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A SYSTEM OF
BOTANICAL ANALYSIS
APPLIED TO THE
DIAGNOSIS OF
BRITISH NATURAL ORDERS.

For the Use of Beginners.

BY
W. HANDSEL GRIFFITHS, Ph.D.

LONDON:
WYMAN & SONS, 74-5, GREAT QUEEN STREET,
LINCOLN'S-INN FIELDS.
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The following pages were originally written for, and are now published at the request of, the Author's pupils.

The object which the Compilation is intended to fulfil is to afford to students commencing the study of Botanical Classification a concise, simple, and systematic guide to the Diagnosis of our British Natural Orders.

In the selection of diagnostic data, reference has been had rather to facility of recognition than to morphological significance, and, as the Work is merely designed for practical analysis in the field, almost all matter has been excluded which is not essential for the purposes of diagnosis. It should be borne in mind that the characteristics specified as pertaining to Orders are not always without exception, and in some cases are applicable only to British representatives. The attention of beginners should also be directed to the fact that in the following System, as in all methods of Artificial Analysis, the Orders are not arranged according to their Natural Affinities, in some cases Orders being placed in apposition which should be widely separated, and vice versa.

Inasmuch as it is presumed that no student will commence the study of Systematic Botany without having previously mastered the outlines of Morphology, technicalities have been freely used throughout the Work.*

*It is necessary to state that in the following pages the term Polycarpellary signifies an ovary composed of more than one carpel; Plurilocular, the existence of more than two cells; Polyandrous, a greater number of stamens than ten; and Oligandrous, ten or fewer stamens.
Some of the Orders are printed in italics, to signify that they do not properly belong to the Group under which they are so printed, but that some of their representatives exhibit approximative characters of the Group.

Very few words are needed as to the method of using the following pages. In examining a plant, it is consecutively referred to its Sub-kingdom, Division, Subdivision, Class, Sub-class, and Group; the analysis of the Group is then followed, and the Order of the plant arrived at. When the student has diagnosed the Order, he should refer to his text-book, and study therefrom the characteristics of the Order in extenso. It is hoped that by this means the study of Systematic Botany will be facilitated for beginners, and rendered a pleasant, as well as a profitable, expenditure of time.

The Author, in conclusion, desires to acknowledge, as valuable sources of information, the works of Bentham, Balfour, Bentley, Henslow, Henfrey, Hooker and Arnott, Lindley, Oliver, and many others; and he would record his gratitude to those gentlemen who have so kindly afforded him their assistance and advice.

W. HANDSEL GRIFFITHS.

London, May, 1870.
A SYSTEM OF BOTANICAL ANALYSIS
APPLIED TO
THE DIAGNOSIS OF BRITISH NATURAL ORDERS.

SUB-KINGDOM PHANEROGAMIA.
Flowering plants. Propagate by seeds containing an embryo.

DIVISION 1.—DICOTYLEDONES or EXOGENÆ.
Embryo with two or more opposite cotyledons. Wood exogenous. Leaves usually net-veined.
Flowers usually formed on a quinary or quaternary type.

SUBDIVISION 1.—Angiospermia.
Ovules contained in an ovary, and fertilized through the intervention of a stigma.

CLASS 1.—DICHCLAMYDEÆ.
Perianth double.

SUB-CLASS 1.—POLYPETALEÆ.
Petals wholly distinct.
Group 1.—HYPOGYNÆ (Thalamifloræ).

Stamens hypogynous.

Ovary monocarpellary. Berberidaceæ (Barberry order). Shrubs. Perianth and Stamens in twos or threes, or their multiples. Anthers opened by recurved valves.

Papilionaceæ. Stamens mon- or diadelphous. Corolla irregular, papilionaceous.


Leaves radical or alternate. Leaves extipulate.


Tamaricaceæ (Tamarisk order). Herbs. Leaves scale-like.

Leaves opposite. Leaves extipulate.

Stamens polyandrous. Cistaceæ (Cistus order). Shrubs or herbs. Petals five.

Stamens oligandrous. Cistaceæ.

Leaves stipulate. Frankeniaceæ (Frankenia order). Herbs or undershrubs.
Corolla irregular.
Leaves radical or alternate.
Leaves exstipulate.
Stamens polyandrous.
Stamens oligandrous.
Leaves stipulate.
Stamens oligandrous.

Resedaceae (Mignonette order). Herbs. Petals four to six. Capsule opens at the top before maturity.
Fumariaceae (Fumitory order). Herbs. Stamens six, diadelphous.

Placentas axile.
Corolla regular.
Leaves opposite.
Leaves exstipulate.
Stamens oligandrous.

Violaceae (Violet order). Herbs. Stamens five, connective prolonged above the anther-cells, filaments dilated.


Anomalous Order—Plumbaginaceae. One ovule, which is pendulous from a funiculus arising from the bottom of the cell.

Ovary bilocular.
Placentas parietal.
Corolla regular.
Leaves radical or alternate.
Leaves exstipulate.
Stamens oligandrous.

Cruciferae (Crucifer order). Herbs, or seldom undershrubs. Sepals and Petals four each. Stamens six, tetradynamous.
<table>
<thead>
<tr>
<th>Corolla regular.</th>
<th>Leaves opposite.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaves exstipulate.</td>
<td>Placentas axile.</td>
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<tr>
<th>Corolla irregular.</th>
<th>Leaves radical or alternate.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaves exstipulate.</td>
<td>Polygalaceae (Milkwort order). Shrubs or herbs. Stamens eight, diadelphous.</td>
</tr>
<tr>
<td>Stamens oligandrous.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ovary plurilocular.</th>
<th>Placentas axile.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corolla regular.</td>
<td>Leaves radical or alternate.</td>
</tr>
<tr>
<td>Leaves exstipulate.</td>
<td>Linaceae (Flax order). Herbs or undershrubs. Leaves simple, entire. Stamens rarely fewer than five (but in exotic genera ten), free, or the filaments very shortly united at the base.</td>
</tr>
</tbody>
</table>

|---------------------------------|-----------------------------------------------|

<table>
<thead>
<tr>
<th>Leaves opposite.</th>
<th>Tiliaceae (Lime order). Trees. Stamens free or united shortly into several clusters.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaves exstipulate.</td>
<td>Hypericaceae (Hypericum order). Shrubs or herbs. Stamens polyadelphous.</td>
</tr>
<tr>
<td>Stamens polyandrous.</td>
<td></td>
</tr>
</tbody>
</table>
Stamens oligandrous. Leaves stipulate.
Stamens oligandrous. Leafless Ericaceae (Gen. Monotropa, leaves represented by scales).
Corolla irregular. Leaves radical or alternate.
Leaves exstipulate. Stamens oligandrous.

Linaceae.
Elatinaceae (Elatine order). Annual March plants.
Leaves entire. Stigmas capitate.
Geraniaceae (Geranium order). Herbs or shrubs.
Leaves divided, cut, or toothed.

Balsaminaceae (Balsam order). Succulent herbs.
Leaves simple.

Group II.—PERIGYNAE (Calyciflorae).

Stamens perigynous. Ovary wholly or partially superior.


Ovary apocarpous. Rosaceae. Leaves stipulate.

Ovary syncarpous. Crassulaceae (Stoncercrop order). Herbs or shrubs. Leaves exstipulate. Flowers symmetrical.

Ovary unilocular.
Placentas parietal.
Corolla regular.
Leaves radical or alternate.
Leaves exstipulate.
Stamens oligandrous.

Saxifragaceae (Saxifrage order) (Gen. Parnassia).
Herbs. Ovary with a distinct style for each carpel.

Paronychiaceae (Gen. Corrigiola).

Ovary bilocular.
Placentas parietal.
Corolla regular.
Leaves radical or alternate.
Leaves exstipulate.
Stamens oligandrous.

Portulaceae (Purslane order). Succulent herbs.
Leaves entire. Sepals two or, rarely, three.

Placentas axile.
Corolla regular.
Leaves opposite or whorled.
Leaves exstipulate.
Stamens oligandrous.

Saxifragaceae.

Placentas axile.
Corolla regular.
Leaves opposite or whorled.
Leaves exstipulate.
Stamens oligandrous.

Saxifragaceae.

Ovary plurilocular.
Placentas axile.

Lythraceae (Loosestrife order). Herbs. Leaves entire. One style.
Group III.—EPICYNOE (Calyciflorae).

Stamens epigynous. Ovary inferior.

Ovary polycarpellary.
  Ovary syncarpous.
    Ovary unilocular.
      Placentas parietal.
        Corolla regular.
          Leaves radical or alternate.
            Leaves stipulate.
              Stamens polyandrous.
                Stamens oligandrous.
              Stamens oligandrous.
        Placentas axile.
          Corolla regular.

Rosaceae.
Rhamnaceae (Buckthorn order). Trees or shrubs.
  Leaves simple. Stamens opposite petals.

Lythraceae.
Celastraceae (Spindle-tree order). Shrubs or trees.
  Leaves simple. Stamens alternate with petals.

Ribesiacae (Currant order). Shrubs. One style.
  Stamens 4—5, alternate with the petals. Leaves lobed.
Leaves radical or alternate.
Leaves extipulate.
Stamens oligandrous.

Leaves opposite or whorled.
Leaves extipulate.
Stamens oligandrous.

Ovary plurilocular.
Placentas axile.
Corolla regular.

Leaves radical or alternate.
Leaves extipulate.
Stamens oligandrous.

Leaves opposite or whorled.
Leaves extipulate.
Stamens oligandrous.

UMBELLIFERAE (Umbellate order). Herbs. Two styles. Stamens 5, alternate with the petals. Leaves variously divided and sheathing. Flowers umbellate. Fruit dry; carpels separate from the axis when ripe.


CORNACEAE (Dogwood order). Trees, shrubs, or herbs. Stamens 4, alternate with petals. One style. Flowers capitate, umbellate or corymbose.

ONAGRACEAE (Gen. Enothera, stamens 8).

ARALIACEAE (Ivy order). Shrubs, trees or climbers, rarely herbs. Stamens 5. Fruit succulent. Flowers umbellate or capitate.

ONAGRACEAE (Gen. Ludwigia, Epilobe. Leaves are sometimes irregularly scattered in latter).

HALORAGACEAE (Marestail order). Aquatic herbs. Stigmas sessile in British genera. Flowers in terminal panicles or racemes.
SUB-CLASS II.—GAMOPETALÆ (Calycifloræ and Corollifloræ).

Petals wholly or partially coherent.

Group I.—EPETALÆ.

Stamens free from corolla.

Ovary polycarpellary.
Ovary syncarpous.

Ovary inferior.
Ovary bilocular.

Corolla regular.
Leaves radical or alternate.

Ovary plurilocular.
Corolla regular.
Leaves radical or alternate.

Corolla irregular.
Leaves radical or alternate.

Ovary superior.
Ovary plurilocular.
Corolla regular.
Leaves opposite or whorled.

Campánulaceæ (Harebell order). Herbs. Stamens as many as corolla-lobes. Anthers free, dehiscing longitudinally.

Campánulaceæ.
Vaccinìaceæ (Cranberry order). Shrubs. Stamens twice as many as corolla-lobes. Anthers bilocular, dehiscing by pores.

Lobeliaceæ (Lobelia order). Lactescent herbs or shrubs. Stamens five. Anthers coherent.

Ericaceæ (Heath order). Shrubs. Stamens usually twice as many as corolla-lobes. Anthers dehise by terminal pores.
Group II.—EPIPETALÆ.

Stamens adherent to corolla.

Ovary polycarpellary.


Ovary syncarpous.

Ovary inferior.

Ovary unilocular.

Corolla regular.

Leaves radical or alternate.

Leaves opposite or whorled.

Corolla irregular.

Leaves radical or alternate.

Leaves opposite or whorled.

**PRIMULACEÆ** (Gen. **Samolus**. Herbs. Flowers small and white, in a terminal raceme).

**COMPOSITÆ** (Composite order). Herbs or shrubs. Florets in capitula on a common receptacle and surrounded by an involucre. Stamens syngenesious. Ovule solitary and erect.

**COMPOSITÆ**.

**COMPOSITÆ**.

**VALERIANACEÆ** (Valerian order). Herbs. Flowers in terminal corymb or panicles. Stamens fewer than corolla-lobes. Ovule solitary, pendulous and exalbuminous.

**DIPSACEÆ** (Teasel order). Herbs or undershrubs. Florets capitulate, with a common involucre, each floret surrounded also by an involucre. Anthers free. Ovule solitary, pendulous and albuminous.
Ovary bilocular.
Corolla regular.
Leaves opposite or whorled.

Ovary plurilocular.
Corolla regular.
Leaves radical or alternate.

Ovary superior.
Corolla regular.
Leaves opposite or whorled.

Corolla irregular.
Leaves radical or alternate.


**Rubiaceae** (*Madder* order). Herbs. Leaves with interpetiolar stipules.

**Cucurbitaceae** (*Cucurbita* or *Cucumis*). Climber. Flowers dicotious.

**Caprifoliateae** (*Honeysuckle* order). Trees, shrubs, or herbs. Leaves exstipulate.

**Primulaceae** (*Primrose* order). Herbs. Stamens as many as and opposite to corolla-lobes. Placenta free-central, bearing many ovules.

**Plumbaginaceae** (*Thrift* order). Herbs or under-shrubs. Stamens five, opposite to corolla-lobes. Ovule solitary, suspended from a funiculus which arises from the base of the cell.


**Portulaceae** (*Portula*). Corolla split open in front. Stamens three.

**Lentibulariaceae** (*Butterwort* order). Marsh or aquatic plants. Stamens two, alternate with corolla-lobes. Placenta free-central.
Ovary bilocular.

Corolla regular.

Leaves radical or alternate.

Leaves opposite or whorled.


\textit{Convolvulaceae} (\textit{Bindweed order}). Twining or trailing herbs. Stamens five (rarely four), alternate with corolla-lobes. Two (rarely one) ovules in each cell. Seed exalbuminous.

\textit{Solanaceae} (\textit{Nightshade order}). Herbs or shrubs. Stamens mostly five (rarely four), alternate with corolla-lobes. Several ovules in each cell. Seed albuminous.


\textit{Oleaceae} (\textit{Olive and Ash order}). Trees or shrubs. Stamens two, alternate with ovary-cells.

\textit{Scrophulariaceae} (\textit{Figwort order}). Herbs. Stamens two or four, rarely five. Corolla personate. Ovules several in each cell.

\textit{Scrophulariaceae}.

\textit{Plantaginaceae}.

\textit{Aquifoliaceae} (\textit{Holly order}). Shrubs or trees with evergreen leaves. Stamens four or six. Seeds albuminous.

\textit{Polemoniaceae} (\textit{Phlox order}). Herbs, or rarely shrubs. Stamens five. Seeds albuminous.

\textit{Boraginaceae} (\textit{Bugloss order}). Herbs rough with hairs. Stamens five. Seeds exalbuminous. Ovary deeply four-lobed, style from between the lobes.
CLASS II.—MONOCHILIAMYDEÆ.

Perianth single.

Flowers hermaphrodite.

|-----------------------|-----------------------------------------------|

Rosaceæ (Gen. Alchemilla, Sanguisorba, Poterium). Herbs or undershrubs.

Ovary polycarpellary.

|-------------------|-------------------------------------------------------------------------------------|


Ovary syncarpous.

<table>
<thead>
<tr>
<th>Ovary inferior.</th>
<th>Santalaceæ (Sandal-wood order). Herbs or undershrubs. Stamens 4–5, opposite to perianth-lobes.</th>
</tr>
</thead>
</table>

Ovary unilocular.

<table>
<thead>
<tr>
<th>Leaves radical or alternate.</th>
<th>Leaves exstipulate.</th>
</tr>
</thead>
</table>

Leaves opposite.
  Leaves exstipulate.

Ovary plurilocular.
  Leaves radical or alternate.
    Leaves exstipulate.
  Leaves opposite or whorled.
    Leaves exstipulate.

Ovary superior.

Ovary unilocular.
  Leaves radical or alternate.
    Leaves exstipulate.

Leaves stipulate.

Leaves opposite or whorled.
  Leaves exstipulate.

Leaves stipulate.

_Saxifragaceae._ (Sp. *Chrysosplenium oppositifolium*).

_Aristolochiaceae._ (Gen. *Asarum*).

_Oncagraceae._ (Gen. *Ludwigia*).

**Chenopodiaceae** (Goosefoot order). Herbs or under-shrubs. Male perianth in 3 or 5 parts. Stamens opposite to corolla-lobes. Ovule solitary. Styles or stigmas two or more.

**Polygonaceae** (Sorrel order). Herbs. Stipules ochracous. Ovule solitary, erect, orthotropous.

_Caryophyllaceae_. Herbs. Stamens usually twice as many as perianth-lobes; hypogynous. Ovules many on a free-central placenta. Stigmas papilllose along inner surface.


_Paronychialae_ (Knotwort order). Annual or perennial herbs. Stamens 5, alternating with five small filaments. Ovule solitary. Styles, or sessile stigmas, 2 or 3.

_Paronychialae._
Ovary bilocular.
  Leaves radical or alternate.
    Leaves stipulate.
  Leaves opposite or whorled.
    Leaves exstipulate.

Ovary plurilocular.
  Leaves radical or alternate.
    Leaves stipulate.

Ovary plurilocular.
  Leaves radical or alternate.
    Leaves exstipulate.

Ovary plurilocular.
  Leaves opposite or whorled.
    Leaves exstipulate.

Ovary plurilocular.
  Leaves opposite or whorled.
    Leaves exstipulate.

Ovary superior.
  Ovary unilocular.

Flowers diclinous.

Ovary monocarpellary.
  Rosaceae. (Gen. Poterium.)

Ovary polycarpellary.
  Rosaceae. (Gen. Poterium.)

Ovary apocarpous.
  Rosaceae. (Gen. Poterium.)

Ovary syncarpous.
  Ovary inferior.
    Ovary unilocular.
      Leaves opposite or whorled.
        Leaves exstipulate.

Loranthaceae (Mistletoe order). Shubby evergreen parasites. Stamens 4, opposite to perianth-lobes.

Corylaceae (Oak order). Trees or shrubs. Flowers in catkins. Fruit in a cupule.
Leaves radical or alternate.
Leaves exstipulate.

Leaves opposite or whorled.
Leaves stipulate.

Ovary bi- or plurilocular.
Leaves opposite or whorled.

**Chenopodiaceae.**

**Eleagnaceae (Oleaster order).** Shrubs or trees with silvery-scurfy leaves. Male perianth of 2 scales. Ovule solitary, erect. One style and simple stigma.

**Urticaceae (Nettle order).** Herbs. Stamens as many as, and opposite to, perianth-lobes. Ovule solitary. One or two styles or stigmas.

**Euphorbiaceae (Sapuge order).** Herbs, shrubs, or trees. Ovule solitary or twin, suspended. Radicle superior.

**Empestraceae (Crowberry order).** Low shrubby evergreens. Ovule solitary, ascending. Radicle inferior.

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**CLASS III.**—Achlamydeae.

Perianth absent or bract-like.

Flowers hermaphrodite. *Oleaceae (Gen. Fraxinus).*

Flowers diclinous. Staminal flowers not in catkins.

| Ovary unilocular. | **Ceratophyllaceae (Hornwort order).** Aquatic herbs. Leaves dissected and whorled. Stamens several. Style 1. Ovule solitary, suspended, orthotropous. |

| Ovary trilocular. | **Euphorbiaceae. (Gen. Euphorbia.)** |

Staminal flowers in catkins.

|-------------------|-----------------|-----------------------------|---------------------------------------------------------------|

Ovary bilocular.


Subdivision II.—Gymnospermia.

Ovules borne on open carpels and fertilized by the direct action of pollen.

Pinaceæ (Pine order). Trees or shrubs. Leaves tufted or imbricated, mostly evergreen and linear. Monœcious or dioœcious. Female flowers in cones.

Taxaceæ (Yew order). Trees or shrubs. Leaves evergreen and linear. Mostly dioœcious. Female flowers composed of a solitary ovule, which is either terminal, or in the axil of a bract.
DIVISION II.—MONOCOTYLEDONES or ENDOGÈNE.

Embryo with one or several alternate cotyledons. Wood endogenous. Leaves usually parallel-veined. Flowers usually formed on a ternary type.

CLASs I.—PETALOIDEÆ.

Perianth double, whorled, trinucrous, wholly or partially petaloid, or rarely scaly.

<table>
<thead>
<tr>
<th>Leaves reticulated.</th>
<th>Leaves parallel-veined.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flowers hermaphrodite.</td>
<td>Flowers hermaphrodite.</td>
</tr>
<tr>
<td>Ovary syncarpous.</td>
<td>Ovary apocarpous.</td>
</tr>
</tbody>
</table>

Trilliaceæ (Trillium order). Herbs with a creeping rootstock. Perianth-segments 8 or 10. Stamens 8 or 10. Ovary plurilocular. Styles several and distinct. Fruit a berry.


Ovary syncarpous.
   Ovary superior.
      Stigmas sessile.
         Stigmas distinct.
      Style solitary.
         Stigmas distinct.
      Stigma simple or 3-lobed.
   Styles several.
Ovary inferior.
   Style adherent to stamens.
   Style free from stamens.
      Stigmas distinct.
      Stigma simple or 3-lobed.


Liliaceæ (Lily order). Herbs with bulbs, tubers, rhizomes, or leafy flowering-stems. Perianth petaloid. Stamens 6, anthers introrse. Fruit capsular, loculicidal. Seed albuminous.

Melanthaceæ (Colchicum order). Herbs with bulbs, tubers, or fibrous roots. Perianth petaloid. Stamens 6, anthers extorse. Fruit capsular, septicidal. Seed albuminous.

Orchidaceæ (Orchid order). Perennial herbs, with fibrous or tuberous roots. Perianth irregular, mostly petaloid. Stamens 1 or 2, gynandrous. Ovary unilocular.

Iridaceæ (Flag order). Perennial herbs, with bulbs, corms, or rhizomes. Leaves radical or equitant. Perianth regular and petaloid. Stamens 3, extorse. Stigmas often petaloid. Ovary trilocular.

Flowers diclinous.
  Ovary syncarpous.
    Ovary superior.
      Style solitary.
    Ovary inferior.
      Styles several.
  
ERIOCAULACEÆ (Eriocaulon order). Aquatic or marsh herbs. Perianth regular, sepaloid. Seed albuminous.

HYDROCHARIDACEÆ (Frog-bit order). Aquatic herbs. Perianth regular, petaloid. Seed exalbuminous.

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CLASS II.—SPADICIFLORÆ.

Perianth absent or scaly. Flowers arranged on a spadix, which is naked or enclosed in a spathe.

Leaves reticulated.
  Spadix distinct.
    Ovary solitary.

AROIDEÆ (Arum order). Herbs. Leaves usually broad, radical or alternate. Fruit a berry. Ovules several. Seeds usually albuminous.

Leaves parallel-veined.
  Spadix distinct.
    Ovary solitary.

AROIDEÆ. Filaments short.

LEMNACEÆ (Duckweed order). Floating plants. Stem and foliage represented by flat floating fronds. Fruit capsular or membranous. Ovules several or solitary. Seeds albuminous.


NAIDACEÆ.

CLASS III.—GLUMIFLORÆ.

Periaurth scaly, green or brown, and imbricated.

CYPERACEÆ (Sedge order). Grass-like or rush-like herbs. Stems solid. Leaf-sheaths tubular, not slit. Each flower in axil of one glume. Glumes mostly brown. Style more or less divided into two or three linear stigmas. Embryo within albumen.

GRAMINACEÆ (Grass order). Herbs. Stems hollow, except at nodes. Leaf-sheaths slit. Each flower enclosed in a pair of glumes. Glumes mostly green or purplish. Styles two or three, stigmas feathery. Embryo outside albumen.
SUB-KINGDOM CRYPTOGRAMIA.

Flowerless plants. Propagate by spores not containing an embryo.

DIVISION.—ACOTYLEDONES.

No cotyledons. Stem, when present, acrogenous. Leaves, when present, with a forked or without true venation.

SUBDIVISION 1.—Angiosporae or Acrogenae.

Stems and leaves distinct. Stomata present. Roots adventitious. Have more or less vascular tissue. Spores produced in sporanges, which are closed until maturity. Spermatozoids spiral.

CLASS I.—SPOROGAMIA.

Produce two kinds of spores (microspores and megaspores), in which the male and female sexual organs (antheridia and archegonia) are developed during germination. The spores are contained in spore-sacs (sporanges or thecae), which are produced in stalked capsules or spore-fruits (sporocarps) arising from near the bases of leaves or leafstalks; or, the sporanges are sessile in the axils of imbricated leaves or bracts, which often form terminal spikes.

Sporanges in stalked sporocarps, arising from near bases of leaves or leafstalks.

Sporanges sessile in axils of imbricated leaves or bracts, which often form terminal spikes.

MARSILLACEAE (Pepper-wort order). Creeping or floating herbs. Stem an inconspicuous rhizome. Leaves small, stalked or sessile, circinate in vernation.

LYCOPODIACEAE (Club-moss order). Herbaceous moss-like plants. Stem creeping or bifurcating. Leaves small and closely imbricated, straight in vernation.

ISOETACEAE (Quill-wort order). Aquatic or marsh plants. Stem perennia and corm-like. Leaves linear, sessile and tufted, straight in vernation.
CLASS II.—THALLOGAMIA.

Produce spores of one kind, which germinate and produce a green cellular frond (prothallium), on which the antheridia and archegonia are developed. The spores are contained in sporanges, which are collected in clubs or spikes, terminating fertile stems; or the sporanges are superficial on the dorsal surface or edges, or on metamorphosed lobes of leaves.

Foliage abortive. Sporanges collected in clubs or spikes, which terminate the fertile stems.

Foliage well developed. Sporanges superficial, on dorsal surface or margins, or on metamorphosed lobes of leaves.

Equisetaceae (Horsetail order). Herbs. Stem fistular, longitudinally striated, jointed, simple or verticillately branched. Leaves abortive, and represented by whorls of scales at the joints. Sporanges peltate-shaped, and attached by stalks to the central axis of the terminal spike in which they are borne. Spores with elaters.

Filices (Fern order). Herbs. Stem represented by a subterranean horizontal or vertical rhizome. Leaves or fronds well developed, radical or alternate with a bifurcated venation, circinate in vernation, except in Ophioglossaceae. Sporanges with or without an annulus, situated on dorsal surface or margins, or on metamorphosed lobes of leaves, often collected in clusters (sori), which are naked or covered with a membrane (indusium).

Sub-Orders:

Ophioglossaceae. Fronds straight in vernation. Sporanges distinct, exannulate, borne on margins of metamorphosed frond-lobes.

Daneaceae. Fronds circinate in vernation. Sporanges coherent, exannulate, dorsal.

Polypodiaceae. Fronds circinate in vernation. Sporanges distinct, annulate, dorsal or marginal.
CLASS III.—AXOGAMIA.

Spores after germination give rise to branched filaments, whence grow leafy stems bearing antheridia and archegonia. Sporanges result from the fertilization of the archegonia.

**Foliage represented by a lobed leaflike expansion or frond.**

**Hepaticæ (Liverwort order).** Thalloid hepaticæ. Sporanges immersed, sessile, pedicillate, or borne on under surface of peltate stalked receptacles which arise from the marginal sinuses of the frond. Dehiscence valvular or irregular. Without a columella (except in Anthocerotææ). Spores mixed with elaters (except in Ricciaceæ).

*Sub-Orders:*

**Marchantiaceæ.** Sporanges with an involucel (perigone) borne on under surface of peltate stalked receptacles, which arise from the marginal sinuses of the frond. Dehiscence by teeth or irregular. No columella. Spores mixed with elaters. Antheridia in distinct receptacles.

**Ricciaceæ.** Sporanges without an involucel, immersed or sessile. Dehiscence irregular. No columella. Spores without elaters.

**Anthocerotææ.** Sporanges pod-shaped, without an involucel. Dehiscence by two valves. With a columella. Spores with rudimentary elaters.

**Jungermaniaceæ.** Sporanges oval, mostly pedicillate with an involucel. Dehiscence by four valves. No columella. Spores with elaters.

**Foliage well developed. Stem filiform. Leaves distichously imbricated.**

**Hepaticæ.** Foliaceous Hepaticæ.

*Sub-Order:*

**Jungermaniaceæ.**
Foliage well developed. Stem simple or branched, erect or creeping. Leaves mostly spirally imbricated.

Aquatic plants. Stems composed of tubular verticillately-branched filaments, rooting at the nodes, sometimes incrusted with carbonate of lime.

MUSCI (Moss order). Sporanges globular or urn-shaped, pedicillate or sessile. Dehiscence opercular, valvular, or rarely indehiscent. With a columnella. Spores without elaters.

Sub-Orders:—

ANDRÉACEÆ. Sporanges sessile. Dehiscence by four valves.

BRYACEÆ. Sporanges mostly pedicillate. Dehiscence opercular, or rarely indehiscent.

CHARACEÆ. Reproductive organs of two kinds:—1. Solitary oval nucleas (female), each of which consists of a spore covered with spirally-arranged tubes; each spore, after fertilization, falls off, germinates, and reproduces the plant. 2. Round eight-valved globules (male), each valve of which, when mature, separates, bearing a tuft of articulated filaments, each articulation of which produces a ciliated spermatozoid.

SUBDIVISION II.—GYMNOSPORÆ or ThallogeneÆ.

Produce a thallus. No distinction into stem and leaves. No stomata. No vascular tissue. Spores produced in cells, which form part of the thallus or grow on definite parts of it, and which are open before maturity. Spermatozoids not spiral.

CLASS I.—HYDROPHYTA.

ALGÆ. Aquatic plants. Thallus coloured and foliaceous, filamentous or pulverulent. Propagation various; by fissiparous division, by spores and antheridia, by zoospores, by tetraspores, or by cell-conjugation.
CLASS II.—AEROPHYTA.

LICHENACEÆ. Aërial plants. Thallus leathery, horny, crustaceous, or pulverulent. Propagation by green cells (gonidia), which are produced in the central cellular substance of the thallus, and which give rise to vegetative reproduction when set free; and by spores produced in spore-sacs (asci), formed in shield-shaped expansions (apothecia) or in excavated chambers (perithecia). Representatives of antheridia are formed in special excavations (spermagonia), and produce minute, motionless, bacilliform fertilizing corpuscles (spermatia).

CLASS III.—HYSTERO PHYTA.

FUNGI. Parasitic plants. Thallus or mycelium consists of branched tubular filaments, forming a cottony mass, which is destitute of chlorophyll and starch. Propagation by propagative buds in the form of simple cells (conidia), and by spores, which in mildews and moulds are free, or contained in asci, and borne at the end of filaments of the mycelium. The higher fungi have the spores naked, or enclosed in asci, in perithecia and apothecia, formed on a stroma or common receptacle, which mostly forms a distinct fruit.
NOTES AND CORRECTIONS.

Page 2.—The Actaea of Ranunculaceae has a monocarpellary ovary.

The leaves of Frankeniaceae are exstipulate.

Page 5.—Elatinaceae.—For annual March plants, read annual marsh plants.

Page 6.—The placentation of Saxifragaceae is axile, not parietal.

The placentation of Paronychiaceae is not parietal, the ovule being solitary on a basal funicle.

Page 7.—In Rhamnaceae and Celastraceae, the ovules arise from the base of cells.

Page 8.—The petals of Umbelliferae are sometimes unequal.

Page 9.—The ovary is sometimes bilocular in Lobeliaceae.

Leaves are often alternate or scattered in Ericaceae.

Page 10.—The ovary of Valerianaceae is more properly trilocular, two of the cells being abortive or empty.

Page 11.—The leaves of Rubiaceae have not invariably interpetiolar stipules.

Page 16.—Leaves of Parietaria of Urticaceae are alternate and exstipulate.

Leaves of Euphorbiaceae and Empetraceae are not always opposite or whorled.

Page 19.—The perianth in Iris of Iridaceae, and in Galanthus of Amaryllidaceae, is irregular.
Lichenaceæ. Aërial
produced in the c
spores produced
Representatives of
fertilizing corpuscles

Fungi. Parasitic plants
of chlorophyll and
mildews and most
the spores naked,
a distinct fruit.

gonidia), which are
set free; and by
members (perithecia),
unless, bacilliform

which is destitute
by spores, which in
the higher fungi have
which mostly forms