palmella* or *Nostoc* gonidia; apothecia superficial or marginal, sessile or shield-shaped. *Lobaria*, *Sticta*. (Pf. I, 1*, 185.)

Family 22. **Peltigeraceae**. Foliose lichens with *Palmella* or *Nostoc* gonidia; apothecia flat, large, submarginal, dark-colored. *Peltigera*, *Solorina*. (Pf. I, 1*, 190.)

Family 23. **Pertusariaceae**. Crustaceous lichens with *Protococcus* gonidia; apothecia mostly punctiform, single or clustered in thalline warts. *Pertusaria*. (Pf. I, 1*, 195.)

Family 24. **Lecanoraceae**. Crustaceous lichens with *Protococcus* gonidia; apothecia sunken, not margined. *Lecanora* (Pf. I, 1*, 199.)

Family 25. **Parmeliaceae**. Foliose lichens with *Protococcus* gonidia; apothecia scutellaeform, margined, sunken. *Parmelia*, *Cetraria*. (Pf. I, 1*, 207.)

Family 26. **Usneaceae**. Fruticose lichens, often long and much branched, with *Protococcus* gonidia; apothecia terminal or marginal, scutellaeform, often large. *Usnea*, *Ramalina*, *Evernia*. (Pf. I, 1*, 216.)

Family 27. **Caloplacaceae**. Crustaceous lichens with *Pleurococcus* gonidia; apothecia at first sunken, later erumpent, spores colorless. *Caloplaca*. (Pf. I, 1*, 226.)

Family 28. **Theloschistaceae**. Foliose to fruticose lichens with *Pleurococcus* gonidia; apothecia at first sunken, later erumpent, spores colorless. *Theloschistes*. (Pf. I, 1*, 229.)

Family 29. **Buelliaceae**. Crustaceous lichens with *Protococcus* gonidia; apothecia at first sunken, later erumpent, spores brown. *Buellia*, *Rinodina*. (Pf. I, 1*, 230.)

Family 30. **Physciaceae**. Foliose or fruticose lichens with *Protococcus* gonidia; apothecia at first sunken, later erumpent, spores brown. *Physcia*. (Pf. I, 1*, 234.)

Order CALICIALES. Powdery Lichens. True fungi, and lichen-forming fungi; apothecia spheroidal, sessile or stalked, the asci and paraphyses breaking up into a pulverulent mass.

Family 31. **Protocaliciaceae.** True fungi; apothecia sessile or stalked; saprophytes. *Mycocalicium*. (Syllabus 46.)

Family 32. **Caliciaceae.** Crustaceous lichens with *Protococcus*, *Pleurococcus*, or *Trentepohlia* gonidia; apothecia usually long-stalked. *Calicium*. (Pf. I, 1*, 80.)

Family 33. **Cypheliaceae.** Crustaceous lichens with *Pleurococcus*, *Protococcus*, or *Trentepohlia* gonidia; apothecia sessile. *Cyphelium*, *Tylophoron*. (Pf. I, 1*, 83.)

Family 34. **Sphaerophoraceae.** Foliose or fruticose lichens with *Protococcus* gonidia; apothecia sessile or nearly so. *Sphaerophorus*. (Pf. I, 1*, 85.)

Order PHACIDIALES. Little Cup Fungi. True fungi, mostly saprophytic, but sometimes parasitic, with a branching septate mycelium, which bears the mostly open spore fruits (apothecia).

Family 35. **Stictidaceae.** Apothecia fleshy, yellow, not black. *Propolis*, *Stictis*. (Pf. I, 1, 245.)

Family 36. **Tryblidiaceae.** Apothecia leathery or carbonaceous, black, at first sunken in the substratum but later erumpent. *Tryblidium*, *Scleroderris*. (Pf. I, 1, 253.)

Family 37. **Phacidiaceae.** Apothecia leathery or carbonaceous, black, sunken in the substratum. *Phacidium*, *Rhytisma*. (Pf. I, 1, 256.)

Order EXOASCALES. Pocket Fungi. True fungi, typically parasitic, much reduced and simplified, the branching mycelium bearing single or clustered asci, not forming genuine apothecia.

Family 38. **Exoasceae.** Parasitic in the tissues of higher plants, producing crowded asci which break through the epidermis. *Exoascus*, *Taphrina*. (Pf. I, 1, 158.)

Family 39. **Ascocorticiaceae.** Saprophytic, the asci forming a cushion on the abundant mycelium. *Ascocorticium*. (Pf. I, 1, 161.)

Family 40. **Endomycetaceae.** Parasitic or saprophytic, the asci single, not clustered in masses or cushions. *Eremascus*, *Endomyces*. (Pf. I, 1, 154.)

Order PEZIZALES. Cup Fungi. True fungi, saprophytic or parasitic, with a branching filamentous mycelium; apothecia at first usually spherical and closed, later opening, cup-shaped, fleshy, or more or less leathery.

Family 41. **Pyronemataceae.** Apothecia fleshy, open from the first, convex. *Pyronema*. (Pf. I, 1, 178.)

Family 42. **Pezizaceae.** Apothecia fleshy, at first spherical and closed, later open, concave, sessile, or stalked. *Lachnea*, *Peziza*. (Pf. I, 1, 178.)

Family 43. **Ascobolaceae.** Apothecia fleshy, at first spherical and closed, later open, concave; asci opening by a lid, when ripe escaping from the apothecium. *Ascobolus*. (Pf. I, 1, 188.)

Family 44. **Helotiaceae.** Apothecia fleshy, mostly open from the first, usually stalked; asci not opening by a lid. *Sarcoscypha*, *Sclerotinia*, *Dasyscypha*, *Helotium*. (Pf. I, 1, 193.)

Family 45. **Mollisiaceae.** Apothecia fleshy, open from the first, sessile; asci not opening by a lid. *Mollisia*, *Pyrenopeziza*. (Pf. I, 1, 210.)

Family 46. **Celidiaceae.** Apothecia leathery, dusky or light-colored, roundish, without a peridium. *Lecidiopsis*, *Celidium*. (Pf. I, 1, 218.) Some of the species are very closely related to such lichen-forming fungi as *Arthonia*.

Family 47. **Patellariaceae.** Apothecia leathery or corneous, free from the first, usually dark-colored, hemispherical or elongated, cup-shaped or plate-shaped, with a peridium. *Patellaria*, *Biatorrella*. (Pf. I, 1, 221.)

Family 48. **Cenangiaceae.** Apothecia leathery or carbonaceous, at first sunken, usually dark-colored, at first round and closed, later open, cup-shaped, with a peridium. *Cenangium*, *Dermatea*, *Bulgaria*. (Pf. I, 1, 231.)

Family 49. **Cordieritidaceae.** Apothecia on the ends of a branched, carbonaceous, brittle stroma; saprophytes. *Cordierites*. (Pf. I, 1, 241.)

Family 50. **Cyttariaceae.** Apothecia sunken in the surface of a bulbous, stalked, hard stroma, which eventually is gelatinous; parasites. *Cyttaria*. (Pf. I, 1, 241.)

Order HELVELLALES. Helvellas. True fungi, saprophytic, with a branching filamentous mycelium; apothecia open from the first, sessile or more commonly stalked, often convex, fleshy or gelatinous.

Family 51. **Rhizinaceae.** Apothecia fleshy, expanded, sessile. *Rhizina*. (Pf. I, 1, 171.)

Family 52. **Geoglossaceae.** Apothecia fleshy, capitate, stalked; asci opening by a slit. *Mitrula*, *Geoglossum*. (Pf. I, 1, 163.)

Family 53. **Helvellaceae.** Apothecia fleshy, capitate, stalked; asci opening by a lid. *Morchella*, *Vcrpa*, *Helvella*. (Pf. I, 1, 167.)

Order GRAPHIDALES. Slit Lichens. Lichen-forming fungi, in which the elongated apothecium opens by a narrow slit, which is usually black-margined.

Family 54. **Arthoniaceae.** Crustaceous lichens with *Palmella*, *Trentepohlia*, or *Phyllactidium* gonidia; apothecia not margined, roundish to oval. *Arthonia*, *Arthothelium*. (Pf. I, 1*, 89.) Compare Family 46. *Cclidiaceae*.

Family 55. **Graphidaceae.** Crustaceous lichens with *Palmella* or *Trentepohlia* gonidia; apothecia single, margined, oval or roundish. *Opegrapha*, *Graphis*, *Graphina*. (Pf. I, 1*, 92.)

Family 56. **Chiodectonaceae.** Crustaceous lichens with *Trentepohlia* or *Phycopeltis* gonidia; apothecia round or elongated, sunken in the stroma. *Sarcographa*, *Chiodecton*. (Pf. I, 1*, 102.)

Family 57. **Dirinaceae.** Crustaceous lichens with *Trentepohlia* gonidia; apothecia round or elongated, superficial. *Dirina*. (Pf. I, 1*, 105.)

Family 58. **Roccellaceae.** Fruticose, erect lichens with *Trentepohlia* gonidia; apothecia round or elongated, sunken or superficial. *Roccella*. (Pf. I, 1*, 106.)

Order PYRENOLICHENES. Closed Lichens. Lichen-forming fungi allied to the preceding families, mostly crustaceous, less often foliaceous. Perithecia spherical or hemispherical, finally with an apical pore or fissure.

Family 59. **Moriolaceae.** Crustaceous lichens with *Pleurococcus* gonidia, which are enclosed in capsular colonies. *Moriola*. (Pf. I, 1*, 52.)

Family 60. **Epigloeeae.** Gelatinous lichens with *Palmella* gonidia; perithecia spherical, erect. *Epigloea*. (Pf. I, 1*, 53.)

Family 61. **Verrucariaceae.** Crustaceous lichens with *Pleurococcus* or *Palmella* gonidia; perithecia erect, single. *Verrucaria*, *Thelidium*. (Pf. I, 1*, 53.)

Family 62. **Dermatocarpaceae.** Foliaceous or somewhat crustaceous lichens, with *Palmella* gonidia; perithecia erect, single, with minute ostiole. *Dermatocarpon*, *Endocarpon*. (Pf. I, 1*, 58.)

Family 63. **Pyrenothamniaceae.** Fruticose, branching lichens, with *Pleurococcus* gonidia; perithecia erect, single. *Pyrenothamnia*. (Pf. I, 1*, 61.)

Family 64. **Pyrenulaceae.** Crustaceous lichens with *Trentepohlia* gonidia; perithecia erect, single, or clustered. *Microthelia*, *Arthropyrenia*, *Porinia*, *Pyrenula*. (Pf. I, 1*, 62.)

Family 65. **Phyllopyreniaceae.** Foliaceous lichens with *Trentepohlia* gonidia; perithecia single, sunken. *Lepolichen*. (Pf. I, 1*, 68.)

Family 66. **Trypetheliaceae.** Crustaceous lichens with *Trentepohlia* gonidia; perithecia clustered, erect, sunken. *Trypethelium*. (Pf. I, 1*, 69.)

Family 67. **Paratheliaceae.** Crustaceous lichens with *Trentepohlia* gonidia; perithecia single, with narrow, tubular ostiole. *Parathelium*. (Pf. I, 1*, 71.)

Family 68. **Astrotheliaceae.** Crustaceous lichens with *Trentepohlia* gonidia; perithecia clustered more or less radially. *Astrothelium*, *Parmentaria*. (Pf. I, 1*, 72.)

Family 69. **Strigulaceae.** Crustaceous lichens with *Cephalcuros* or *Phyllactidium* gonidia; perithecia single, erect. *Phylloporinia*, *Strigula*. (Pf. I, 1*, 74.)

Family 70. **Pyrenidiaceae.** Crustaceous to scaly, and foliaceous lichens with *Nostoc*, *Scytonema*, or *Sirosiphon* gonidia; perithecia single, erect. *Pyrenidium*. (Pf. I, 1*, 76.)

Family 71. **Mycoporaceae.** Crustaceous lichens with *Palmella* or *Trentepohlia* gonidia; perithecia flattened, more or less subdivided. *Mycoporum*. (Pf. I, 1*, 77.)

Order PYRENOMYCETALES. Closed Fungi; "Black Fungi." Plants filamentous, often compacted into a hard cellular mass, the stroma, in the surface of which the spheroidal, simple or mostly compound perithecia are partially embedded.

Family 72. **Hypocreaceae.** Simple or compound; perithecia mostly reddish or yellowish, subcarnose or waxy-membranaceous. *Nectria*, *Epichloe*, *Cordyceps*, *Claviceps*. (Pf. I, 1, 342.)

Family 73. **Dothideaceae.** Compound; perithecia black, coriaceous or carbonaceous, confluent with the stroma. *Plowrightia*, *Dothidea*, *Phyllachora*. (Pf. I, 1, 373.)

Family 74. **Sordariaceae.** Simple; perithecia soft, brown or black, with or without a stroma; mostly coprophilous. *Sordaria*, *Sporormia*. (Pf. I, 1, 390.)

Family 75. **Chaetomiaceae.** Simple; perithecia superficial, free, brown, and fragile, generally bristly, on a superficial mycelium. *Chaetomium*. (Pf. I, 1, 387.)

Family 76. **Sphaeriaceae.** Simple; perithecia superficial, free, or more or less sunken in the stroma, globular or flattish. *Trichosphaeria*, *Lasiosphaeria*, *Rosellinia*. (Pf. I, 1, 394.)

Family 77. **Ceratostomataceae.** Simple; the perithecia more or less prolonged into a tubular ostiole. *Ceratostomella*, *Ceratostoma*. (Pf. I, 1, 405.)

Family 78. **Cucurbitariaceae.** Perithecia clustered, sometimes united into a compound ascigerous mass, hard, woody or leathery, black or brown. *Nitschkia*, *Cucurbitaria*. (Pf. I, 1, 408.)

Family 79. **Amphisphaeriaceae.** Perithecia either closely adnate, or somewhat sunken into the matrix, generally hard and carbonaceous; ostiole papilliform. *Amphisphaeria*, *Strickeria*. (Pf. I, 1, 413.)

Family 80. **Lophiostomataceae.** Perithecia scattered, generally more or less buried in the matrix, carbonaceous or subcoriaceous; ostiole an elongated slit. *Lophiostoma*. (Pf. I, 1, 417.)

Family 81. **Mycosphaerellaceae.** Perithecia at first subepidermal, spherical, minute. *Guignardia*, *Mycosphaerella*. (Pf. I, 1, 421.)

Family 82. **Pleosporaceae.** Perithecia buried in the matrix with only the papilliform ostiole projecting, membranaceous. *Physalospora*, *Venturia*, *Didymella*, *Didymosphaeria*, *Metasphaeria*, *Pleospora*. (Pf. I, 1, 428.)

Family 83. **Massariaceae.** Perithecia for the most part permanently covered by the epidermis with only the papilliform ostiole projecting, coriaceous. *Massaria*. (Pf. I, 1, 444.)

Family 84. **Gnomoniaceae.** Perithecia at first subepidermal, later erumpent, with an elongated tubular ostiole, membranaceous. *Hendersonia*, *Gnomonia*. (Pf. I, 1, 447.)

Family 85. **Valsaceae.** Perithecia permanently enclosed in a stroma (compound), black. *Anthostoma*, *Valsa*, *Diaporthe*. (Pf. I, 1, 454.)

Family 86. **Melanconidaceae.** Perithecia buried more or less deeply in the cushion-like stroma; saprophytes. *Melanconis*. (Pf. I, 1, 468.)

Family 87. **Diatrypaceae.** Perithecia immersed in the stroma in one or more series, elongated into neck-like projections; saprophytes. *Calosphaeria*, *Diatrype*. (Pf. I, 1, 472.)

Family 88. **Melogrammataceae.** Perithecia immersed in the stroma (hemispherical) forming under the periderm, then break-

ing through, pointed or elongated into neck-like projections; saprophytes. *Botryosphaeria*, *Melogramma*. (Pf. I, 1, 477.)

Family 89. **Xylariaceae**. Perithecia peripheral in the massive stroma, which is often hemispherical or clavate, black, or brown, woody or carbonaceous. *Hypoxylon*, *Xylaria*, *Nummularia*, *Ustulina*. (Pf. I, 1, 480.)

Order HYSTERIALES. Slit Fungi. True fungi, saprophytic or parasitic, with a branching mycelium, often forming a stroma; apothecia sessile, or at first sunken and later erumpent, usually elongated, dark-colored, leathery or carbonaceous, with a narrow slit.

Family 90. **Hypodermataceae**. Apothecia sunken, leathery, round or elongated, black; saprophytes. *Hypoderma*, *Lophiodermium*. (Pf. I, 1, 267.)

Family 91. **Dichaenaceae**. Apothecia at first sunken, later erumpent, leathery, black, elongated, or round; bark-saprophytes. *Dichaena*. (Pf. I, 1, 270.)

Family 92. **Ostropaceae**. Apothecia at first deeply sunken, later somewhat erumpent, leathery, black, roundish; saprophytes. *Ostropa*. (Pf. I, 1, 271.)

Family 93. **Hysteriaceae**. Apothecia sessile, narrowly elongated to broad, and even lobed, black, carbonaceous or leathery; saprophytes. *Hysterium*, *Hysterographium*. (Pf. I, 1, 272.)

Family 94. **Acrospermaceae**. Apothecia sessile, erect clavate, corneous, brown, spores very long, filamentous; saprophytes. *Acrospermum*. (Pf. I, 1, 277.)

Order PERISPORIALES. Mildews. Plants filamentous, producing minute, simple, mostly spherical spore-fruits, consisting of one to many asci enclosed in a hard, cellular shell (perithecium).

Family 95. **Erysiphaceae**. Superficial parasites upon higher plants, the filaments white with abundant, simple, vertical conidophores, the blackish, spherical spore-fruits with radiating, usually forked appendages. *Erysiphe*, *Sphaerotheca*, *Microsphaera*, *Podosphaera*, *Uncinula*. (Pf. I, 1, 328.)

Family 96. **Perisporiaceae**. Mostly saprophytes with the yellow or black fruits usually without appendages. *Parodiella*, *Perisporium*. (Pf. I, 1, 333.)

Family 97. **Microthyriaceae**. Minute superficial parasites upon higher plants, the filaments dark-colored; spore fruits flattish, unappendaged, containing 8-spored asci. *Microthyrium*, *Asterina*. (Pf. I, 1, 338.)

Order ASPERGILLALES. Little Truffles. True fungi, saprophytic, with an abundant branching mycelium which grows superficially, or penetrates the substratum, and eventually bears the small, mostly spherical, fleshy spore-fruits.

Family 98. **Gymnoascaceae**. Spore-fruits usually mere loose masses of hyphae with asci in the center. *Gymnoascus*, *Myrotrichium*. (Pf. I, 1, 293.)

Family 99. **Aspergillaceae**. Spore-fruits spheroidal, parenchymatous, with a definite peridium, sessile, not subterranean, opening irregularly. *Aspergillus*, *Penicillium*, *Meliola*. (Pf. I, 1, 297.)

Family 100. **Onygenaceae**. Spore-fruits spheroidal, parenchymatous, with a definite peridium, stalked, not subterranean. *Onygena*. (Pf. I, 1, 309.)

Family 101. **Trichocomataceae**. Spore-fruits cylindrical, erect, with a peridium, sessile, not subterranean. *Trichocoma*. (Pf. I, 1, 310.)

Family 102. **Elaphomycetaceae**. Spore-fruits subterranean, opening irregularly, pulverulent when ripe. *Elaphomyces*. (Pf. I, 1, 311.)

Family 103. **Terfeziaceae**. Spore-fruits subterranean, opening irregularly, not pulverulent when ripe. *Terfezia*, *Choiromyces*. (Pf. I, 1, 312.)

Order HEMIASCALLES. True fungi, mostly saprophytic, much reduced and simplified, the branched mycelium bearing the single few- to many-spored asci.

Family 104. **Ascoideaceae**. Asci much elongated, not corticated. *Ascoidea*. (Pf. I, 1, 145.)

Family 105. **Protomycetaceae**. Asci ellipsoid or spherical, not corticated. *Protomyces* (parasitic), *Endogone*. (Pf. I, 1, 147.)

Family 106. **Monascaceae**. Asci spherical, terminal, corticated. *Monascus*. (Pf. I, 1, 148.)

Family 107. **Saccharomycetaceae**. "Yeasts." Asci early isolated from the few-celled mycelium, which itself early breaks up into short segments; saprophytic. *Saccharomyces*. (Pf. I, 1, 153.)

Order TUBERALES. Truffles. True fungi, saprophytic, with a branching filamentous, generally subterranean mycelium; spore-fruits tuberous, subterranean, fleshy, containing asci in definite cavities or layers.

Family 108. **Tuberaceae**. Spore-fruits with spore-bearing cavities open to the exterior by rifts or slits in the tissue and rind. *Tuber*, *Genea*. (Pf. I, 1, 281.)

Family 109. **Balsamiaceae**. Spore-fruits with spore-bearing cavities not open to the exterior. *Balsamia*. (Pf. I, 1, 288.)

Class 16. BASIDIOSPOREAE. Basidium Fungi. True fungi, mostly saprophytes, consisting of septated mycelium which bears the spore-fruits; spores ("basidiospores") borne externally upon special cells ("basidia"), which are usually massed in a hymenium. The basidia are here regarded as the homologues of the asci of the *Ascosporeae*. (About 14,000 species.)

Order HYMENOGASTRALES. False Tubers. Spore-fruit indehiscent, subterranean; gleba fleshy or gelatinous, putrescent, wholly, or at first filled with irregular cavities; no capillitium.

Family 110. **Hymenogastraceae**. With the characters of the order. *Hysterangium*, *Hymenogaster*, *Octaviana*, *Rhizopogon*. (Pf. I, 1**, 296.)

Order SCLERODEMATALES. Hard Puff-balls. Spore-fruit epigeous, roundish, often stalked, containing groups of clustered basidia, bearing terminal spores; no capillitium; with or without columella.

Family 111. **Sclerodermataceae.** Spore-fruit often with a stalk-like base; no columella; gleba powdery, often with sporangioles. *Scleroderma*, *Pisolithus*. (Pf. I, 1**, 329.)

Family 112. **Podaxaceae.** With columella; gleba more or less lamellate. *Secotium*, *Podaxon*. (Pf. I, 1**, 329.)

Order LYCOPERDALES. Puff-balls. Spore-fruit fleshy when young, closed, subterranean at first, later superficial, internally filled with irregular spore-bearing canals, or a spore-bearing tissue; capillitium present.

Family 113. **Lycoperdaceae.** Spore-fruit sessile or short-stalked, filled with spore-bearing canals. *Lycoperdon*, *Calvatia*, *Bovista*, *Geaster*. (Pf. I, 1**, 315.)

Family 114. **Tylostomataceae.** Spore-fruit long-stalked, when young filled with spore-bearing tissue. *Tylostoma*, *Battarea*. (Pf. I, 1**, 342.)

Order NIDULARIALES. Bird-nest Fungi. Spore-fruit spherical, top-shaped, or cylindrical, leathery, containing one or more spore-bearing cavities, which by deliquescence of the surrounding tissues become peridioles ("sporangioles").

Family 115. **Nidulariaceae.** Spore-fruits small, each with several peridioles, sessile upon the ground. *Nidularia*, *Crucibulum*, *Cyathus*. (Pf. I, 1**, 326.)

Family 116. **Sphaerobolaceae.** Spore-fruits spherical, each with one spherical peridiole which is ejected at maturity. *Sphaerobolus*. (Pf. I, 1**, 346.)

Order PHALLALES. Stink-Horns. Spore-fruit fleshy, when young closed, subterranean at first, internally containing a circular spore-bearing cavity, later developing a stalk which ruptures the peridium, exposing the spores; no capillitium.

Family 117. **Phallaceae.** Spore-bearing stalk cylindraceous, hollow, capped by the spore mass. *Mutinus*, *Ithyphallus*, *Dictyophora*. (Pf. I, 1**, 289.)

Family 118. **Clathraceae.** Spore-bearing stalk ovoid and reticulated, or cylindrical and branched above; spore mass capitate or

between the branches. *Clathrus*, *Simblum*, *Aseroe*. (Pf. I, 1**, 280.)

Order AGARICALES. Toadstool Fungi. Spore-fruit when mature from umbrella-shaped to bracket-shaped, branched, fruticose, foliose, and vaguely expanded, developing a hymenium on surfaces which are eventually external.

Family 119. **Agaricaceae.** Agarics. Spore-fruits usually fleshy, typically umbrella-shaped, with hymenium on lamellae on the under side of the cap. *Coprinus*, *Russula*, *Psalliota*, *Agaricus*, *Amanita*. (Pf. I, 1**, 198.)

Family 120. **Polyporaceae.** Polypores. Spore-fruit fleshy, leathery or woody, from umbrella-shaped to bracket-shaped, and resupinate and expanded; the hymenium lining pits or pores. *Fomes*, *Polyporus*, *Polystictus*, *Boletus*. (Pf. I, 1**, 152.)

Family 121. **Hydnaceae.** Prickly Fungi. Spore-fruit fleshy or leathery, from umbrella-shaped to bracket-shaped, fruticose or resupinate-expanded, the hymenium covering the surface of warts or prickles. *Hydnum*, *Irpea*. (Pf. I, 1**, 139.)

Family 122. **Clavariaceae.** Coral Fungi. Spore-fruits fleshy to leathery, cylindrical to clavate and fruticose, the hymenium covering the outer surface. *Pistillaria*, *Clavaria*. (Pf. I, 1**, 130.)

Family 123. **Thelephoraceae.** Leathery Fungi. Spore-fruits cuticular or leathery, flat, shell-shaped, capitate or branched, the hymenium smooth and covering the surface. *Corticium*, *Stereum*, *Thelephora*. (Pf. I, 1**, 117.)

Order EXOBASIDIALES. Reduced and degraded *Basidiosporeae*, related to the preceding families; basidia undivided, more or less rounded.

Family 124. **Dacryomycetaceae.** Saprophytes; basidia long-clavate, branched in or on gelatinous explanate, cup-shaped fruticose or capitate spore-fruits. *Dacryomyces*, *Guepinia*, *Calocera*. (Pf. I, 1**, 96.)

Family 125. **Tulasnellaceae.** Saprophytes; basidia rounded, without sterigmata. *Tulasnella*. (Syllabus 40.)

Family 126. **Hypochnaceae.** Basidia developed upon the flocculent mycelium, forming vague superficial spore-fruits. *Hypochnus*, *Tomentella*. (Pf. I, 1**, 114.)

Family 127. **Exobasidiaceae.** Parasites in the tissues of higher plants, the basidia crowded into a loose hymenium; spores borne on sterigmata. *Exobasidium*. (Pf. I, 1**, 103.)

Order TREMELLALES. Jelly Fungi. Reduced and degraded *Basidiosporeae*, related to the preceding families: basidia divided by vertical partitions.

Family 128. **Sirobasidiaceae.** Spore-fruits gelatinous, open, the basidia in serial rows, spores sessile. *Sirobasidium*. (Pf. I, 1**, 89.)

Family 129. **Tremellaceae.** Spore-fruits gelatinous, open, expanded to foliose and cup-shaped; basidia collateral, elongated. *Exidia*, *Tremella*. (Pf. I, 1**, 90.)

Family 130. **Hyaloriaceae.** Spore-fruits capitate, stalked, closed, the basidia developed in a circular subterminal zone. *Hyaloria*. (Pf. I, 1**, 95.)

Order AURICULARIALES. Ear Fungi. Reduced and degraded *Basidiosporeae*, related to the preceding families; basidia divided by transverse partitions.

Family 131. **Auriculariaceae.** Hymenium exposed; spore-fruits from irregular foliose to loose and vague aggregations of basidia; more or less gelatinous. *Platyglœa*, *Auricularia*. (Pf. I, 1**, 83.)

Family 132. **Pilacraceae.** Spore-fruits capitate, stalked, closed, filled with basidia. *Pilacre*, *Pilacrella*. (Pf. I, 1**, 86.)

Class 17. TELIOSPOREAE. Brand Fungi. Parasitic fungi, much reduced and degraded, with a mycelium which penetrates the tissues of the host and produces erumpent spore-clusters (sori) but no definite spore-fruits; conidia single-celled, usually

of one or two kinds; asci and basidia here replaced by one-, two-, or several-celled teliospores. (About 4,200 species.)

Order UREDINALES. Rusts. Typically producing five kinds of spores, viz., (1) thin-walled sporidia, (2) smooth-walled pycniospores, (3) aeciospores, (4) uredospores, (5) teliospores, of which 3 and 4 are forms of conidia.

Family 133. **Aecidiaceae.** Teliospores free or fascicled, usually erumpent; sporidia, pycniospores, aeciospores, uredospores, and teliospores typically present; walls of spores usually firm. *Uropyxis*, *Phragmidium*, *Aecidium*, *Nigredo*, *Uromyces*, *Dicaeoma* ("Puccinia"). (Pf. I, 1**, 48.)

Family 134. **Uredinaceae.** Teliospores compacted into a crust or column, subcuticular or erumpent, walls of spores firm. *Uredo* ("Melampsora"), *Cronartium*. (Pf. I, 1**, 38.)

Family 135. **Coleosporiaceae.** Teliospores compacted laterally into waxy layers; walls of spores weakly gelatinous. *Coleosporium*. (Pf. I, 1**, 42.)

Order USTILAGINALES. Smuts. Typically producing two kinds of spores, viz., (1) thin-walled sporidia, (2) teliospores, which are here regarded as homologous with the teliospores of the preceding order.

Family 136. **Ustilaginaceae.** Germinating teliospore producing a septated promycelium. *Ustilago*, *Sphacelotheca*. (Pf. I, 1**, 6.)

Family 137. **Tilletiaceae.** Germinating teliospore producing a tubular promycelium. *Tilletia*, *Entyloma*. (Pf. I, 1**, 15.)

FUNGI IMPERFECTI. The Imperfect Fungi. Here are collected from 16,000 to 17,000 species of fungi with regard to which our knowledge is quite imperfect. We do not know their ascigerous states, if indeed they have any, but it is generally assumed that they are the conidial states of *Ascosporae*, and that possibly in some cases they have lost all else through excessive degeneration. They are mostly parasitic. For the present they must be grouped here, and treated as though they were

autonomous, although the classification here given is merely provisional.

Order SPHAEROPSIDALES. Spot Fungi. Conidia developed in pycnidia, i. e. perithecium-like "fruits."

Family 138. **Sphaerioidaceae.** Pycnidia more or less spherical, cuticular, leathery or carbonaceous, black. *Phyllosticta*, *Phoma*, *Sphaeropsis*, *Ascochyta*, *Darluka*, *Diplodia*, *Septoria*. (Pf. I, 1**, 349.)

Family 139. **Nectrioidaceae.** Pycnidia more or less spherical, fleshy or waxy, bright colored; spores hyaline. *Zythia*, *Sphaeronomella*, *Aschersonia*. (Pf. I, 1**, 382.)

Family 140. **Leptostromataceae.** Pycnidia shield-shaped, cuticular or carbonaceous, black. *Leptothyrium*, *Leptostroma*, *Leptostromella*. (Pf. I, 1**, 386.)

Family 141. **Excipulaceae.** Pycnidia more or less dish- or top-shaped, round or elongated, cuticular or carbonaceous, black. *Excipula*, *Amerosporium*, *Discella*. (Pf. I, 1**, 392.)

Order MELANCONIALES. Black-dot Fungi. Conidia developed upon a stroma which eventually breaks through the epidermis.

Family 142. **Melanconiaceae.** Stroma sometimes feebly developed but more often firm and black. *Glocosporium*, *Colletotrichum*, *Melanconium*, *Coryneum*, *Pestalozzia*, *Cylindrosporium*. (Pf. I, 1**, 398.)

Order MONILIALES. Molds. Conidia developed upon separate conidiophores which do not form a stroma, but penetrate the epidermis or the stromata singly or in clusters.

Family 143. **Mucedinaceae.** Conidiophores hyaline, always separate. *Oospora*, *Monilia*, *Oidium*, *Sterigmatocystis*, *Ovularia*, *Sporotrichium*, *Botrytis*, *Verticillium*, *Ramularia*. (Pf. I, 1**, 416.)

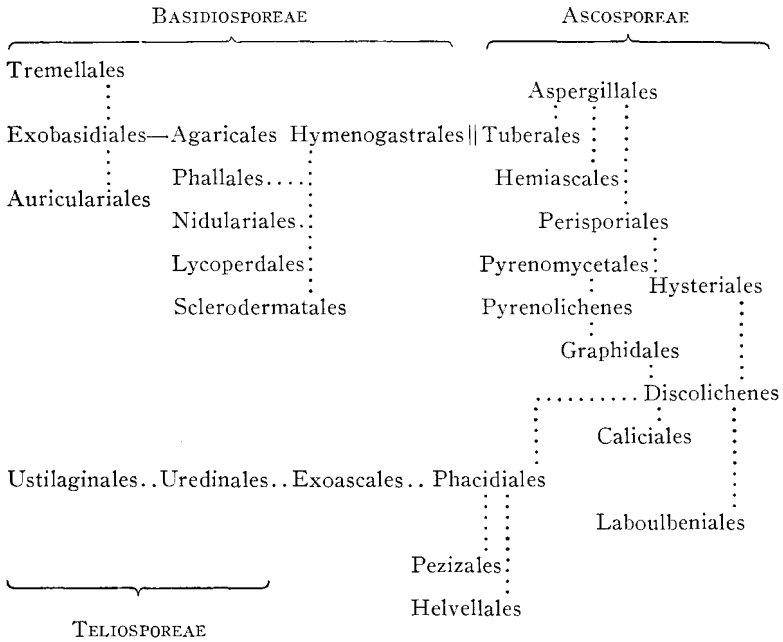
Family 144. **Dematiaceae.** Conidiophores dark or black, always separate. *Torula*, *Trichosporium*, *Dematium*, *Fusicladium*, *Cladosporium*, *Helminthosporium*, *Macrosporium*, *Cercospora*. (Pf. I, 1**, 454.)

Family 145. **Stilbaceae.** Conidiophores united into an erect, compound, spore-bearing body. *Isaria*, *Graphium*, *Stysanus*. (Pf. I, 1**, 488.)

Family 146. **Tuberculariaceae.** Conidiophores united into a cushion-like spore-bearing body. *Tubercularia*, *Fusarium*, *Epicoccum*. (Pf. I, 1**, 498.)

PHYLOGENETIC CHART

Showing the sequence and general relationship of the orders of Ascosporeae, Basidiosporeae, and Teliosporeae, as given on the preceding pages.



Phylum XII. **CYCADOPHYTA.** The Cycads.

Chlorophyll-green terrestrial plants in which the alternation of generations is obscured by the reduction of the gametophyte to a condition of dependence upon the long-lived, leafy-stemmed sporophyte. Spores of two kinds (heterosporous), borne on

sporophylls which occur in strobili, the microspores set free in germination producing tubular antherids; the megaspores retained in their sporangia, where they develop gametophytes and archezones; after fecundation of the egg by the motile sperms, the embryo sporophyte surrounded by the gametophyte tissue embedded in the 1- or 2-coated sporangium constitutes the "seed." (Living species about 140, but very many extinct.)

Class 27. PTERIDOSPERMEAE (*Cycadofilices*). Seed Ferns. Palaeozoic plants, long extinct, related to the ferns on the one hand, and the following classes on the other. Stems short and erect, increasing in thickness, bearing pinnate leaves.

Order PTERIDOSPERMALES. With the characters of the class.

Family 1. **Lyginopterideae**. With stems which seem to have had the power of increasing in diameter by the growth of their collateral bundles. *Lyginopteris*, *Megaloxylon*, *Calamopitys*. (Pf. I, 4, 783.)

Family 2. **Medulloseae**, related to the preceding. *Medullosa*, *Steloxylon*. (Pf. I, 4, 788.)

Family 3. **Cladoxyleae**, including *Cladoxylon* and *Voelkelia*. (Pf. I, 4, 782.)

Family 4. **Protopityeae**, including *Protopitys*. (Pf. I, 4, 794.)

Family 5. **Araucarioxyleae**, including *Araucarioxylon*. (Pf. I, 4, 795.)

Class 28. CYCADINEAE. Common Cycads. Plants with erect, woody, little-branched stems, bearing terminal clusters of pinnate leaves. The collateral fibrovascular bundles are arranged concentrically in the stem; these increase the thickness of the stem by development of their cambium, and also by the formation of new bundles in the cortical meristem. Sporophylls in dioecious strobili. Many cycads which existed in Mesozoic times have become extinct, leaving only a few genera and species in the present.

Order CYCADALES. With the characters of the class.

Family 6. **Cycadaceae**. Tropical trees of the present time pro-

ducing staminate cones, and loose clusters of megasporophylls. *Cycas*. (Pf. II, 1, 6.)

Family 7. **Zamiaceae**. Tropical trees of the present time, with both staminate and seed cones. *Dioon*, *Encephalartos*, *Macrosamia*, *Zamia*, *Ceratosamia*. (Pf. II, 1, 6.)

Class 29. BENNETTITINEAE. "Flowering-plant Ancestors." Mesozoic plants, long extinct, related on the one hand to the ancient cycads, and on the other to the flowering plants, of which they are thought by some, with very good reasons, to have been the ancestors. Stems simple, erect, increasing in thickness by annular growth of fibrovascular tissue; leaves pinnate; sporophylls in terminal amphisporangiate strobili.

Order BENNETTITALES. With the characters of the class.

Family 8. **Bennettitaceae**. Short-stemmed plants with the main axis terminated by a strobilus of sporophylls, the lower sterile and long, the next bearing many microsporangia, and the uppermost megasporangia. *Bennettites*. (Wieand, American Fossil Cycads; Engler's Syllabus, 103.)

Class 30. CORDAITINEAE. Conifer Ancestors. Palaeozoic plants, mostly long extinct, related to the modern cycads, and probably also to the conifers, of which indeed they may have been the ancestors.

Order CORDAITALES. Branching trees, bearing large, elongated, parallel-veined leaves; seeds with two integuments. (Extinct.)

Family 9. **Cordaitaceae**. Tall trees (20-30 m. high) bearing subterminal clusters of thick, spirally-arranged, leathery leaves, sometimes as much as 1 m. long, and 2 dm. wide. *Cordaites*, *Dadoxylon*, *Artisia*. (Pf. II, 1, 26.)

Order GINKGOALES. Maidenhair Trees. Woody, freely-branched trees, bearing fan-shaped, parallel-veined leaves; the collateral fibrovascular bundles are arranged concentrically in the stem, and these increase its thickness by the development of their cambium; sporophylls in dioecious strobili.

Family 10. **Ginkgoaceae**. Represented today by a single spe-

cies of *Ginkgo*, a large Chinese and Japanese tree, but in the Tertiary there were many species of this genus, and of other now wholly extinct genera. (Pf. II, I, 108.)

Order GNETALES. The Joint-Firs. Chlorophyll-green terrestrial plants, shrubby in size and structure, with a branched or simple stem, undivided leaves, monoecious sporophylls, non-motile sperms and naked seeds. They are related to the Cycads, and possibly should be included in this phylum. There are three genera of doubtful mutual relationship. They are usually referred to a common family, *Gnetaceae*, with no good reason. They probably represent the remnants of as many divergent families.

Family 11. **Ephedraceae**. Small, Equisetum-like evergreen shrubs with reduced, opposite leaves. *Ephedra*. (Species 35.) (Pf. II, I, 117.)

Family 12. **Gnetaceae**. Shrubs and trees with large, opposite, evergreen, pinnately-veined leaves. *Gnetum*. (Species 15.) (Pf. II, I, 120.)

Family 13. **Tumboaceae**. Short, thick-stemmed woody plants with two large, opposite, parallel-veined leaves. *Tumboa* (*Welwitschia*). (Species 1.) (Pf. II, I, 123.)

Phylum XIV. **ANTHOPHYTA**. The Flowering Plants.

Typically chlorophyll-green plants (a few colorless hystero-phytes), ranging from small or even minute plants to great trees a hundred or more meters in height; alternation of generations obscured by the extreme reduction of the gametophyte to a condition of dependence upon the long-lived, leafy-stemmed sporophyte. Spores of two kinds (heterosporous), produced on sporophylls which are borne in modified, often much reduced strobili (flowers); microsporophylls (stamens) normally with two sporangia (pollen sacs); the microspores being set free (as "pollen") when mature; megasporophylls (carpels) folded lengthwise (constituting the "pistil"), enclosing the sporangia (ovules) in which the megaspores remain and develop the minute gametophyte; archegones very much reduced, including little more than the egg.

which is fecundated by the non-ciliated sperms (male nuclei) from the tubular antherids resulting in the formation of an embryo sporophyte; megasporangia surrounded by one or two enveloping coats (seed coats); mature seed with or without endosperm (gametophyte tissue).

The Flowering Plants are here held to have sprung from strobiliferous ancestors probably of the type of the *Bennettitaceae*, and as a consequence those Anthophyta are considered to be primitive in which the sporophylls are many and distinct. Symphyllly and syncarpy are later structural conditions than apophyllly and apocarpy. So also, fewer sporophylls in the anthostrobilus is a later condition derived from the earlier polyphyllous structure. The symphysis of sporophylls is a mode of evolution, and so is their aphanisis.

The plants constituting this phylum are those commonly termed Angiosperms, in contrast with the Gymnosperms, including the Cycads (CYCADOPHYTA) and Conifers (STROBILOPHYTA). It appears to the writer, however, that these are more properly three pretty distinct phyla, and that the relationship of the Gymnosperms to the Angiosperms is so remote that the treatment here given them is more nearly in accordance with what is known as to their phylogeny.

There are two classes, Monocotyledons and Dicotyledons, of which the second was probably the earlier, as it is now much the larger numerically. Indeed it is becoming more probable that the Monocotyledons are to be regarded as a peculiar side branch which sprang from the primitive Dicotyledons after the latter had become well established. Yet the Monocotyledons have not developed to as high a rank in any of their orders as have some of the Dicotyledons.

Class 32. MONOCOTYLEDONEAE. The Monocotyledons. Leaves of young sporophore alternate; leaves of mature sporophore usually parallel-veined; fibro-vascular bundles of the stem scattered, usually not arranged in rings. (Species about 23,700.)

Sub-Class MONOCOTYLEDONEAE-HYPOGYNAE. Per-

ianth and stamens arising below the carpels; (carpels superior). Flowers mostly actinomorphic.

Order ALISMATALES. Pistils separate, superior to all other parts of the flower.

Family 1. **Alismataceae**. Water Plantains. Aquatic or paludose herbs with mostly radical, often large leaves; flowers small to large; perianth in two whorls of three leaves each (calyx and corolla). *Alisma*, *Sagittaria*. (Pf. II, 1, 227.)

Family 2. **Butomaceae**. Aquatic or paludose herbs, bearing narrow or broad leaves, with convergent veins; perianth in two whorls, of three leaves each (calyx and corolla). *Butomus*, *Limnnocharis*. (Pf. II, 1, 232.)

Family 3. **Truridaceae**. Very small, pale, leafless plants growing in wet places in tropical countries. *Triuris*. (Pf. II, 1, 235.)

Family 4. **Scheuchzeriaceae**. Aquatic or paludose herbs with rush-like leaves, and small flowers, with a two-whorled perianth, each 4- to 6-parted. *Triglochin*, *Scheuchzeria*. (Pf. II, 1, 222.)

Family 5. **Typhaceae**. Cat-tails. Aquatic or paludose herbs, with linear, sheathing leaves; pistil 1-celled; ovule 1. *Typha*. (Pf. II, 1, 183.)

Family 6. **Sparganiaceae**. Aquatic or paludose plants with creeping rootstocks and erect stems, bearing linear leaves; flowers monoecious in dense globose heads. *Sparganium*. (Pf. II, 1, 192.)

Family 7. **Pandanaceae**. Screw-pines. Shrubs or trees with spirally crowded, narrow, stiff leaves on the ends of the branches; pistil 1-celled; ovules one or many. *Pandanus*. (Pf. II, 1, 186.)

Family 8. **Aponogetonaceae**. Aquatic plants with petioled, oblong, translucent leaves, with convergent veins; flowers small, spicate. *Aponogeton*. (Pf. II, 1, 218.)

Family 9. **Potamogetonaceae**. River-weeds. Aquatic or paludose herbs with mostly alternate stem-leaves; flowers mostly small and inconspicuous; perianth none, or of 1 to 6 leaves in 1

or 2 whorls. *Potamogeton*, *Zostera*, *Zannichellia*. (Pf. II, 1, 194.)

Order LILIALES. Pistils united (usually 3), forming a compound pistil, superior; flower leaves (usually 6, in two similar whorls) delicate and corolla-like.

Family 10. **Liliaceae**. The Lilies. Pistil mostly 3-celled; stamens 6; perianth of two similar whorls, each of three similar leaves. *Lilium*, *Erythronium*, *Tulipa*, *Yucca*, *Asparagus*, *Allium*. (Pf. II, 5, 10.)

Family 11. **Stemonaceae**. Pistil 1-celled; stamens 4; perianth of two similar whorls, each of two similar leaves. *Stemona*, *Croomia*. (Pf. II, 5, 8.)

Family 12. **Pontederiaceae**. Aquatic herbs with 3- or 1-celled pistil; stamens 6 or 3; perianth of two similar whorls, each of three similar or dissimilar leaves. *Pontederia*, *Heteranthera*. (Pf. II, 4, 70.)

Family 13. **Cyanastraceae**. Tropical African rhizomatous plants. *Cyanastrum*. (Syllabus, 96.)

Family 14. **Philydraceae**. Pistil 3-celled; stamen 1; perianth of two similar whorls, each of two dissimilar leaves. *Philydrium*. (Pf. II, 4, 75.)

Family 15. **Commelinaceae**. Spiderworts. Succulent herbs with 3- or 2-celled pistil; stamens 6; perianth of two dissimilar whorls of three similar leaves. *Commelina*, *Tradescantia*. (Pf. II, 4, 60.)

Family 16. **Xyridaceae**. Rush-like plants with a 1-celled or incompletely 3-celled pistil; stamens 3; perianth of two dissimilar whorls, each of three similar leaves. *Xyris*. (Pf. II, 4, 14.)

Family 17. **Mayaceae**. Slender, creeping, moss-like plants with 1-celled pistil; stamens 3; perianth of two dissimilar whorls, each of three similar leaves. *Mayaca*. (Pf. II, 4, 16.)

Family 18. **Juncaceae**. Rushes. Herbs with narrow leaves; pistil 1- to 3-celled; ovules solitary or many; fruit a dry 3-valved pod. *Juncus*, *Luzula*. (Pf. II, 5, 1.)

Family 19. **Eriocaulonaceae**. Rush-like herbs with flowers in close heads; perianth segments 6 or less, small; pistil 3- or 2-celled; ovules orthotropous, pendulous. *Eriocaulon*. (Pf. II, 4, 21.)

Family 20. **Thurniaceae**. South American herbs, with small, 1-nerved leaves, and small axillary flowers. *Thurnia*. (Syllabus, 94.)

Family 21. **Rapateaceae**. Tall, sedge-like marsh herbs with 3-celled pistil; stamens 6, in pairs; perianth of two dissimilar whorls, each of three similar leaves. *Rapatca*. (Pf. II, 4, 28.)

Family 22. **Naiadaceae**. Slender, branching, wholly submerged aquatics, with sheathing, mostly opposite leaves, and monoecious or dioecious flowers. *Naias*. (Pf. II, 1, 214.)

Order ARALES. Compound pistil, mostly tricarpeillary, superior; ovules more than one; flower-leaves reduced to scales or entirely wanting.

Family 23. **Cyclanthaceae**. Mostly herbaceous plants with broad, petioled leaves having parallel venation; pistil 1-celled; ovules many, on four parietal placentae. *Cyclanthus*. (Pf. II, 3, 93.)

Family 24. **Araceae**. Arums. Mostly herbaceous plants with broad, petioled leaves, having reticulate venation; pistil 1- to 4-celled; ovules 1 or more. *Anthurium*, *Acorus*, *Monstera*, *Symplocarpus*, *Calla*, *Philodendron*, *Calocasia*, *Caladium*, *Arum*, *Arisaema*. (Pf. II, 3, 102.)

Family 25. **Lemnaceae**. Duckweeds. Very small, floating, aquatic herbs; pistil 1-celled; ovules 1 or more. *Lemna*, *Spirodela*. (Pf. II, 3, 154.)

Order PALMALES. Compound pistil mostly tricarpeillary, superior; ovules usually one; flower-leaves reduced to rigid or herbaceous scales. (Sp. 1085.)

Family 26. **Palmaceae**. Palms. Trees or shrubs with compound leaves; pistil 1- to 3-celled; fruit a 1-seeded berry or drupe

(rarely 2- to 3-seeded). *Phoenix*, *Chamaerops*, *Calamus*, *Oreodoxa*, *Cocos*. (Pf. II, 3, 1.)

Order GRAMINALES. Compound pistil reduced to 2 or 3 carpels; ovule solitary; perianth reduced to small scales or entirely wanting.

Family 27. **Restionaceae**. Rush-like herbs or undershrubs, with spiked, racemed, or paniced flowers; perianth segments 6 or less, chaffy; pistil 1- to 3-celled; ovules orthotropous, pendulous. *Restio*. (Pf. II, 4, 3.)

Family 28. **Centrolepidiaceae**. Small rush-like herbs with flowers in spikes or heads; perianth none; pistil 1- to 3-celled; ovules orthotropous, pendulous. *Centrolepis*. (Pf. II, 4, 11.)

Family 29. **Flagellariaceae**. Erect or climbing herbs with long narrow leaves; pistil 3-celled; ovules solitary; fruit a 1- to 2-seeded berry. *Flagellaria*. (Pf. II, 4, 1.)

Family 30. **Cyperaceae**. Sedges. Grass-like herbs with 3-ranked leaves; perianth segments bristly or none; pistil 1-celled; ovules anatropous, erect. *Cyperus*, *Scirpus*, *Fimbristylis*, *Rhynchospora*, *Carex*. (Sp. 1959.) (Pf. II, 2, 98.)

Family 31. **Poaceae**. Grasses. Mostly erect herbs with hollow, jointed stems, and 2-ranked leaves; perianth segments of 2 to 6 scales or vestiges; pistil 1-celled; ovules anatropous, ascending. *Bambusa*, *Bromus*, *Triticum*, *Bouteloua*, *Avena*, *Agrostis*, *Phalaris*, *Oryza*, *Panicum*, *Andropogon*, *Zea*. (Sp. 3545.) (Pf. II, 2, 1.)

Sub-Class MONOCOTYLEDONEAE—EPIGYNAE. Perianth and stamens arising above the carpels; (carpels inferior). Flowers from actinomorphic to zygomorphic.

Order HYDRALES. Compound tricarpeillary pistil, inferior to all other parts of the flower; flower-leaves in each whorl alike in shape (flower regular); seeds without endosperm.

Family 32. **Vallisneriaceae**. Tape-Grasses. Small aquatic herbs mostly inhabiting the fresh waters of temperate climates. *Vallisneria*, *Hydrocharis*, *Philotria*. (Pf. II, 1, 238.)

Order IRIDALES. Compound tricarPELLARY pistil, inferior; flower-leaves in each whorl mostly alike in shape (flower regular, actinomorphic); seeds with endosperm.

Family 33. **Amaryllidaceae.** Amaryllises. Leaves narrow, or the blade broad, with longitudinal veins; pistil 3-celled; ovules many; stamens 6 or 3. *Amaryllis*, *Crinum*, *Narcissus*, *Agave*, *Hypoxis*. (Pf. II, 5, 97.)

Family 34. **Haemodoraceae.** Leaves sword-shaped; pistil 3-celled; ovules 1 to many; stamens 6. *Haemodorum*. (Pf. II, 5, 92.)

Family 35. **Iridaceae.** Leaves sword-shaped; pistil 3-celled; ovules many; stamens 3. *Crocus*, *Iris*, *Tigridia*, *Sisyrinchium*, *Ixia*, *Tritonia*, *Gladiolus*, *Freesia*. (Pf. II, 5, 137.)

Family 36. **Velloziaceae.** Woody-stemmed leafy plants, with a 3-celled pistil containing many ovules, stamens 6 or more. *Vellozia*. (Pf. II, 5, 125.)

Family 37. **Taccaceae.** Stemless herbs, with broad pinnately parallel-veined leaves; pistil 1-celled; ovules many; stamens 6. *Tacca*. (Pf. II, 5, 127.)

Family 38. **Dioscoreaceae.** Yams. Mostly twining herbs with broad, petioled, longitudinally-veined leaves; pistil 3-celled; ovules 2 in each cell; stamens 6. *Dioscorea*, *Testudinaria*. (Pf. II, 5, 130.)

Family 39. **Bromeliaceae.** Pine-Apples. Leaves mostly rosulate; external perianth whorl calycine; pistil 3-celled; ovules many; stamens 6. *Tillandsia*, *Dendropogon*, *Ananas*. (Pf. II, 4, 32.)

Family 40. **Musaceae.** Bananas. Large herbs, the stem often composed of the sheathing leaf-bases; perianth petaloid of 6, often dissimilar segments; stamens 6; pistil 3-celled; ovules 1 to very many. *Strelitzia*, *Musa*. (Pf. II, 6, 1.)

Family 41. **Zingiberaceae.** Ginger. Perennial, medium sized herbs, with creeping or tuberous rootstocks; perianth irregular; stamen 1, anther 2-celled, with several "staminodes"; pistil 3-

celled; ovules 1 or more in each cell. *Curcuma*, *Zingiber*, *Amomum*. (Pf. II, 6, 10.)

Family 42. **Cannaceae**. Cannas. Perennial herbs of medium size, with simple pinnately-veined leaves; perianth irregular; stamen 1, anther 1-celled, with several "staminodes"; pistil 3-celled; ovules 1 to many. *Canna*. (Pf. II, 6, 30.)

Family 43. **Marantaceae**. Perennial herbs of variable habit, leaves parallel or pinnately-veined; perianth irregular; functional stamen 1, with several "staminodes"; pistil 3-celled; ovules 1 in each cell. *Calathea*, *Maranta*. (Pf. II, 6, 33.)

Order ORCHIDALES. Compound tricarpellary pistil, inferior; flower-leaves in each whorl mostly unlike in shape (flower irregular, zygomorphic); seeds without endosperm.

Family 44. **Burmanniaceae**. Flowers irregular; stamens 3 or 6. *Burmannia*. (Pf. II, 6, 44.)

Family 45. **Orchidaceae**. Orchids. Flowers irregular; stamens 1 or 2. *Cypripedium*, *Orchis*, *Platanthera*, *Vanilla*, *Spiranthes*. (Sp. 7521.) (Pf. II, 6, 52.)

Class 33. DICOTYLEDONEAE. The Dicotyledons. Leaves of young sporophore opposite; leaves of mature sporophore usually reticulate-veined; fibrovascular bundles of the stems in one or more rings. (Species about 108,800.)

Sub-Class DICOTYLEDONEAE-AXIFLORAE. "Axis Flowers." Axis of the flower normally cylindrical, spherical, hemispherical or flattened, bearing on its surface the hypogynous perianth, stamens and pistils (or the stamens may be attached to the corolla).

Super-Order AXIFLORAE-APOPETALAE-POLYCARPELLATAE. Carpels typically many, separate or united; petals separate. Flowers mostly actinomorphic. This Super-Order has much in common with the Alismatales, and also with the Calyciflorae Apopetalae. In fact, these three groups appear to diverge from a common point of origin.

Order RANALES. All parts of the flower free (not united). Pistils many to 1, monocarpellary (or rarely united); stamens generally indefinite; embryo mostly small, in copious endosperm.

Family 46. **Magnoliaceae.** Magnolias. Petals present, in one to many whorls; receptacle usually elongated; shrubs and trees with alternate leaves and usually large flowers. *Magnolia*, *Liriodendron*. (Pf. III, 2, 12.)

Family 47. **Calycanthaceae.** Petals present, in many whorls; seeds without endosperm; shrubs with opposite leaves. *Calycanthus*. (Pf. III, 2, 92.)

Family 48. **Monimiaceae.** Petals absent; pistils many, 1-ovuled, embedded in the receptacle; trees and shrubs with opposite or whorled leaves, and declinuous flowers. *Kibara*, *Monimia*, *Siparuna*. (Pf. III, 2, 94.)

Family 49. **Cercidiphyllaceae.** Trees with naked flowers, many stamens, and a single whorl of superior pistils. *Cercidiphyllum*. (Pf. III, 2, 21.)

Family 50. **Trochodendraceae.** Trees and shrubs with naked flowers, many stamens, and a single whorl of 2 to many partly inferior pistils. *Trochodendron*. (Pf. III, 2, 21.)

Family 51. **Leitneriaceae.** Shrubs with alternate leaves and dioecious flowers in catkins; perianth minute or 0; pistil 1-celled, 1-ovuled; endosperm minute. *Leitneria*. (Pf. III, 1, 28.)

Family 52. **Anonaceae.** Papaws. Petals present, in two whorls of 3 each; endosperm ruminated; trees or shrubs with alternate leaves. *Asimina*, *Anona*. (Pf. III, 2, 23.)

Family 53. **Lactoridaceae.** Much-branched shrubs of the South Pacific Islands, with alternate leaves, and apetalous flowers. *Lactoris*. (Pf. III, 2, 19.)

Family 54. **Gomortegaceae.** Large trees of South America, with opposite evergreen leaves, and acyclic flowers; pistils 2-3, each with 1 ovule. *Gomortega*. (Pf. Nach. 172.)

Family 55. **Myristicaceae.** Nutmegs. Petals absent; pistil 1 (or a second rudiment), 1-seeded; endosperm ruminated; trees

or shrubs with alternate leaves and small, inconspicuous, dioecious flowers. *Myristica*. (Pf. III, 2, 40.)

Family 56. **Saururaceae**. Rhizomatous, marsh herbs, with alternate leaves; perianth none; pistil of 3 to 5 carpels, more or less united. *Saururus*. (Pf. III, 1, 1.)

Family 57. **Piperaceae**. Peppers. Herbs, shrubs, and trees with alternate (or opposite) leaves; flowers perfect or diclinous, mostly spicate; perianth 0; pistil 1-celled, 1-ovuled; endosperm present. *Piper*, *Macropiper*. (Pf. III, 1, 3.)

Family 58. **Lacistemaceae**. Shrubs and trees with alternate leaves; perianth 0; stamen 1; pistil 3- or 2-carpellary. *Lacistema*. (Pf. III, 1, 14.)

Family 59. **Chloranthaceae**. No perianth whatever; pistil 1, with 1 ovule; mostly trees and shrubs, with opposite leaves, and small flowers. *Chloranthus*. (Pf. III, 1, 12.)

Family 60. **Ranunculaceae**. Buttercups. Petals present in one whorl, or absent; sepals deciduous; mostly herbs with alternate leaves. *Myosurus*, *Ranunculus*, *Anemone*, *Clematis*. (Pf. III, 2, 43.)

Family 61. **Lardizabalaceae**. Petals and sepals 6 each; stamens 6; twining or erect shrubs, with alternate leaves. *Akebia*, *Lardizabala*. (Pf. III, 2, 67.)

Family 62. **Berberidaceae**. Barberries. Petals usually present, in 1 to 3 whorls; pistil 1 (rarely more), with many ovules; mostly shrubs with alternate leaves and perfect flowers. *Podophyllum*, *Berberis*. (Pf. III, 2, 70.)

Family 63. **Menispermaceae**. Moonseeds. Petals present, in 2 whorls; twining shrubs with alternate leaves and small diclinous flowers. *Menispermum*, *Cocculus*. (Pf. III, 2, 78.)

Family 64. **Lauraceae**. Laurels. Aromatic trees and shrubs with alternate simple leaves; disk 0; petals 0; ovule 1, pendulous; endosperm 0. *Cinnamomum*, *Persea*, *Ocotea*, *Umbellularia*, *Sassafras*, *Litsea*, *Laurus*. (Pf. III, 2, 106.)

Family 65. **Nelumbaceae**. Lotuses. Large aquatic herbs with

peltate leaves, and many separate carpels immersed in the flattish axis ("receptacle"). *Nelumbo*. (Pf. III, 2, 1.)

Family 66. **Cabombaceae**. Water-shields. Small aquatic herbs with floating, sometimes peltate leaves, and few to many separate carpels (not immersed). *Cabomba*, *Brasenia*. (Pf. III, 2, 1.)

Family 67. **Ceratophyllaceae**. Aquatic herbs with verticillate, divided leaves; flowers dioecious; perianth 0; pistil 1-celled, 1-ovuled; endosperm 0. *Ceratophyllum*. (Pf. III, 2, 10.)

Family 68. **Dilleniaceae**. Petals present, in one whorl; sepals persistent; mostly shrubs and trees with alternate leaves. *Dillenia*, *Actinidia*. (Pf. III, 6, 100.)

Family 69. **Winteranaceae**. Aromatic trees with alternate leaves; sepals 4-5; petals 4-5 (or 0); stamens 20-30; pistil 2- to 5-carpellary. *Winterana*, *Cinnamodendron*. (Pf. III, 6, 314.)

Order MALVALES. Pistil usually of 3 to many carpels, with as many cells (sometimes greatly reduced); ovules few; stamens indefinite, monadelphous, branched, or by reduction separate and few; endosperm present or absent.

Family 70. **Sterculiaceae**. Trees and shrubs with alternate leaves; flowers perfect or diclinous, with or without petals; stamens mon- or polyadelphous, 2-celled; pistil 4- to many-celled; endosperm present or 0. *Theobroma*, *Sterculia*. (Pf. III, 6, 69.)

Family 71. **Malvaceae**. Mallows. Herbs, shrubs, and trees with alternate leaves; flowers perfect, with petals; stamens monadelphous, 1-celled; pistil 5- to many-celled; endosperm little or 0. *Abutilon*, *Althaea*, *Malva*, *Hibiscus*, *Gossypium*. (Pf. III, 6, 30.)

Family 72. **Bombaceae**. Tropical trees with alternate, palmate leaves; sepals and petals present; staminal column 5-8 cleft. *Adansonia*, *Bombax*. (Pf. III, 6, 53.)

Family 73. **Scytopetalaceae**. Trees of the southern hemisphere, with alternate leathery leaves; sepals small; petals much larger, valvate; stamens many. *Scytopetalum*. (Pf. Nach. 242.)

Family 74. **Chlaenaceae.** Madagascar trees and shrubs with alternate leaves; inflorescence dichotomous; petals contorted. *Rhodochlaena*, *Leptochlaena*. (Pf. III, 6, 168.)

Family 75. **Gonystylaceae.** East Indian trees with leathery, evergreen leaves, pentamerous flowers, and a berry-like fruit. *Gonystylus*. (Pf. Nach. 231.)

Family 76. **Tiliaceae.** Lindens. Trees, shrubs (and herbs) with mostly alternate leaves; flowers mostly perfect, with petals; stamens free, 2-celled; pistil 2- to 10-celled; endosperm present or o. *Corchorus*, *Tilia*, *Grewia*. (Pf. III, 6, 8.)

Family 77. **Elaeocarpaceae.** Tropical trees and shrubs, with alternate or opposite simple leaves; sepals and petals present; stamens distinct, many; pistil of 2-several carpels. *Elaeocarpus*, *Aristotelia*. (Pf. III, 6, 1.)

Family 78. **Balanopsidaceae.** Australian trees and shrubs with alternate leaves; flowers dioecious, apetalous, the staminate in catkins, the pistillate solitary, producing acorn-like, 2-celled, 2-seeded fruits; seeds endospermous. This family is doubtfully given place here, and it may be that it should be placed near the *Fagaceae*, as is done by Baillon. *Balanops*. (Pf. Nach. 114.)

Family 79. **Ulmaceae.** Elms. Trees and shrubs with alternate, simple leaves, small apetalous flowers, a 1-celled (rarely 2-celled) ovary, which develops into a samara, drupe or nut. *Ulmus*, *Celtis*, *Zelkova*, *Planera*. (Pf. III, 1, 59.)

Family 80. **Moraceae.** Figs. Trees, shrubs, and herbs, mostly with a milky juice, and alternate or opposite leaves; flowers apetalous, monoecious or dioecious; ovary 1-celled, 1-ovuled. *Morus*, *Toxylon*, (*Maclura*), *Broussonctia*, *Dorstenia*, *Artocarpus*, *Castilloa*, *Antiaris*, *Ficus*, *Humulus*, *Cannabis*. (Pf. III, 1, 66.)

Family 81. **Urticaceae.** Nettles. Herbs, shrubs, and trees with alternate or opposite leaves; flowers mostly diclinous, without petals; stamens few, 2-celled; pistil monocarpellary, 1-celled, mostly 1-seeded; endosperm none. *Urtica*, *Boehmeria*. (Pf. III, 1, 98.)

Order SARRACENIALES. Pistil of 3 to 5 carpels united; placentae parietal or central; seeds indefinite; herbs with "insectivorous" leaves; related to the Mallows.

Family 82. **Sarraceniaceae**. Pitcher Plants. Herbs with pitcher-shaped leaves; sepals 4-5; petals 5-0; stamens indefinite; pistil 3-5-carpellary. *Sarracenia, Darlingtonia*. (Pf. III, 2, 244.)

Family 83. **Nepenthaceae**. Pitcher Plants. Tropical undershrubs with pitcher-shaped leaves; sepals 4 or 3; petals 0; stamens 4-16; pistil 4- to 3-carpellary. *Nepenthes*. (Pf. III, 2, 253.)

Order GERANIALES. Receptacle usually with an annular or glandular disk; pistil of several carpels; ovules 1 to 2 (or many), mostly pendulous.

Family 84. **Geraniaceae**. Geraniums. Herbs, shrubs, and trees, with opposite or alternate (compound or simple) leaves; torus elongated; pistil lobed, 3- to 5-celled; endosperm sparse or 0. *Geranium, Pelargonium, Erodium*. (Pf. III, 4, 1.)

Family 85. **Oxalidaceae**. Sorrels. Herbs, rarely shrubs, the juice sour; leaves mostly 3-foliolate; flowers pentamerous. *Oxalis*. (Pf. III, 4, 15.)

Family 86. **Tropaeolaceae**. Nasturtiums. Succulent, prostrate or climbing herbs, with alternate, peltate leaves, and irregular long-peduncled, spurred flowers; stamens 8; ovary tricarpellary. *Tropaeolum*. (Pf. III, 4, 23.)

Family 87. **Balsaminaceae**. Touch-me-nots. Succulent herbs, mostly erect, with alternate leaves, and irregular, spurred axillary flowers; stamens 5; ovary pentacarpellary. *Impatiens*. (Pf. III, 5, 383.)

Family 88. **Limnanthaceae**. Succulent marsh herbs, with alternate, pinnate leaves; flowers pentamerous; stamens 10; carpels 5. *Limnanthes*. (Pf. III, 5, 136.)

Family 89. **Linaceae**. Flaxes. Herbs and shrubs, with alternate simple leaves; pistil 3- to 5-celled; endosperm fleshy or 0. *Linum*. (Pf. III, 4, 27.)

Family 90. **Humiriaceae.** Trees with alternate simple leaves; pistil 5- to 7-celled; endosperm copious. *Humiria*, *Saccoglottis*. (Pf. III, 4, 35.)

Family 91. **Erythroxyloaceae.** Shrubs and trees, with mostly alternate, simple leaves; flowers pentamerous; stamens 10; ovary 2- to 3-carpellary. *Erythroxyton*. (Pf. III, 4, 37.)

Family 92. **Zygophyllaceae.** Herbs and shrubs with usually opposite, compound leaves; pistil lobed, 4- to 5-celled; endosperm copious or 0. *Zygophyllum*, *Guaiacum*, *Larrea*. (Pf. III, 4, 74.)

Family 93. **Cneoraceae.** Shrubs with alternate entire leaves, trimerous or tetramerous flowers; pistil 3- or 4-celled, each cell with one ovule. *Cneorum*. (Pf. III, 4, 93.)

Family 94. **Rutaceae.** Oranges. Herbs, shrubs, and trees with glandular-dotted, opposite, simple, or compound leaves; pistil lobed, 4- to 5-celled; endosperm fleshy or 0. *Xanthoxylum*, *Ruta*, *Dictamnus*, *Ptelea*, *Limonia*, *Citrus*. (Pf. III, 4, 95.)

Family 95. **Simarubaceae.** Trees and shrubs with generally alternate, non-glandular, simple, or compound leaves; pistil lobed, 1- to 5-celled; endosperm fleshy or 0. *Simaruba*, *Quassia*, *Holacantha*, *Ailanthus*. (Pf. III, 4, 202.)

Family 96. **Burseraceae.** Balsamic trees and shrubs with alternate compound leaves; pistil 2- to 5-celled; endosperm 0. *Protium*, *Canarium*, *Bursera*. (Pf. III, 4, 231.)

Family 97. **Meliaceae.** Trees and shrubs with alternate compound leaves; pistil 3- to 5-celled; endosperm present or 0. *Swietenia*, *Melia*. (Pf. III, 4, 258.)

Family 98. **Malpighiaceae.** Trees and shrubs with usually opposite, simple or lobed leaves; pistil tricarpeal; endosperm 0. *Stigmatophyllum*, *Malpighia*, *Byrsonima*. (Pf. III, 4, 41.)

Family 99. **Trigonaceae.** Trees and shrubs with opposite simple leaves and irregular flowers; pistil tricarpeal. *Trigonia*. (Pf. III, 4, 309.)

Family 100. **Vochysiaceae.** Shrubs and trees with opposite or

whorled leaves; sepals 5; petals 1, 3, or 5; stamens several, usually but one fertile. *Vochysia*, *Qualca*. (Pf. III, 4, 312.)

Family 101. **Polygalaceae**. Herbs, shrubs, and trees with alternate leaves; sepals 5; petals 3-5; stamens usually 8. *Polygala*, *Xanthophyllum*. (Pf. III, 4, 323.)

Family 102. **Tremandraceae**. Small shrubs with alternate, opposite, or whorled leaves; sepals and petals 3, 4, or 5 each; stamens twice as many. *Tremandra*, *Tetratheca*. (Pf. III, 4, 320.)

Family 103. **Dichapetalaceae**. Trees and shrubs with alternate simple leaves; pistil 2- to 3-celled; endosperm 0. *Dichapetalum*, *Tapura*. (Pf. III, 4, 345.)

Family 104. **Euphorbiaceae**. Spurges. Herbs, shrubs, and trees, mostly with a milky juice and alternate or opposite leaves; flowers diclinous, with a perianth of 1 or 2 whorls, or wanting; stamens 2-celled, free or united; pistil usually 3-celled; endosperm copious. *Euphorbia*, *Pedilanthus*, *Phyllanthus*, *Croton*, *Mallotus*, *Acalypha*, *Ricinus*, *Jatropha*, *Manihot*, *Stillingia*. (Sp. 4319.) (Pf. III, 5, 1.)

Family 105. **Callitrichaceae**. Floating herbs with opposite sessile leaves; flowers sessile in the leaf-axils; perianth none; stamens 1 or 2; ovary 2-celled. *Callitriche*. (Pf. III, 5, 120.)

Order GUTTIFERALES. Pistil mostly of 2 or more carpels, 2-celled, with axile placentae; stamens usually indefinite; endosperm usually wanting.

Family 106. **Theaceae**. Teas. Trees and shrubs usually with alternate leaves; inflorescence various; petals imbricated. *Thea*, *Stuartia*. (Pf. III, 6, 175.)

Family 107. **Cistaceae**. Herbs and shrubs with opposite (or alternate) leaves; sepals 3-5; petals 5; stamens many; pistil 3- to 5-carpellary. *Cistus*, *Helianthemum*, *Hudsonia*. (Pf. III, 6, 299.)

Family 108. **Guttiferaceae**. Trees, shrubs, and herbs, with opposite or whorled, glandular-dotted leaves; inflorescence often

trichotomous; petals imbricated or contorted. *Hypericum*, *Mammea*, *Clusia*, *Garcinia*. (Pf. III, 6, 194.)

Family 109. **Eucryphiaceae.** Evergreen trees of the southern hemisphere, with opposite leaves; flowers large, tetramerous; stamens many; pistil many-celled. *Eucryphia*. (Pf. III, 6, 129.)

Family 110. **Ochnaceae.** Shrubs and trees with alternate, coriaceous, simple leaves; pistil lobed, 1- to 10-celled; endosperm fleshy or o. *Ochna*. (Pf. III, 6, 131.)

Family 111. **Dipterocarpaceae.** Trees and shrubs with alternate leaves; inflorescence paniced; petals contorted; fruiting calyx enlarged, and wing-like. *Dipterocarpus*. (Pf. III, 6, 243.)

Family 112. **Caryocaraceae.** Tropical trees and shrubs, with alternate trifoliolate leaves, large showy flowers, and many long stamens. *Caryocar*. (Pf. III, 6, 153.)

Family 113. **Quinaceae.** South American trees and shrubs, with opposite or whorled simple leaves; sepals 4-5; petals 4-5; stamens 15-30. *Quina*. (Pf. III, 6, 165.)

Family 114. **Marcgraviaceae.** Tropical trees and shrubs, with alternate, simple leaves; sepals 2-6; petals as many; stamens as many or more; ovary 3-5-celled. *Marcgravia*. (Pf. III, 6, 157.)

Family 115. **Flacourtiaceae.** Trees and shrubs of the tropics, with alternate leaves; sepals 2-15; petals 10-0; stamens indefinite; carpels 2-10. *Pangium*, *Flacourtia*, *Samyda*. (Pf. III, 6a, 1.)

Family 116. **Bixaceae.** Shrubs with alternate leaves; sepals 3 to 7; petals large; stamens indefinite; pistil bicarpellary. *Bixa*. (Pf. III, 6, 307.)

Family 117. **Cochlospermaceae.** Trees and shrubs with alternate lobed or compound leaves; petals large; stamens indefinite; pistil 3- to 5-carpellary. *Cochlospermum*. (Pf. III, 6, 312, and Nach. 251.)

Family 118. **Violaceae.** Violets. Herbs and shrubs with alternate (or opposite) leaves; sepals and petals 5, irregular; stamens

5; pistil 3-carpellary with 3 parietal placentae. *Rinorea*, *Hybanthus*, *Viola*. (Pf. III, 6, 322.)

Family 119. **Malesherbiaceae**. South American branching herbs or undershrubs, with pentamerous flowers. *Malesherbia*. (Pf. III, 6a, 65.)

Family 120. **Turneraceae**. Herbs and shrubs with alternate leaves; flowers perfect; sepals and petals dissimilar; stamens definite; ovary free; endosperm copious. *Turnera*. (Pf. III, 6a, 57.)

Family 121. **Passifloraceae**. Passion Flowers. Climbing herbs and shrubs (a few trees) with alternate leaves; flowers perfect; sepals and petals similar, distinct; stamens definite; ovary free; endosperm fleshy. *Adcniia*, *Passiflora*. (Pf. III, 6a, 69.)

Family 122. **Achariaceae**. South African herbs and undershrubs, related to the *Passifloraceae*; but with the petals united. *Acharia*. (Pf. III, 6a, 92.)

Family 123. **Caricaceae**. Papaws. Succulent-stemmed tropical trees, mostly with palmate leaves; flowers pentamerous; fruit a many seeded berry. *Carica*. (Pf. III, 6a, 94.)

Family 124. **Stachyuraceae**. Asiatic shrubs and trees with alternate leaves; sepals 4; petals 4; stamens 8. *Stachyurus*. (Pf. III, 6, 192.)

Family 125. **Koerberliniaceae**. Leafless, thorny Texan and Mexican shrubs, with tetramerous flowers; pistil bicarpellary. *Koerberlinia*. (Pf. III, 6, 319.)

Order RHOEADALES. Pistil of 2 or more united carpels, mostly 1-celled, with parietal placentae; stamens indefinite or definite; endosperm none or copious.

Family 126. **Papaveraceae**. Poppies. Mostly milky-juiced plants, with alternate leaves; sepals 2-3; petals 4 or more (or 0); stamens indefinite; pistil many-carpellary. *Eschscholtzia*, *Sanguinaria*, *Argemone*, *Papaver*, *Bicuculla*, *Fumaria*. (Pf. III, 2, 130.)

Family 127. **Tovariaceae.** Annual herbs of the tropics, with alternate leaves; 8-merous flowers. *Tovaria*. (Pf. III, 2, 207.)

Family 128. **Nymphaeaceae.** Water Lilies. Petals present, in 1 to many whorls; pistils closely united; aquatic herbs with floating leaves. *Victoria*, *Castalia*, *Nymphaea*. (Pf. III, 2, 1.)

Family 129. **Moringaceae.** Trees of the tropics, with decom-
pound leaves and pentamerous flowers, and producing bean-like pods. *Moringa*. (Pf. III, 2, 242.)

Family 130. **Resedaceae.** Mignonettes. Herbs and shrubs with scattered leaves; sepals 4-8 (or 2 or 0); stamens 3-40; pistil 2- to 6-carpellary. *Reseda*. (Pf. III, 2, 237.)

Family 131. **Capparidaceae.** Capers. Herbs, shrubs, and trees with alternate or opposite leaves; sepals 4; petals 4 (or 0); stamens 4 (or many); pistil 2- to 6-carpellary. *Cleome*, *Cap-
paris*. (Pf. III, 2, 209.)

Family 132. **Brassicaceae.** Mustards. Herbs, rarely shrubs, with alternate (or opposite) leaves; sepals 4; petals 4; stamens 6 or 4; pistil 2-carpellary. *Sinapis*, *Brassica*, *Raphanus*, *Bursa*, *Alyssum*. (Pf. III, 2, 145.)

Order CARYOPHYLLALES. Pistil usually of 3 or more united carpels, mostly 1-celled, with a free central placenta, and many ovules (sometimes reduced to a one-celled, one-ovuled ovary); stamens as many or twice as many as the petals; seeds endospermous, usually with a curved embryo.

Family 133. **Caryophyllaceae.** Pinks. Herbs (and shrubs) with opposite leaves; petals 3-5, stalked or not; ovules many on a central placenta. *Silene*, *Lychnis*, *Dianthus*, *Alsine*, *Paronychia*, *Illecebrum*. (Pf. III, 1b, 61.)

Family 134. **Elatinaceae.** Small marsh herbs or undershrubs, with small, opposite or whorled leaves; inflorescence axillary; petals imbricated; stamens 4-10. *Elatine*. (Pf. III, 6, 277.)

Family 135. **Portulacaceae.** Purslanes. Herbs, or somewhat woody plants, usually somewhat succulent; sepals usually 2; petals 4-5; seeds many. *Claytonia*, *Portulaca*. (Pf. III, 1b, 51.)

Family 136. **Aizoaceae.** Herbaceous or shrubby plants with mostly opposite or verticillate leaves; calyx tetramerous or pentamerous; corolla often wanting; ovary 3- to 5-celled with numerous ovules in each cell. *Mollugo*, *Sesuvium*, *Mesembrianthemum*. (Pf. III, 1b, 33.)

Family 137. **Frankeniaceae.** Herbs and undershrubs with opposite leaves; petals 4-5, long-stalked; ovules many, on 2-4 parietal placentae. *Frankenia*. (Pf. III, 6, 283.)

Family 138. **Fouquieriaceae.** Shrubs with small thorn-like leaves, and paniced tubular flowers. *Fouquieria*. (Pf. III, 6, 298.)

Family 139. **Tamaricaceae.** Tamarixes. Shrubs and herbs with minute, alternate, deciduous leaves; petals 5; ovules many on central or parietal placentae. *Tamarix*. (Pf. III, 6, 289.)

Family 140. **Salicaceae.** Willows. Shrubs and trees with alternate leaves; perianth 0; ovules many on 2-4 parietal placentae. Here regarded as reduced, dioecious, apetalous, *Tamricaceae*. *Salix*, *Populus*. (Pf. III, 1, 29.)

Family 141. **Podostemonaceae.** Riverweeds. Small aquatic, sometimes thallose, plants; flowers perfect or diclinous; perianth 0; pistil 1- to 3-celled; ovules many; endosperm 0. *Podostemon*. (Pf. III, 2a, 1.)

Family 142. **Hydrostachydaceae.** Large tuber-forming Madagascar plants, with naked, dioecious flowers, and numerous ovules. *Hydrostachys*. (Pf. III, 2a, 22.)

Family 143. **Phytolaccaceae.** Pokeweeds. Herbs, shrubs, and trees with usually alternate leaves; petals 0 (or 4-5); carpels several, distinct or nearly so, 1-ovuled. *Phytolacca*. (Pf. III, 1b, 1.)

Family 144. **Basellaceae.** Herbaceous, or shrubby plants, with mostly alternate leaves; calyx pentamerous; corolla none; stamens 5; ovary 1-celled, with one ovule. *Basella*, *Boussingaultia*. (Pf. III, 1a, 124.)

Family 145. **Amaranthaceae.** Amaranths. Herbs, shrubs

(and trees) with opposite leaves; petals 0; ovules 1 or more, basal, campylotropous. *Celosia*, *Amaranthus*, *Froelichia*. (Pf. III, 1a, 91.)

Family 146. **Chenopodiaceae.** The Goosefoots. Herbs, shrubs (and trees) with mostly alternate leaves; petals 0; ovule 1, basal, campylotropous. *Beta*, *Chenopodium*, *Spinacia*, *Atriplex*, *Sarcobatus*, *Salsola*. (Pf. III, 1a, 36.)

Family 147. **Polygonaceae.** Buckwheats. Herbs, shrubs, and trees with alternate leaves; petals 0; ovule 1, erect, orthotropous. *Eriogonum*, *Rumex*, *Rheum*, *Polygonum*, *Fagopyrum*, *Coccoloba*. (Pf. III, 1a, 1.)

Family 148. **Nyctaginaceae.** Four o'clocks. Herbs and shrubs with opposite leaves; petals 0; sepals petaloid; ovule 1, erect. *Mirabilis*, *Bougainvillea*, *Allionia*. (Pf. III, 1b, 14.)

Family 149. **Cynocrambaceae.** Annual, succulent herbs, with petioled leaves, opposite below, alternate above; flowers monoecious, apetalous, small, axillary. *Cynocrambe*. (Pf. III, 1a, 121.)

Family 150. **Batidaceae.** Shrubs with opposite leaves; petals 0; ovary 4-celled; ovule solitary, erect. Very doubtfully placed here. *Batis*. (Pf. III, 1a, 118.)

Super-Order AXIFLORAE-GAMOPETALAE-POLYCARPELLATAE. Carpels typically many, united; petals united. Flowers actinomorphic.

Order PRIMULALES. Flowers regular, mostly perfect; stamens mostly opposite to the corolla-lobes; ovary pluricarpellary, mostly 1-celled, with a free central placenta.

Family 151. **Primulaceae.** Primroses. Herbs with alternate or opposite, sometimes clustered, leaves; stamens opposite the petals; ovules many; fruit a capsule dehiscing longitudinally from the apex, or circumscissilely. *Primula*, *Androsace*, *Lysimachia*, *Cyclamen*, *Dodecatheon*. (Pf. IV, 1, 98.)

Family 152. **Plantaginaceae.** Plantains. Herbs with alternate or clustered leaves; stamens alternate with the petals; ovary

mostly 2-celled; ovules many; placenta axile; fruit a capsule dehiscing circumscissilely. *Plantago*. (Pf. IV, 3b, 363.)

Family 153. **Plumbaginaceae**. Leadworts. Herbs with alternate or clustered leaves; stamens opposite the petals; ovule 1, basal, anatropous; fruit capsular; dehiscence valvate or irregular. *Plumbago*, *Armeria*. (Pf. IV, 1, 116.)

Family 154. **Theophrastaceae**. Tropical trees and shrubs closely related to the preceding family, and usually included in it. *Theophrasta*, *Jacquinia*. (Pf. IV, 1, 88.)

Family 155. **Myrsinaceae**. Trees and shrubs with alternate (or opposite) leaves; stamens opposite the petals; ovules usually few; fruit a drupe or berry. *Myrsine*, *Ardisia*. (Pf. IV, 1, 84.)

Order ERICALES. Flowers regular, perfect; stamens alternate with the corolla-lobes; cells of the ovary, or placentae 2 to many; seeds minute.

Family 156. **Clethraceae**. White Alders. Shrubs and trees of warm climates, with alternate deciduous leaves; stamens 10; pistil tricarpeillary. *Clethra*. (Pf. IV, 1, 1.)

Family 157. **Ericaceae**. Heaths. Shrubs and small trees with mostly evergreen leaves; ovary typically superior, 2- to 10-celled; anthers usually dehiscing by an apical pore. *Rhododendron*, *Kalmia*, *Gaultheria*, *Arctostaphylos*, *Gaylussacia*, *Vaccinium*, *Calluna*, *Erica*. (Pf. IV, 1, 15.)

Family 158. **Epacridaceae**. Shrubs and small trees with mostly alternate evergreen leaves; ovary superior, mostly 2- to 10-celled; fruit capsular or drupaceous; anthers dehiscing by a slit. *Epacris*. (Pf. IV, 1, 66.)

Family 159. **Diapensiaceae**. Low undershrubs, with alternate evergreen leaves; ovary superior, 3-celled; fruit a capsule; anthers dehiscing by a slit. *Diapensia*, *Shortia*. (Pf. IV, 1, 80.)

Family 160. **Pirolaceae**. Wintergreens. Low evergreen, or chlorophyllless herbs, with pentamerous or tetramerous (rarely hexamerous) flowers; stamens twice as many as the petals; ovary 4- to 6-celled. *Pirola*, *Chimaphila*, *Monotropa*. (Pf. IV, 1, 3.)

Family 161. **Lennoaceae.** Parasitic, leafless herbs; ovary superior, 10- to 14-carpellary, 20- to 28-celled; ovules solitary; anthers dehiscing by a slit. *Lennoa*. (Pf. IV, 1, 12.)

Order EBENALES. Flowers regular, perfect, or diclinous; stamens opposite to the corolla-lobes; ovary 2- to many-celled; seeds mostly solitary or few, usually large.

Family 162. **Sapotaceae.** Sapodillas. Tropical trees and shrubs with mostly alternate leaves; flowers mostly perfect; stamens attached to the corolla; ovary superior. *Achras*, *Sideroxylon*, *Chrysophyllum*, *Mimusops*. (Pf. IV, 1, 126.)

Family 163. **Ebenaceae.** Ebonys. Tropical and subtropical trees and shrubs, with very hard wood, and mostly alternate leaves; flowers mostly dioecious; stamens usually free from the corolla; ovary superior. *Diospyros*, *Maba*. (Pf. IV, 1, 153.)

Family 164. **Symplocaceae.** Tropical and subtropical trees and shrubs, with mostly perfect flowers; stamens many. *Symplocos*. (Pf. IV, 1, 165.)

Family 165. **Styracaceae.** *Styrax*s. Trees and shrubs with alternate leaves; flowers mostly perfect; stamens attached to the corolla; ovary usually inferior. *Halesia*, *Styrax*. (Pf. IV, 1, 172.)

Super-Order AXIFLORAE-GAMOPETALAE-DICARPELLATAE. Carpels typically two, united; petals united. Flowers from actinomorphic to zygomorphic.

Order POLEMONIALES. Corolla actinomorphic (regular); stamens alternate with the corolla-lobes, and of the same number; leaves mostly alternate.

Family 166. **Polemoniaceae.** Phloxes. Herbs (and shrubs) with alternate or opposite leaves; corolla-lobes contorted; ovary tricarpellary, 3-celled; ovules 2 or more. *Cobaea*, *Phlox*, *Gilia*, *Polemonium*. (Pf. IV, 3a, 40.)

Family 167. **Convolvulaceae.** Morning Glories. Herbs, shrubs (and trees) with alternate leaves; corolla-limb more or less plicate (rarely imbricated); ovary 2- (3- to 5-) celled; ovules

few. *Evolvulus*, *Quamoclit*, *Ipomoea*, *Convolvulus*, *Cuscuta* (parasitic). (Pf. IV, 3a, 1.)

Family 168. **Hydrophyllaceae.** Herbs with radical or alternate (rarely opposite) leaves; corolla-lobes imbricated (or contorted); ovary 1- or incompletely 2-celled; ovules 2 or more. *Hydrophyllum*, *Phacelia*, *Nama*. (Pf. IV, 3a, 54.)

Family 169. **Borraginaceae.** Forget-me-nots. Herbs, shrubs, and trees with alternate leaves; corolla-lobes imbricated (or contorted); ovary bicarpellary, 4-celled, 4-lobed; ovules solitary. *Heliotropium*, *Cynoglossum*, *Oreocarya*, *Borrago*, *Myosotis*, *Mertensia*, *Lithospermum*. (Pf. IV, 3a, 71.)

Family 170. **Nolanaceae.** Herbaceous or suffrutescent prostrate plants, with alternate, entire leaves; calyx 5-parted; corolla long funnel-shaped; stamens 5, inserted on the corolla; pistils 5 or united. *Nolana*. (Pf. IV, 3b, 1.)

Family 171. **Solanaceae.** Nightshades. Herbs, shrubs (and trees) with alternate leaves; corolla-limb more or less plicate (rarely imbricated); ovary mostly 2-celled; ovules many. *Lycium*, *Atropa*, *Hyoscyamus*, *Physalis*, *Capsicum*, *Solanum*, *Datura*, *Nicotiana*, *Petunia*. (Pf. IV, 3b, 4.)

Order GENTIANALES. Corolla actinomorphic (regular); stamens alternate with the corolla-lobes, and usually of the same number; leaves opposite (rarely alternate).

Family 172. **Oleaceae.** Olives. Shrubs and trees (rarely herbs) with mostly opposite leaves; corolla-lobes valvate or 0; stamens 2 (or 4); ovary 2-celled; ovules 1 to 3. *Syringa*, *Olea*, *Jasminum*, *Fraxinus*. (Pf. IV, 2, 1.)

Family 173. **Salvadoraceae.** Shrubs and trees with opposite undivided leaves; corolla-lobes imbricated; stamens 4; ovary 2-celled; ovules 2. *Salvadora*. (Pf. IV, 2, 17.)

Family 174. **Loganiaceae.** Herbs, shrubs, and trees with mostly opposite simple leaves; corolla-lobes imbricated or contorted; stamens 4 to 5 (or indefinite); ovary 2- to 4-celled; ovules 1 to many. *Gelsemium*, *Logania*, *Spigelia*, *Strychnos*. (Pf. IV, 2, 19.)

Family 175. **Gentianaceae.** Gentians. Mostly herbs with usually opposite undivided leaves; corolla-lobes contorted, valvate, or induplicate; stamens 4 to 5 (or indefinite); ovary usually 1-celled; ovules many. *Erythraea*, *Gentiana*, *Eustoma*, *Menyanthes*. (Pf. IV, 2, 50.)

Family 176. **Apocynaceae.** Dogbanes. Milky-juiced trees, shrubs, and herbs, with opposite, simple leaves; corolla-lobes contorted or valvate; stamens 5, with granular pollen; ovary 2-celled or the carpels separating; ovules many. *Vinca*, *Apocynum*, *Nerium*. (Pf. IV, 2, 109.)

Family 177. **Asclepiadaceae.** Milkweeds. Milky-juiced herbs and shrubs, with opposite (or alternate) leaves; corolla-lobes contorted; stamens 5, with agglutinated pollen; ovary of two separated carpels; ovules many. *Asclepias*, *Enslenia*, *Crotopogon*, *Stapelia*, *Hoya*. (Pf. IV, 2, 189.)

Order SCROPHULARIALES. Corolla mostly zygomorphic (irregular or oblique); stamens fewer than the corolla-lobes, usually 4 or 2; ovules numerous; fruit mostly capsular.

Family 178. **Scrophulariaceae.** Snapdragons. Herbs (or shrubs and small trees) with alternate, opposite, or whorled leaves; ovary 2-celled with an axile placenta; seeds with endosperm. *Verbascum*, *Linaria*, *Antirrhinum*, *Maurandia*, *Collinsia*, *Scrophularia*, *Mimulus*, *Veronica*, *Digitalis*, *Gerardia*, *Castilleja*, *Pedicularis*. (Pf. IV, 3b, 39.)

Family 179. **Bignoniaceae.** Catalpas. Trees, shrubs (and herbs) with opposite or whorled leaves; ovary 1- or 2-celled with parietal or axile placentae; seeds numerous without endosperm. *Bignonia*, *Catalpa*, *Tecoma*. (Pf. IV, 3b, 189.)

Family 180. **Pedaliaceae.** Herbs with mostly opposite leaves; ovary 1-, 2-, or 4-celled with axile placentae; seeds 1 to many, with but little endosperm. *Pedaliium*, *Sesamum*. (Pf. IV, 3b, 253.)

Family 181. **Martyniaceae.** Herbs with mostly opposite leaves, and perfect, irregular flowers; ovary with parietal placentae. *Martynia*. (Pf. IV, 3b, 265.)

Family 182. **Orobanchaceae.** Broom-rapes. Leafless parasitic herbs; ovary 1-celled; placentae parietal; ovules minute, numerous. *Orobanche*, *Thalesia*, *Conopholis*. (Pf. IV, 3b, 123.)

Family 183. **Gesneraceae.** Tropical and subtropical herbs, shrubs (and trees) with usually opposite leaves; ovary 1-celled, with 2 parietal placentae; seeds numerous; endosperm scanty or 0. *Streptocarpus*, *Gesnera*, *Gloxinia*. (Pf. IV, 3b, 133.)

Family 184. **Columelliaceae.** South America trees and shrubs with opposite, evergreen leaves; ovary 2-celled, with an axile placenta. *Columellia*. (Pf. IV, 3b, 186.)

Family 185. **Lentibulariaceae.** Bladderworts. Aquatic or marsh herbs with radical or alternate leaves; ovary 1-celled, with a globose basilar placenta. *Pinguicula*, *Utricularia*. (Pf. IV, 3b, 108.)

Family 186. **Globulariaceae.** Shrubs and undershrubs or evergreen herbs, with alternate leaves, and a terminal capitate cluster of small flowers; ovary 1-celled, with a single ovule. *Globularia*. (Pf. IV, 3b, 270.)

Family 187. **Acanthaceae.** Herbs (shrubs and trees) with opposite leaves; ovary 2-celled; placentae axile; seeds 2 to many without endosperm. *Thunbergia*, *Ruellia*, *Acanthus*, *Justicia*. (Pf. IV, 3b, 274.)

Order LAMIALES. Corolla mostly zygomorphic (irregular or oblique); stamens fewer than the corolla-lobes, usually 4 or 2; ovules mostly solitary; fruit indehiscent.

Family 188. **Myoporaceae.** Shrubs and trees, with usually alternate leaves; flowers axillary. *Myoporum*. (Pf. IV, 3b, 354.)

Family 189. **Phrymaceae.** Erect, perennial herbs, with opposite leaves, and small spicate flowers; calyx and corolla cylindrical, 2-lipped; stamens 4; ovary 1-celled, 1-ovuled. *Phryma*. (Pf. IV, 3b, 361.)

Family 190. **Verbenaceae.** Verbenas. Herbs, shrubs, and trees, with usually opposite leaves; stigma usually undivided. *Verbena*, *Lantana*, *Lippia*, *Tectona*, *Vitex*. (Pf. IV, 3a, 132.)

Family 191. **Lamiaceae.** Mints. Mostly aromatic herbs, shrubs (and trees) with opposite or whorled leaves; stigma usually bifid. *Lavendula*, *Nepeta*, *Stachys*, *Salvia*, *Thymus*, *Mentha*, *Coleus*. (Pf. IV, 3a, 183.)

Sub-Class DICOTYLEDONEAE-CALYCIFLORAE. "Cup Flowers." Axis of the flower normally expanded into a disk or cup, bearing on its margin the perianth and stamens (or the latter may be attached to the corolla.)

Super-Order CALYCIFLORAE-APOPETALAE. Petals separate. Carpels many to few, separate to united, superior to inferior. This super-order originates near the beginning of the Axiflorae, and indeed the orders Ranales and Rosales are unquestionably closely related.

Order ROSALES. Flowers usually perfect, actinomorphic to zygomorphic (regular to irregular); carpels separate or more or less united, sometimes united with the axis-cup; styles usually distinct.

Family 192. **Rosaceae.** Roses. Herbs, shrubs, and trees with mostly alternate leaves; stamens usually indefinite; carpels 1 to many, free (but they may be enclosed in the deep cup); ovules usually 2, anatropous. *Potentilla*, *Fragaria*, *Spiraea*, *Rosa*. (Sp. about 2700.) (Pf. III, 3, 1.)

Family 193. **Malaceae.** Apples. Shrubs and trees with alternate leaves; stamens usually many; carpels few. More or less united, and adnate to the axis-cup, so as to be "inferior." *Sorbus*, *Pirus*, *Malus*, *Crataegus*. (Pf. III, 3, 1 and 18.)

Family 194. **Prunaceae.** Plums. Shrubs and trees with alternate leaves; stamens many, on the cup margin; carpel one, in the bottom of the deep cup, becoming a drupe. *Prunus*, *Amygdalus*. (Sp. 150.) (Pf. III, 3, 1 and 50.)

Family 195. **Crossosomataceae.** Southwest North American shrubs, with small leaves and a bitter bark; sepals and petals 5 each; stamens 20 or more; carpels 3-5. *Crossosoma*. (Pf. Nach. 185.)

Family 196. **Connaraceae.** Trees and shrubs with alternate compound leaves; stamens definite; pistils 1 to 5, free; ovules 2, ascending, orthotropous. *Connarus, Cnestis.* (Pf. III, 3, 61.)

Family 197. **Mimosaceae.** The Mimosas. Trees, shrubs, and herbs, with alternate mostly compound leaves; flowers actinomorphic; stamens 10 or more, usually separate; fruit a legume; seeds without endosperm. *Acacia, Mimosa.* (Sp. 1483.) (Pf. III, 3, 70 and 99.)

Family 198. **Cassiaceae.** The Sennas. Trees, shrubs, and herbs, with alternate mostly compound leaves; flowers zygomorphic; stamens 10 or less, usually separate; fruit a legume; seeds with or without endosperm. *Cassia, Caesalpinia, Gleditsia, Gymnocladus.* (Sp. 1172.) (Pf. III, 3, 70 and 125.)

Family 199. **Fabaceae.** The Beans. Mostly herbs, but with many shrubs and trees, with alternate, mostly compound leaves; flowers zygomorphic; stamens 10 or less usually more or less united; fruit a legume; seeds usually without endosperm. *Lupinus, Medicago, Trifolium, Robinia, Astragalus, Arachis, Vicia, Pisum, Phaseolus.* (Sp. 6948.) (Pf. III, 3, 70 and 184.)

Family 200. **Saxifragaceae.** Saxifrages. Herbs with alternate or opposite leaves, regular 4- or 5-merous flowers, with 8 or 10 stamens, and usually 2 more or less united carpels which are superior. *Saxifraga, Heuchera, Mitella.* (Pf. III, 2a, 41.)

Family 201. **Hydrangeaceae.** Hydrangeas. Shrubs and trees with mostly opposite leaves, and regular 4- or 5-merous flowers, with few (8) to many (40) stamens, and 2 to 5 united carpels, which are more or less overgrown by the axis-cup. *Philadelphus, Hydrangea.* (Pf. III, 2a, 41.)

Family 202. **Grossulariaceae.** Gooseberries. Shrubs with alternate leaves, regular 4- or 5-merous flowers, usually 5 stamens, and 2 to several united carpels which are wholly overgrown by the fleshy cup (ovary inferior). *Ribes.* (Pf. III, 2a, 41.)

Family 203. **Crassulaceae.** Stonecrops. Mostly fleshy herbs, with opposite or alternate leaves; stamens definite; pistils several,

free or little united, ovules indefinite. *Sedum*, *Cotyledon*, *Crasula*, *Penthorum*. (Pf. III, 2a, 23.)

Family 204. **Droseraceae**. Sundews. Gland-bearing marsh herbs; stamens mostly definite; pistil syncarpous, 1- to 3-celled, superior; ovules many, on basal, axile, or parietal placentae. *Drosera*, *Dionaea*. (Pf. III, 2, 261.)

Family 205. **Cephalotaceae**. Pitcher Plants. Perennial Australian herbs with a whorl of pipe-shaped radical leaves, and an erect, spicate flowering stem. *Cephalotus*. (Pf. III, 2a, 39.)

Family 206. **Pittosporaceae**. Trees and shrubs of the southern hemisphere, with alternate leaves; sepals, petals, and stamens 5 each. *Pittosporum*, *Marianthus*. (Pf. III, 2a, 106.)

Family 207. **Brunelliaceae**. South American trees, with opposite or whorled leaves; sepals and petals 4 to 5 or 7 each; stamens twice as many; carpels usually 4 to 5, free. *Brunellia*. (Pf. Nach. 182.)

Family 208. **Cunoniaceae**. Shrubs and trees, mostly of the southern hemisphere, with opposite or whorled leaves; sepals and petals 4 to 6 each; stamens twice as many; carpels 2 to 5, united. *Belangeria*, *Cunonia*. (Pf. III, 2a, 94.)

Family 209. **Myrothamnaceae**. Small, rigid, balsamic South African and Madagascar shrubs, with opposite leaves, and dioecious, achlamydeous flowers. *Myrothamnus*. (Pf. III, 2a, 103.)

Family 210. **Bruniaceae**. Heath-like shrubs of the southern hemisphere, with small leaves; stamens definite; pistil mostly 3-celled, inferior or superior; ovules 1 to many, pendulous. *Brunia*. (Pf. III, 2a, 131.)

Family 211. **Hamamelidaceae**. Witch Hazels. Shrubs and trees with mostly alternate leaves; stamens few or many; pistil bicarpellary, its ovary inferior; ovules solitary or many. *Liquidambar*, *Altingia*, *Hamamelis*. (Pf. III, 2a, 115.)

Family 212. **Casuarinaceae**. Beefwood Trees. Shrubs and trees with striate stems bearing whorls of reduced scale-like leaves; disk 0; petals 0; pistil 1-celled; ovules 2, lateral, half ana-

tropous; endosperm 0. *Casuarina*. (Pf. III, 1, 16.) This family which has puzzled botanists from the first is doubtfully placed here, on the theory that these plants are leafless relatives of the *Hamamelidaceae*.

Family 213. **Eucommiaceae**. Chinese trees, with alternate leaves, and achlamydeous flowers; stamens 6–10; pistil one-celled, two-seeded. *Eucommia*. (Pf. Nach. 159.)

Family 214. **Platanaceae**. Plane Trees. Trees with alternate leaves, and monoecious flowers in globular heads; perianth 0; pistils 1-celled, 1-ovuled; endosperm minute. *Platanus*. (Pf. III, 2a, 137.)

Order MYRTALES. Flowers actinomorphic (regular) or nearly so, usually perfect; pistil of united carpels, usually inferior; placentae axile or apical (rarely basal); style 1 (rarely several); leaves simple, usually entire.

Family 215. **Lythraceae**. Herbs, shrubs, and trees usually with opposite leaves and 4-angled branches; stamens definite or indefinite; pistil 2- to 6-celled, free; ovules numerous, on axile placentae. *Lythrum*, *Cuphea*, *Lagerstroemia*. (Pf. III, 7, 1.)

Family 216. **Sonneratiaceae**. Tropical trees with opposite leaves; ovary sunken in the calyx-cup, many celled; stamens many. *Sonneratia*. (Pf. III, 7, 16.)

Family 217. **Punicaceae**. Pomegranates. Small tropical and subtropical trees with opposite leaves; ovary inferior, 4- to 15-celled, producing a pulpy, many-seeded fruit. *Punica*. (Pf. III, 7, 22.)

Family 218. **Lecythidaceae**. Tropical trees, with alternate opposite or whorled leaves; ovary inferior, 2–6-celled; stamens very many. *Barringtonia*, *Napoleona*, *Lecythis*, *Bertholletia*. (Pf. III, 7, 26.)

Family 219. **Melastomaceae**. Mostly tropical herbs, shrubs, and trees with generally opposite leaves; stamens usually double the number of petals; pistil 2- to many-celled, free or adherent to the calyx-tube; ovules minute, numerous, on axile or parietal

placentae. *Melastoma*, *Osbeckia*, *Rhexia*, *Tamonea*. (Pf. III, 7, 130.)

Family 220. **Myrtaceae**. Myrtles. Trees and shrubs with opposite or alternate leaves; stamens indefinite; pistil 2- to many-celled, inferior; ovules 2 to many; placentae basal or axile. *Myrtus*, *Pimenta*, *Eugenia*, *Jambosa*, *Eucalyptus*, *Malaleuca*. (Sp. 2556.) (Pf. III, 7, 57.)

Family 221. **Combretaceae**. Trees and shrubs with opposite or alternate leaves; stamens usually definite; pistil 1-celled, inferior; ovules 2 to 6 or solitary, pendulous. *Terminalia*, *Combretum*, *Laguncularia*. (Pf. III, 7, 106.)

Family 222. **Rhizophoraceae**. Mangroves. Trees and shrubs with mostly opposite leaves; stamens 2 to 4 times the number of petals; pistil 2- to 6-celled, usually inferior; ovules 2, pendulous. *Rhizophora*, *Carallia*. (Pf. III, 7, 42.)

Family 223. **Oenotheraceae**. Evening Primroses. Herbs (shrubs and trees) with opposite or alternate leaves; stamens 1 to 8, rarely more; pistil usually 4-celled, inferior; ovules 1 to many on axile placentae. *Epilobium*, *Onagra*, *Oenothera*, *Meriolix*, *Gaura*, *Fuchsia*, *Circaea*. (Pf. III, 7, 199.)

Family 224. **Halorrhagidaceae**. Aquatic or terrestrial herbs with mostly alternate leaves; pistil 1- to 4-celled, inferior; ovules solitary, pendulous. *Halorrhagis*, *Myriophyllum*. (Pf. III, 7, 226.)

Family 225. **Hippuridaceae**. Aquatic perennial erect herbs, with whorled leaves, and small, reduced, axillary apetalous flowers. *Hippuris*. (Pf. III, 7, 237.)

Family 226. **Cynomoriaceae**. Parasitic rhizomatous fleshy plants with spicate, small, apetalous flowers. *Cynomorium*. (Pf. III, 1, 250.)

Family 227. **Aristolochiaceae**. Dutchman's Pipes. Herbaceous or shrubby plants, with alternate leaves; petals absent; stamens 6, rarely more; pistil 4- or 6-celled, inferior; ovules numerous, on axile (or protruding parietal) placentae. *Asarum*, *Aristolochia*. (Pf. III, 1, 264.)

Family 228. **Rafflesiaceae.** Fleshy, parasitic herbs, leafless or nearly so; petals 4 or 0; stamens 8 to many; pistil 1-celled or imperfectly many-celled, inferior; ovules minute, very numerous, on parietal or pendulous, folded placentae. *Rafflesia*, *Cytinus*. (Pf. III, 1, 274.)

Family 229. **Hydnoraceae.** Parasitic, succulent, tropical herbs; perianth single, valvate; stamens numerous; seeds very numerous. *Hydnora*. (Pf. III, 1, 282.)

Order CACTALES. Flowers actinomorphic (regular) or nearly so, perfect; pistil syncarpous, 1-celled, with parietal placentae, its ovary inferior; style divided at the apex; endosperm present or 0; embryo curved; fleshy-stemmed, mostly leafless, plants.

Family 230. **Cactaceae.** Cactuses. With the characters of the order. *Peireskia*, *Opuntia*, *Cercus*, *Melocactus*, *Cactus*, *Rhipsalis*. (Pf. III, 6a, 156.)

Order LOASALES. Flowers usually actinomorphic (regular), perfect or dichlinous; pistil syncarpous, 1-celled, its ovary usually inferior; placentae parietal; styles free or connate; leaves ample, entire, lobed or dissected.

Family 231. **Loasaceae.** Star Flowers. Herbs with opposite or alternate leaves; flowers perfect; sepals and petals dissimilar; stamens indefinite; ovary inferior; endosperm fleshy or 0. *Mentzelia*, *Loasa*. (Pf. III, 6a, 100.)

Family 232. **Cucurbitaceae.** Melons. Mostly climbing or prostrate herbs and undershrubs, with alternate leaves; flowers dichlinous; stamens definite (usually 3); ovary inferior; endosperm 0. *Melothria*, *Momordica*, *Luffa*, *Citrullus*, *Cucumis*, *Lagenaria*, *Cucurbita*. (Pf. IV, 5, 1.)

Family 233. **Begoniaceae.** Begonias. Mostly herbs with alternate leaves; flowers dichlinous; stamens indefinite; ovary inferior, usually 3-angular; endosperm little or 0. *Begonia*. (Pf. III, 6a, 121.)

Family 234. **Datisceae.** Herbs or trees, with alternate leaves; flowers mostly dichlinous; stamens 4 to many; ovary in-

ferior, usually gaping at the top; endosperm scanty. *Datisca*. (Pf. III, 6a, 150.)

Family 235. **Ancistrocladaceae**. Climbing plants of tropical Asia, with 5 petals, 5-10 stamens and a 1-celled, many-seeded inferior ovary. *Ancistrocladus*. (Pf. III, 6, 274.)

Order CELASTRALES. Receptacle developing a glandular, annular or turgid disk, which is sometimes adnate to the calyx-tube or the pistil (sometimes the disk is rudimentary or wanting); pistil 1- to many-celled (rarely apocarpous); ovules 1 to 3, pendulous or erect; endosperm present or 0. Flowers actinomorphic.

Family 236. **Rhamnaceae**. Buckthorns. Trees and shrubs, with usually alternate, simple leaves; disk adnate to the calyx; petals present; pistil 2- to 4-celled; ovules 1 or 2, erect; endosperm fleshy. *Zizyphus*, *Rhamnus*, *Ceanothus*, *Phylica*, *Colletia*. (Pf. III, 5, 393.)

Family 237. **Vitaceae**. Grapes. Climbing shrubs and trees, with alternate, simple or compound leaves; disk adnate to the calyx; petals coherent, valvate; pistil 2-celled, 2-ovuled (or 3-6-celled, 1-ovuled); endosperm often ruminant. *Vitis*, *Parthenocissus*, *Cissus*. (Pf. III, 5, 427.)

Family 238. **Celastraceae**. Bittersweets. Shrubs and trees, with usually alternate, simple leaves; disk fleshy; petals present; pistil 2- to 5-celled; ovules usually 2, erect or pendulous; endosperm fleshy. *Euonymus*, *Celastrus*, *Cassine*. (Pf. III, 5, 189.)

Family 239. **Buxaceae**. Boxes. Evergreen shrubs and trees, with alternate or opposite leaves, and usually monoecious, small, apetalous flowers; stamens 4; pistil tricarpeled. *Pachysandra*, *Buxus*. (Pf. III, 5, 130.)

Family 240. **Aquifoliaceae**. Hollies. Trees and shrubs, with alternate or opposite, simple leaves; disk obsolete; pistil 3- to many-celled; ovule 1, pendulous; endosperm fleshy. *Ilex*, *Nemopanthes*. (Pf. III, 5, 183.)

Family 241. **Cyrillaceae**. Evergreen shrubs or small trees, with alternate leaves; sepals 5; petals 5; stamens 10; carpels 2-5, united superior. *Cyrilla*. (Pf. III, 5, 179.)

Family 242. **Pentaphylaceae.** Chinese trees, with alternate, leathery leaves; sepals 5; petals 5; stamens 5; pistil superior, of 5 carpels. *Pentaphylax*. (Pf. Nach. 214.)

Family 243. **Corynocarpaceae.** New Zealand trees, with alternate, fleshy, leathery leaves; sepals 3-5; petals 3-6; stamens 5; pistil superior, of 1 or 2 carpels. *Corynocarpus*. (Pf. Nach. 215.)

Family 244. **Hippocrateaceae.** Tropical trailing and climbing woody plants; sepals 5; petals 5; stamens 3 or 2 or 5; pistil of 3 carpels, sessile on the disk. *Hippocratea*, *Salacia*. (Pf. III, 5, 222.)

Family 245. **Stackhousiaceae.** Australian herbs with simple alternate leaves; disk thin, on the base of the calyx; petals present; ovary 2- to 5-celled; ovule 1, erect; endosperm fleshy. *Stackhousia*. (Pf. III, 5, 231.)

Family 246. **Staphyleaceae.** Bladder-nuts. Shrubs and trees, with opposite, compound leaves; sepals 5; petals 5; stamens 5; pistil of 3 carpels, sessile on the disk. *Staphylea*, *Turpinia*. (Pf. III, 5, 258.)

Family 247. **Geissolomataceae.** South African evergreen shrubs, with closely crowded, sessile leaves; sepals 4; petals none; stamens 8; pistil superior, of 4 carpels. *Geissoloma*. (Pf. III, 6a, 205.)

Family 248. **Penaeeae.** South African evergreen heath-like shrubs, with small, opposite leaves; disk 0; petals 0; pistil 4-celled; ovules 2, erect; endosperm 0. *Penaea*. (Pf. III, 6a, 208.)

Family 249. **Oliniaceae.** African shrubs and trees, with thick, leathery, opposite leaves; sepals 4-5, large; petals 4-5, very small; stamens 4-5; pistil inferior of 3-5 carpels. *Olinia*. (Pf. III, 6a, 213.)

Family 250. **Thymelaeaceae.** Shrubs, small trees (and herbs), with scattered or opposite, usually coriaceous, simple leaves; disk 0; petals 0; pistil 1-celled; ovule 1, pendulous; endosperm fleshy, copious, sparse, or 0. *Gnidia*, *Thymelaea*, *Daphne*, *Dirca*. (Pf. III, 6a, 215.)

Family 251. **Hernandiaceae.** Tropical trees and shrubs, with alternate leaves; flowers monoecious; sepals 4-10; petals none; stamens 3; pistil 1-celled, included in the calyx-tube. *Hernandia*. (Pf. III, 2, 126.)

Family 252. **Elaeagnaceae.** Oleasters. White- or brown-scurfy trees and shrubs, with alternate or opposite, simple leaves; disk lining the perianth-tube; petals 0; pistil 1-celled; ovule 1, ascending; endosperm 0 or scanty. *Elaeagnus*, *Lepargyrea*. (Pf. III, 6a, 246.)

Family 253. **Myzodendraceae.** South American parasitic shrubs, with alternate, rather small leaves; flowers dioecious, apetalous; stamens 2-3; pistil 1-celled. *Myzodendron*. (Pf. III, 1, 198.)

Family 254. **Santalaceae.** Sandalwoods. Parasitic herbs, shrubs, and trees, with alternate or opposite, simple leaves; disk epigynous; petals 0; pistil 1-celled; ovules 2 to 5, pendulous; endosperm present. *Santalum*, *Comandra*, *Thesium*. (Pf. III, 1, 202.)

Family 255. **Opiliaceae.** Small trees and shrubs of tropical climates, with alternate leaves, and perfect flowers; sepals, petals and stamens 4-5 each; pistil superior. *Opilia*. (Pf. Nach. 142.)

Family 256. **Grubbiaceae.** South African shrubs with opposite or whorled leaves, and epigynous, apetalous flowers. *Grubbia*. (Pf. III, 1, 282.)

Family 257. **Olacaceae.** Trees and shrubs, mostly tropical, with usually alternate, simple leaves; disk free or adnate to the calyx; petals present; pistil 1- to 3-celled; ovules 2 to 3, pendulous; endosperm fleshy. *Ola.v.* (Pf. III, 1, 231.)

Family 258. **Loranthaceae.** Mistletoes. Parasitic herbs or shrubs, with opposite or alternate leaves, often reduced to bracts; disk epigynous; petals 0; pistil 1-celled, inferior; ovules 1, erect; endosperm present. *Loranthus*, *Viscum*, *Phoradendron*, *Razoumowskia*. (Pf. III, 1, 156.)

Family 259. **Balanophoraceae.** Parasitic, leafless herbs, all

tropical, monoecious or dioecious; disk 0; petals 0; pistil 1-celled, inferior; ovule 1, erect; endosperm present. *Balanophora*. (Pf. III, 1, 243.)

Order SAPINDALES. Flowers mostly actinomorphic; disk tumid, adnate to the calyx, lining its tube or rudimentary, or entirely wanting; pistil 1- to several-celled; ovules 1 to 2, erect, ascending, or pendulous; endosperm mostly 0.

Family 260. **Sapindaceae**. Soapberries. Trees and shrubs, mostly tropical, with alternate (or opposite), mostly compound leaves; disk present or 0; petals 3 to 5 or 0; pistil 1- to 4-celled; ovules 1 or 2, ascending; endosperm usually 0. *Paullinia*, *Sapindus*, *Talisia*, *Litchi*, *Koelreuteria*, *Dodonaea*. (Pf. III, 5, 277.)

Family 261. **Hippocastanaceae**. Horsechestnuts. Trees and shrubs, with opposite, palmately compound leaves; flowers irregular; sepals 5; petals 5; stamens 8-5; pistil superior, tricarpeillary. *Aesculus*. (Pf. III, 5, 273.)

Family 262. **Aceraceae**. Maples. Trees and shrubs, with opposite, simple or compound leaves; sepals mostly 5; petals 5 or none; pistil superior, bicarpeillary, winged in fruit. *Acer*. (Pf. III, 5, 258.)

Family 263. **Sabiaceae**. Trees and shrubs of the tropics, with alternate, simple or compound leaves; disk small; petals present; pistil 2- to 3-celled; ovules 1 or 2, horizontal or pendulous; endosperm 0. *Sabia*, *Meliosma*. (Pf. III, 5, 367.)

Family 264. **Icacinaceae**. Tropical trees and shrubs, with alternate or opposite leaves; sepals 5-4; petals 5-4; stamens 5-4; pistil superior, of 5 or 3 carpels. *Icacina*. (Pf. III, 5, 233.)

Family 265. **Meliantaceae**. Tropical trees and shrubs, with alternate leaves, and pentamerous, zygomorphic flowers. *Melanthus*. (Pf. III, 5, 374.)

Family 266. **Empetraceae**. Heath-like shrubs, with small leaves; flowers small, mostly dioecious, solitary or in heads; petals present; stamens 2-3, 2- to 3-celled; pistil 2- to many-celled; seeds solitary, endospermous. *Corema*, *Empetrum*. (Pf. III, 5, 123.)

Family 267. **Coriariaceae.** Shrubs with opposite, sessile leaves; 5 sepals; 5 petals; 10 stamens; 5 to 10 carpels, slightly united. *Coriaria*. (Pf. III, 5, 128.)

Family 268. **Anacardiaceae.** Sumachs. Trees and shrubs, mostly tropical, with alternate, usually compound leaves; disk usually annular; petals 3 to 7 or 0; pistil 1- to 5-celled; ovules solitary, pendulous (or erect); endosperm scanty or 0. *Mangifera*, *Anacardium*, *Schinus*, *Cotinus*, *Mctopium*, *Rhus*. (Pf. III, 5, 138.)

Family 269. **Juglandaceae.** Walnuts. Trees and shrubs, with alternate, compound leaves; disk forming a capsule; pistil 1-celled, inferior; ovule 1, erect, orthotropous; endosperm 0. *Engelhardtia*, *Juglans*, *Hicoria*. (Pf. III, 1, 19.)

Family 270. **Betulaceae.** Birches. Trees and shrubs, with alternate, simple leaves, and monoecious or dioecious flowers, which are in aments; petals none; calyx small or none; stamens 2-10; pistil 1-2-celled. *Carpinus*, *Ostrya*, *Corylus*, *Betula*, *Alnus*. (Pf. III, 1, 38.)

Family 271. **Fagaceae.** Beeches. Trees and shrubs, with alternate, simple leaves; disk 0; petals 0; pistil 2- to 6-celled, inferior; ovules 2, erect or pendulous; endosperm 0. *Fagus*, *Castanea*, *Pasania*, *Quercus*. (Pf. III, 1, 47.)

Family 272. **Myricaceae.** Bayberries. Shrubs and trees, with alternate, simple leaves; disk 0; petals 0; pistil free, 1-celled; ovule 1, erect, orthotropous; endosperm 0. *Myrica*. (Pf. III, 1, 26.)

Family 273. **Julianaceae.** Dioecious, tropical trees, with leaves clustered at the ends of the twigs; flowers small, apetalous, dioecious; stamens 4-8; pistil of 3-5 carpels. *Juliana*. (Pf. Nach. 335, and Syllabus III.) This family is given place here very doubtfully.

Family 274. **Proteaceae.** Shrubs, trees (and herbs) of the southern hemisphere, with scattered, simple, usually coriaceous leaves; disk 0; petals 0; pistil 1-celled; ovule 1, erect or pendulous; endosperm little or none. *Protea*, *Leucadendron*, *Grevillea*,

Hakca, Banksia. (Pf. III, 1, 118.) This puzzling family is given place here very doubtfully.

Order UMBELLALES. Flowers actinomorphic (regular), usually perfect; stamens usually definite; pistil syncarpous, 1- to many-celled, its ovary inferior; ovules solitary, pendulous; styles free or united at the base; endosperm copious; embryo usually minute.

Family 275. **Araliaceae**. Aralias. Trees, shrubs (and herbs), mostly tropical, with alternate leaves; flowers in umbels, heads, or panicles; ovary 2- to 15-celled; fruit a berry with a fleshy or dry exocarp. *Hedera, Aralia, Panax*. (Pf. III, 8, 1.)

Family 276. **Apiaceae**. Parsleys. Herbs (shrubs and trees), with alternate leaves; flowers small, mostly umbellate; ovary 2-celled; fruit splitting into two dry indehiscent mericarps. *Hydrocotyle, Sanicula, Eryngium, Coriandrum, Conium, Apium, Cicuta, Carum, Foeniculum, Angelica, Ferula, Heracleum, Daucus*. (Sp. 2177.) (Pf. III, 8, 63.)

Family 277. **Cornaceae**. Cornels. Shrubs and trees (rarely herbs), with usually opposite leaves; flowers umbellate, capitate, or corymbose; ovary 2- to 4-celled, fruit drupaceous. *Garrya, Nyssa, Cornus, Aucuba*. (Pf. III, 8, 250.)

Super-Order CALYCIFLORAE-GAMOPETALAE. Petals united. Carpels few, united, inferior; stamens usually as many as the corolla-lobes, mostly attached to the corolla.

Order RUBIALES. Flowers actinomorphic to zygomorphic (regular or irregular); stamens attached to the corolla; calyx small; ovary 2- to 8-celled; ovules 2 to many.

Family 278. **Rubiaceae**. Madders. Trees, shrubs and herbs, mostly tropical, with opposite or whorled leaves; flowers usually regular, with valvate, contorted, or imbricate corolla-lobes; style simple bifid, or multifid; fruit a capsule, berry, or drupe. *Houstonia, Cinchona, Bowvardia, Cephalanthus, Randia, Coffea, Mitchellia, Galium, Rubia*. (Pf. IV, 4, 1.)

Family 279. **Caprifoliaceae**. Honeysuckles. Flowers usually irregular, with imbricate corolla-lobes; style usually with a capi-

tate undivided stigma; fruit a berry. *Sambucus*, *Viburnum*, *Linnæa*, *Lonicera*. (Pf. IV, 4, 156.)

Family 280. **Adoxaceae**. Moschatels. Slender herbs with scaly rootstocks, bearing ternately compound leaves; flowers small, greenish, in heads; stamens 10; fruit drupaceous. *Adoxa*. (Pf. IV, 4, 170.)

Family 281. **Valerianaceae**. Valerians. Herbs (and shrubs) with opposite leaves; flowers cymose, corymbose, or solitary; anthers free; ovules pendulous. *Valerianella*, *Fedia*, *Valeriana*. (Pf. IV, 4, 172.)

Family 282. **Dipsaceae**. Teasels. Herbs (and shrubs) with opposite or whorled leaves; flowers in involucrate heads; anthers free; ovule pendulous. *Cephalaria*, *Dipsacus*, *Scabiosa*. (Pf. IV, 4, 182.)

Order CAMPANULALES. Flowers actinomorphic to zygomorphic (regular or irregular); stamens mostly free from the corolla, their anthers free or connate; ovary 1- to several-celled; ovules 1-8.

Family 283. **Campanulaceae**. Bellflowers. Mostly milky-juiced herbs (shrubs and small trees), with alternate (or opposite) leaves; flowers regular or irregular; stamens usually 5, free from the style. *Campanula*, *Lobelia*. (Pf. IV, 5, 40.)

Family 284. **Goodeniaceae**. Mostly Australian herbs and shrubs, with alternate (or opposite) leaves; flowers usually irregular; stamens 5, free from the style. *Goodenia*, *Scaevola*, *Brunonia*. (Pf. IV, 5, 70.)

Family 285. **Stylidiaceae**. Australian herbs, with tufted, radical, or scattered and sometimes crowded stem-leaves; flowers usually irregular; stamens 2, connate with the style. *Stylidium*, *Levenhookia*. (Pf. IV, 5, 79.)

Family 286. **Calyceraceae**. South American herbs, with alternate leaves; flowers in involucrate heads; anthers connate; ovule pendulous. *Boopis*, *Calycera*. (Pf. IV, 5, 84.)

Order ASTERALES. Composites. Flowers actinomorphic or zygomorphic, collected into involucrate heads; calyx small, and often forming a "pappus"; stamens 5, epipetalous, mostly with their anthers connate; carpels 2, united, inferior, with one style which is 2-branched above; ovule one, erect, anatropous. An immense order (commonly regarded as a family) of more than 14,300 species, which are usually distributed among fourteen tribes, all of which are here raised to families. In the following arrangement the *Helianthaceae* are regarded as the lowest, from which the two principal phyletic lines have arisen, culminating on the one hand in the *Eupatoriaceae*, and on the other in the *Lactucaceae*. (Pf. IV, 5, 87.)

Family 287. **Helianthaceae**. Sunflowers. Calyx not capillary; receptacle chaffy; usually with ray flowers; mostly large and coarse plants. *Helianthus*, *Zinnia*, *Rudbeckia*, *Silphium*. (Sp. 1364.) (Pf. IV, 5, 210.)

Family 288. **Ambrosiaceae**. Ragweed. Calyx not capillary; receptacle chaffy; without ray flowers; mostly large and coarse plants, which are declinous. *Ambrosia*, *Xanthium*. (Sp. 74.) (Pf. IV, 5, 220.)

Family 289. **Heleniaceae**. False Sunflowers. Calyx not capillary; receptacle usually naked; with or without rays; anthers tailless; medium sized plants. *Helenium*, *Gaillardia*. (Sp. 449.) (Pf. IV, 5, 251.)

Family 290. **Arctotidaceae**. Gazanias. Calyx not capillary; receptacle naked; anthers tailless. South African plants. *Gazania*, *Arctotis*. (Sp. 278.) (Pf. IV, 5, 307.)

Family 291. **Calendulaceae**. Marigolds. Calyx not capillary; receptacle naked; anthers tailed. Old world plants, mostly tropical. *Calendula*. (Sp. 125.) (Pf. IV, 5, 303.)

Family 292. **Inulaceae**. Everlastings. Calyx from bracteose to capillary; receptacle usually naked; anthers tailed; usually rayless; mostly low plants. *Inula*, *Antennaria*, *Gnaphalium*, *Helichrysum*. (Sp. 1580.) (Pf. IV, 5, 172.)

Family 293. **Asteraceae.** Asters, Calyx from bracteose to capillary; receptacle naked; usually with rays. Medium-sized plants. *Aster*, *Solidago*, *Erigeron*, *Bellis*. (Sp. 1815.) (Pf. IV, 5, 142.)

Family 294. **Vernoniaceae.** Ironweeds. Calyx from bracteose to capillary; receptacle naked; without rays; style branches hispidulous. Medium-sized plants. *Vernonia*. (Sp. 788.) (Pf. IV, 5, 120.)

Family 295. **Eupatoriaceae.** Blazing Stars. Calyx from bracteose to capillary; receptacle naked; without rays; style branches papillose. Medium sized plants. *Lacinaria*, *Eupatorium*. (Sp. 944.) (Pf. IV, 5, 131.)

Family 296. **Anthemidaceae.** Camomiles. Calyx a short crown or wanting; receptacle chaffy or naked; usually with white ray flowers. Medium sized plants. *Anthemis*, *Chrysanthemum*, *Artemisia*. (Sp. 915.) (Pf. IV, 5, 267.)

Family 297. **Senecionidaceae.** Groundsels. Calyx capillary; receptacle naked; with or without rays. Medium sized to large plants. *Senecio*, *Arnica*. (Sp. 1982.) (Pf. IV, 5, 283.)

Family 298. **Carduaceae.** Thistles. Calyx mostly capillary; receptacle usually bristly (not chaffy); without rays. Mostly stout plants. *Carduus*, *Arctium*, *Cnicus*. (Sp. 1563.) (Pf. IV, 5, 312.)

Family 299. **Mutisiaceae.** Mutisias. Calyx mostly capillary; receptacle usually naked; flowers all two-lipped. Medium to large (even woody) plants, of tropical or warm regions. *Mutisia*, *Chaptalia*. (Sp. 550.) (Pf. IV, 5, 333.)

Family 300. **Lactucaceae.** Lettuces. Calyx mostly capillary; receptacle usually naked; flowers all strap-shaped. Small to medium sized plants, mostly with a milky juice. *Lactuca*, *Hieracium*, *Cichorium*, *Taraxacum*. (Sp. 1701.) (Pf. IV, 5, 350.)

PHYLOGENETIC CHART

Showing the sequence and general relationship of the orders of Anthophyta, as given on the preceding pages.

