

TREES AND SHRUBS
OF THE BRITISH ISLES



General Library

Library of

Wellesley

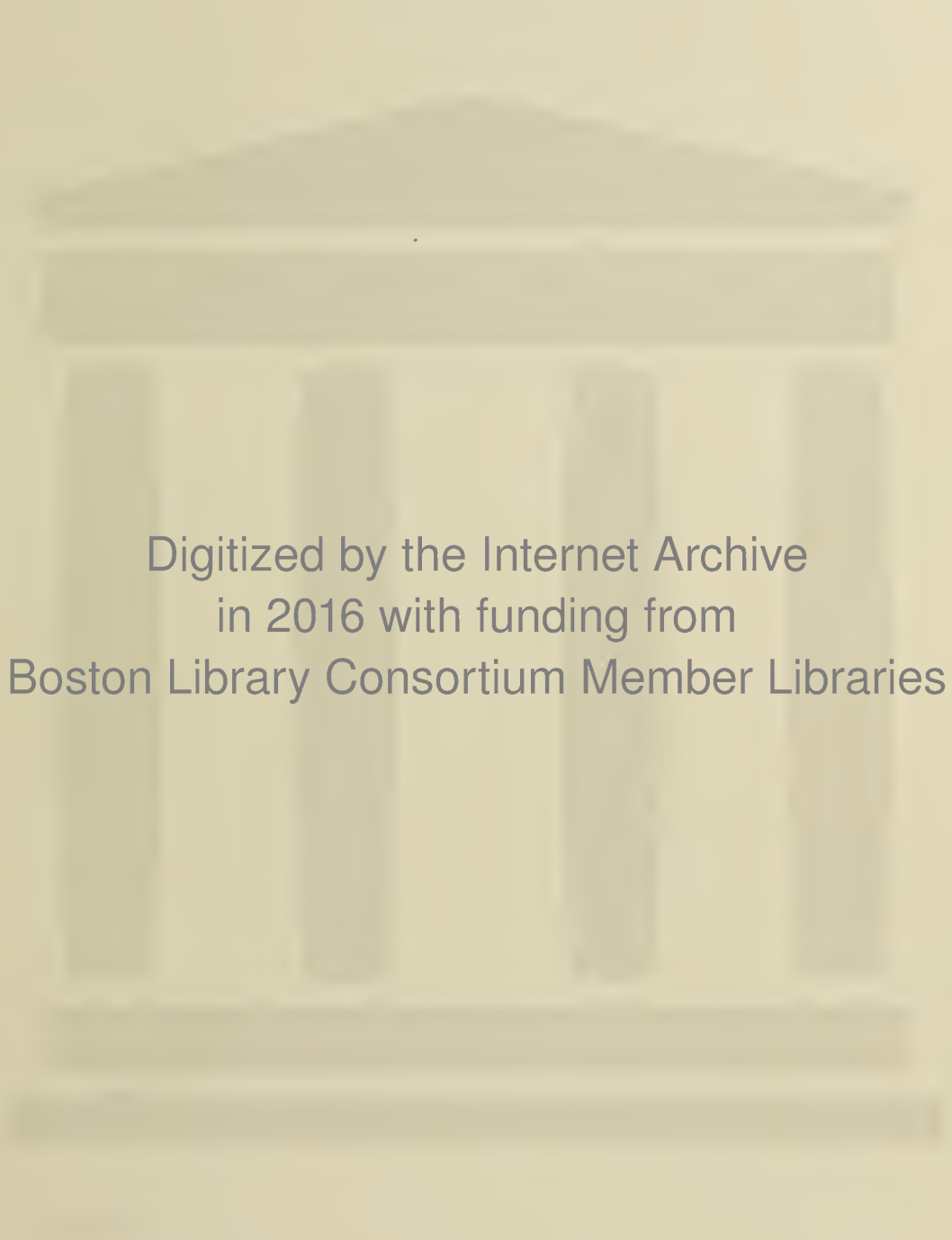


College.

Purchased from
The Horstford Fund.

No 80052

TREES AND SHRUBS OF THE
BRITISH ISLES



Digitized by the Internet Archive
in 2016 with funding from
Boston Library Consortium Member Libraries

<https://archive.org/details/treeshrubsofbri01coop>



STRAWBERRY TREE

(*Arbutus unedo*)

TREES & SHRUBS

OF THE

BRITISH ISLES

NATIVE & ACCLIMATISED

BY

C. S. COOPER, F.R.H.S.

AND

W. PERCIVAL WESTELL, F.L.S.

SIXTEEN FULL-PAGE COLOURED PLATES

AND

70 FULL-PAGE BLACK AND WHITE PLATES

DRAWN DIRECT FROM NATURE

BY

C. F. NEWALL

VOL. I



LONDON

J. M. DENT & CO.

NEW YORK: E. P. DUTTON & CO.

MCMIX

All rights reserved

H

80052

SCIENCE

g Qk
5 488
C6
1

325
2 v.
Dr Wolfe

P R E F A C E

THIS work has been prepared to enable the reader to identify not only the Trees and Shrubby Plants of the British Isles, but also the more common cultivated Trees and Shrubs, and of presenting in a concise form much valuable information on such subjects as Timber and its uses, Insect and Fungoid Pests, the more common Galls, the native habitat, the date of introduction to this country, methods of propagation, &c. &c. Over 550 species of Trees and Shrubs are described under the headings of Flowers, Inflorescence, Fruit, Foliage, Mode of Growth and Winter Buds, each plant under its natural order, and the characteristics of the Order preceding each group.

Although there have been many works produced dealing with Trees, we know of none giving detailed descriptions of such a number of species, and the Shrubs, it is believed, have never been so dealt with. Many readers are well informed as to most of the herbaceous plants so often described in popular books, yet they have little or no knowledge of the great majority of the Trees and Shrubs which specially help to make this country so beautiful. It is the Authors' hope that their work will not only enable such persons to identify all the species common to these Islands, and many that have been introduced, but will make them familiar with their Habitat, Form, Structure, Beauty, Uses, &c.

The work appeals to Art Masters, Botanists, Field Naturalists, Foresters, the general reader who wishes to know something of Trees and Shrubs, Horticulturists, Natural History and Scientific Societies, Owners of Estates and Gardens, Students, Teachers, and to the users of General Reference Libraries.

The Authors' wide experience as practical botanists and field naturalists has been brought to bear on the subject, and where this has been inadequate, most careful research has been carried out, and no effort spared to make the work absolutely reliable and up to date. The style of treatment is scientific in so far as accuracy of detail is concerned, and whilst technical words have

PREFACE

been employed *where necessary*, there is a detailed Glossary of over 350 Botanical terms with derivations of all words used, as well as lists of Latin and Greek roots used in Floral nomenclature, and Latin, English, Natural Order, and Colour Indices.

The text is almost wholly the work of Mr. C. S. Cooper, Mr. W. Percival Westell, in the capacity of General Editor, having collaborated and been responsible for seeing the work through the press.

The Authors wish to record their great indebtedness to Mr. George Paul, J.P., V.M.H., of Cheshunt, and his staff, who have at all times placed their valuable and unique experience at disposal and also enabled many points of a difficult nature to be settled from direct observation of the living plants. They are also under an obligation to Mr. H. R. Hutchinson, who, in his official capacity of Librarian to the Royal Horticultural Society, has always treated them with unfailing courtesy; and they desire to acknowledge the help accorded in the preparation of the Useful Insects plate by Mr. A. E. Gibbs, F.L.S., F.E.S.; and by Mr. Claude Morley, F.E.S., who kindly supplied specimens of Insects; also the valuable assistance accorded by Mr. Wm. Dallimore, of the Royal Gardens, Kew, in the compilation of those parts of the Calendar dealing with the Coniferæ.

The works of many of the greatest authorities have been rigidly and persistently consulted, and the titles of some of the most useful of these are given at the end of the second volume for the benefit of those who may desire more extended information.

The fine series of illustrations have all been specially drawn for this work direct from Nature by Mr. C. F. Newall, and the Artist has spared no pains to make his pictures thoroughly representative, and every detail technically correct. He is himself an experienced Botanist and an Artist of no mean calibre—a rare combination of great value in the accurate production of illustrative work of this kind.

C. S. C.

W. P. W.

CONTENTS

	PAGE
GLOSSARY	x
CALENDAR OF TREES AND SHRUBS GIVING THE AVERAGE DATES OF FLOWERING IN MILD LATITUDES	xxiii
TREES AND SHRUBS FOR CERTAIN SOILS AND SITUATIONS	xxviii
INTRODUCTION	i
Influence of Soil upon Trees	iii
Influence of Trees upon Soil—Methods of Rooting—Situation and its influence	iv
Shapes of Trees—Importance of Studying the Spray	v
Main Stem or Trunk—The Bark and its Uses	vi
Uses of Timber and Trees generally	vii
Plea for an Arbor Day and Re-afforestation	viii
The Advent of the Garden City	ix
Study of Winter Buds	x
Insect Pests—Fungoid Pests—Age of Trees	xi
Nature's Laboratory and Coal	xii
Leaf Structure, Form, and Functions	xiii
Autumnal Beauty of Hedgerow, Wood, and Garden	xiv
Floral Structure and Pollination	xv
Commercial Products of Flowers of Trees and Shrubs	xvi
Fruit and Seed	xvii
Fine Fruiting Trees and Shrubs for Decorative Effect	xviii
Pendulous Trees and Shrubs—the Scent of Trees	xix
Companionship of Trees	xx
Our Woodlands of To-day—A Good Story by Dean Hole	xxii
The Mission of the Trees	xxiii
An English Wood in Springtime	xxiv
More Woodland Pictures	xxv
How to Read the Story of the Year	xxvi
Descriptions of Plates I, II, and III	xxviii

CHAPTER I

INJURIOUS INSECTS	xxix
-----------------------------	------

CHAPTER II

USEFUL INSECTS	xlv
--------------------------	-----

CONTENTS

CHAPTER III

	PAGE
GALLS	li

CHAPTER IV

FUNGOID PESTS	lxi
I. Diseases of Roses	lxiii
II. Diseases of Orchard and Fruit Garden	lxv
III. Pests of the Ornamental Shrubbery	lxx
IV. Fungoid Pests of Forest Trees	lxxi

CHAPTER V

FUNGICIDES AND INSECTICIDES	lxxix
---------------------------------------	-------

NATURAL ORDERS—

Ranunculaceæ	1
Magnoliaceæ	4
Calycanthaceæ	10
Berberidæ	13
Cistineæ	18
Tamariscineæ	22
Hypericineæ	23
Ternstroëmiaceæ	26
Malvaceæ	28
Sterculiaceæ	30
Tiliaceæ	31
Rutaceæ	34
Simarubæ	37
Aquifoliaceæ	38
Celastrineæ	41
Rhamneæ	44
Ampelideæ	49
Sapindaceæ	52
Staphyleaceæ	64
Anacardiaceæ	66
Leguminosæ	71
Rosaceæ	91

LIST OF ILLUSTRATIONS

COLOURED PLATES

STRAWBERRY TREE (<i>Arbutus Unedo</i>)	<i>Frontispiece</i>
INSECT PESTS	<i>To face page xxx</i>
YULAN (<i>Magnolia conspicua</i>)	4
COMMON BARBERRY (<i>Berberis vulgaris</i>)	16
TUTSAN (<i>Hypericum Androsæmum</i>)	24
HORSE CHESTNUT (<i>Æsculus Hippocastanum</i>)	64
COMMON FURZE (<i>Ulex europæus</i>)	76
COMMON BROOM (<i>Cytisus scoparius</i>)	90

BLACK AND WHITE PLATES

PLATE	
I. SHAPES OF LEAVES	xiii
II. TYPES OF INFLORESCENCE	xvi
III. SOME TYPICAL FRUITS	xix
IV. TRAVELLER'S JOY (<i>Clematis vitalba</i>)	3
V. LIME (<i>Tilia vulgaris</i>)	10
VI. COMMON BARBERRY (<i>Berberis vulgaris</i>)	12
VII. HOLLY (<i>Ilex aquifolium</i>)	39
VIII. SPINDLE TREE (<i>Euonymus europæus</i>)	46
IX. ALDER BUCKTHORN (<i>Rhamnus Frangula</i>)	49
X. HORSE CHESTNUT (<i>Æsculus Hippocastanum</i>)	53
XI. OAK GALLS	56
XII. SYCAMORE (<i>Acer Pseudo-platanus</i>)	60
XIII. LABURNUM (<i>Laburnum vulgare</i>)	75
XIV. COMMON BROOM (<i>Cytisus scoparius</i>)	82
XV. BLACKTHORN (<i>Prunus spinosa</i>)	87
XVI. COMMON LAUREL (<i>Prunus Laurocerasus</i>)	94
XVII. DEWBERRY (<i>Rubus cæsius</i>)	99
XVIII. BRAMBLE (<i>Rubus fruticosus</i>)	106

GLOSSARY

- Abortion.** (L. *aborior*, *abortus*; *ab*, *orior*, to rise, to grow; *ab* reverses the meaning.) Failure to complete development.
- Accrescent.** (L. *accresco*, I am added, joined to; *ad*, in addition; *creresco*, to grow.) Parts growing together externally.
- Acerose.** (L. *acer*, sharp; *ac*, sharp.) Sharp-pointed or needle-like leaves. (Plate I., Fig. A.)
- Achene.** (Gr. *a*, not; *chaino*, to open.) A dry fruit which does not open.
- Acicular.** (L. *acicula*, a small pin; *acus*, a needle; root *ac*, sharp.) Needle-shaped leaves. (Plate I., Fig. A.)
- Acuminate.** (L. *acuminatus*, p.p. of *acumino*; *acuo*, I sharpen.) Apex of leaf gradually pointed. (Plate I., Fig. E.)
- Acute.** (L. *acutus*, p.p. of *acuo*, I sharpen.) Pointed at the apex. (Plate VII., Fig. A.)
- Adnate.** (L. *adnatus*, p.p. of *adnascor*; *ad*, to; *nascor*, to be born.) Growing near to, as when the filament grows up against the anther.
- Adpressed, Appressed.** (L. *ad*, to; *pressus*, *-a*, *-um*, compressed, close,—*premo*, I press.) Closely pressed to the surface.
- Æcidiospore.** (Gr. *aikia*, injury; *spora*, a seed.) A spore formed by abstriction in an æcidium.
- Æcidium.** (Gr. *aikia*, injury.) The cup-shaped organ in which the spores are produced.
- Alternate.** (L. *alternatus*, p.p. of *alterno*; *alter*, another.) Placed one above the other on opposite sides of the stem. (Plate VII.)
- Amentum or Catkin.** (L. *amentum*, a strap or thong.) A deciduous spike bearing unisexual flowers. (Plate II., Figs. D¹, D².)
- Amplexicaul.** (L. *amplexus*, p.p. of *amplector*; *ambi*, around, *plecto*, I twine; *caulis*, a stem.) Leaves encircling the stem at their base.
- Andro-dioecious.** (Gr. *aner*, *andros*, a man, a male; *di*, twice; *oikos*, a house.) Having perfect flowers in one individual, and staminate only in another.
- Andrœcium.** (Gr. *andreiōs*, male; *oikos*, a house.) The outermost whorl of the reproductive organs of the flower, consisting of one or more stamens.
- Anemophilous.** (Gr. *anemos*, wind; *philos*, loved.) Fertilised by the wind.
- Anthers.** (Gr. *antheros*, flowery, blooming; *anthos*, a flower.) The hollow pollen box at the summit of the stamen; usually divided by the filament into two halves or lobes.
- Apetalous.** Without petals.
- Apiculate.** (L. *apex*, *-icis*, a point.) Terminated in a little point.
- Apocarpous.** (Gr. *apo*, separate; *karpos*, a fruit.) Pistils having separate carpels. (Plate XVIII.)
- Appendiculate.** (L. *appendicula*, dim. of *appendix*; *ad*, to; *pendere*, to hang.) With appendages at the throat.
- Approximate.** (L. *approximatus*, p.p. of *approximo*; *ad*, to; *proximus*, nearest.) Near together.
- Arborescent.** (L. *arborescens*, p.p. of *arboresco*, to grow to a tree.) Having a tendency to become a tree.
- Aril.** (L.L. *arilli*, dried grapes; L. *areo*, I am dry.) An extra covering of the fertilised ovule or seed, usually fleshy and coloured, often falling off when dry.
- Ascus.** (Gr. *askos*, a bag, a wine-skin.) A large cell or spore-case, within which spores, usually eight in number, are developed.
- Astringent.** (L. *astringo*; *ad*, to; *stringo*, I close.) Rough to the taste, causing contraction.
- Attenuate.** (L. *attenuatus*, p.p. of *attenuo*; *ad*, to; *tenuis*, thin.) Tapering off.
- Awns.** (M.E. *awn*; *agun*; Ice. *ögn*, chaff, husk; Ger. *ahne*, beard of corn or grass; *ac*, sharp.) Small bristle-like appendages.
- Axil.** (L. *axilla*, the armpit.) The angle between leaf or bract and the axis bearing it.
- Axillary.** (L. *axilla*, the armpit.) Growing in

GLOSSARY

- the angle formed between leaf and stem. (Plate IX., Fig. B.)
- Baccate.** (L. *baccatus*; *bacca*, a berry.) Berry-like.
- Base.** (Gr. *basis*, a step, a foundation; *baino*, to step.) Part nearest insertion.
- Basidia.** (Gr. *basis*, stepping, base; *baino*, to go.) Mother cells from which spores are abjoined.
- Basifixed.** (Gr. *basis*, a step; L. *figo*, *fixi*, *fixum*, I fix, attach.) Base of anther joined to filament.
- Basilar or Gynobasic.** (Gr. *basis*, a step.) When the style springs from the base of the ovary.
- Berry.** (A.S. *berie*, a berry.) A succulent fruit which does not open, and which contains seeds buried in pulp. (Plate III., Figs. 16, 17.)
- Binate or Bifoliate.** (L. *bini*, *-æ*, *-a*, two by two, a pair; *bis*, twice; *folium*, a leaf.) Having only two leaflets.
- Bipinnate.** (L. *bis*, twice; *pinnatus*—*pinna* = *penna*, a feather.) With leaflets themselves pinnately divided. (Plate I., Fig. M.)
- Blade.** (A.S. *blaed*.) The fully expanded part of a leaf.
- Bracteate.** (L. *bractea*, a thin plate of metal.) Bearing bracts.
- Bracteole.** (L. *bractea*, a thin plate of metal.) A small bract between the normal bract and the individual flower.
- Bracts.** (L. *bractea*, a thin plate of metal.) Leaf-like organs growing between the leaves and the flowers.
- Bud-scales.** (M.E. *budde*; allied to the Dutch *bot*, a bud; O.Fr. *boton*, a bud; *boter*, to bud; A.S. *sceale*, a shell, a husk.) Scales enveloping the bud.
- Bullate.** (L. *bullatus*, p.p. of *bullo*, to bubble; *bulia*, a bubble.) Blistered, puckered, inflated.
- Caducous.** (L. *caducus*; *carlo*, I fall.) Falling before the opening of the flower.
- Calyx.** (Gr. *kalyx*; *kalypto*; to cover.) The outer whorl of the flower.
- Calyx-tube.** (Gr. *kalur*, a covering; Fr. *tube*—L. *tubus*, a tube; *tuba*, a trumpet.) The outer whorl of the flower, consisting of sepals.
- Campanulate.** (L. *campanula*, dim. of *campana*, a bell.) Bell-shaped.
- Canescent.** (L. *canesco*, I become gray, hoary; *caneo*, I am gray.) Hoary, approaching to white.
- Capitate.** (L. *capitatus*; *caput*, the head.) Growing in a head.
- Capitulum.** (L. dim. of *caput*, a head.) An indefinite inflorescence with shortened axis and sessile flowers. (Plate II., Figs. F, F¹, F².)
- Capsule.** (L. *capsula*, a small box.) A form of fruit which opens and disperses the seeds. (Plate III., Figs. 7–9.)
- Carcerulus.** (L. *carcer*, a prison.) A fruit of four or more small nutlets or achenes. (Plate III., Figs. 18, 19.)
- Carpellary scale.** (Gr. *karpos*, a fruit; A.S. *sceale*, a husk.) The outer of the two scales in a cone.
- Carpels.** (Gr. *karpos*, a fruit.) The parts of the pistil which, when ripened, form the fruit.
- Cartilaginous.** (L. *cartilago*; Gr. *kartilos*.) Hard and tough, like cartilage.
- Caryopsis.** (Gr. *karyon*, a nut; *opsis*, an appearance.) An achene in which the membranous pericarp adheres closely to the side.
- Catkin or Amentum.** (M.D. *katteken*, dim. of *katte*, a cat.) A deciduous spike bearing unisexual flowers, having a fancied resemblance to a cat's tail. (Plate II., Figs. D¹, D².)
- Cauline.** (L. *caulis*, a stem; Gr. *kaulinos*; *kaulos*, a stalk.) Leaves growing upon the stem.
- Ciliate.** (L. *cilium*, an eye-lash.) Having a hairy fringe.
- Cladode.** (Gr. *klavlos*, a young branch, a shoot.) A flattened and leaf-like branch.
- Clavate.** (L. *clava*, a club.) Club-shaped, gradually thickened towards the top.
- Claw.** (A.S. *clawu*, akin to *cleave*; A.S. *clifan*, to stick or hold on.) The stalk-like narrow base of some petals.
- Composite.** (L. *compositus*, p.p. of *compono*; *com*, together; *pono*, *positum*, I place.) Flowers arranged in a dense head or capitulum.
- Compound.** (O.E. *compone*, *compoune*, with *d* added; L. *compono*, *com*, together, and *pono*, *positum*, I set or put.) Having the lamina cut into a number of distinct pieces called leaflets.
- Conceptacle.** (L. *conceptaculum*; *concipere*, *-ceptum*, to conceive.) A cavity enclosing the reproductive cells.
- Concolor.** (L. *con*, together; and *color*.) Of one colour throughout.
- Cone.** (L. *conus*; Gr. *konos*, a peak, a peg; root *ka*, to sharpen.) A catkin, the carpels of

GLOSSARY

- which are scale-like, spread open, and bear seeds. Also called a Strobilus. (Plate III., Figs. 32-34.)
- Conidia.** (Gr. *konis*, dust.) Spores which are asexually produced.
- Connate.** (L. *L. connatus*, p.p. of *connascor*; *con*, together; *nascor*, *natus*, to grow.) United at the base.
- Connective.** (L. *connecto*; *con*, together; *necto*, I bind.) The portion of the filament which unites the anther lobes.
- Connivent.** (L. *conniveo*, I close the eyes; *con*, together; *nico*, I wink.) Converging, having a gradually inward direction.
- Conoid.** (Gr. *konos*, a peak; *eidōs*, form.) Cone-shaped.
- Convolute.** (L. *convolutus*, p.p. of *convolveo*; *con*, together; *volvo*, *volutus*, I roll.) Rolled up from one side to the other.
- Cordate.** (L. *cor*, *cordis*, the heart.) Heart-shaped, hollowed at base (Plate I., Fig. I.)
- Coriaceous.** (L. *coriaceus*; *corium*; Gr. *chorion*, skin, leather.) Leathery.
- Corolla.** (L. *corolla*, dim. of *corona*, a crown.) The second whorl of the flower, usually coloured, consisting of petals.
- Corollifloræ or Gamopetalæ.** Dicotyledons in which the petals are united.
- Corona or Paracorolla.** (Gr. *para*, besides.) Subsidiary organs of a petaloid character attached to the corolla.
- Corymb.** (L. *corymbus*; Gr. *korymbos*, the uppermost point; *korys*, a helmet.) A racemose inflorescence forming a flat-topped head. (Plate II., Fig. C.)
- Cotyledons.** (Gr. *kotyledon*, a socket; *kotyle*, a cup.) The fleshy lobes within the seed.
- Crenate.** (L. *crena*, a notch.) With rounded teeth.
- Cuneate.** (L. *cuneatus*, p.p. of *cuneo*; *cuneus*, a wedge.) Having shape of a wedge. (Plate I., Fig. J.)
- Cupule.** (L. *cupula*, dim. of *cupa*, a tub.) A cup formed of bracts, growing round and enclosing the fruit. (Plate III., Fig. 3.)
- Cuspidate.** (L. *cuspidatus*, p.p. of *cuspidō*, I sharpen; *cuspis*, a point.) Suddenly narrowed at top and prolonged into a point.
- Cyme.** (Gr. *kuma*, a sprout, a wave.) A general name for an indefinite inflorescence.
- Cynarrhodium.** (Gr. *cyn*, a combining form; *rhodon*, a rose.) An assemblage of achenes within a hollow receptacle. (Plate III., Figs. 30, 31.)
- Cypselā.** (Gr. *kypselē*, any hollow vessel.) An inferior, one-celled fruit, hard and dry, often crowned by a pappus. (Plate III., Figs. 1, 2.)
- Deciduous.** (L. *deciduus*, *decido*; from *de*, off; *cado*, I fall.) Falling off.
- Decurrent.** (L. *decurrēns*, pr.p. of *decurro*; *de*, down; *curro*, *cursum*, I run.) Leaves with base running along the stem.
- Decussate.** (L. *decussatus*, p.p. of *decusso*, I divide in the form of an X; *decussis*, ten.) Two pairs of leaves arranged at right angles, thus crossing in the form of a cross.
- Dehiscent fruits.** (L. *dehiscens*, pr.p. of *dehisco*; *de*, off, and *hisco*, I gape.) Those which break when ripe.
- Dentate.** (L. *dentatus*; *dens*, *dentis*, a tooth.) Toothed.
- Denticulate.** (L. *denticulus*, dim. of *dens*, a tooth.) Minutely toothed.
- Diadelphous.** (Gr. *dis*, twice; *adelphos*, a brotherhood.) Stamens arranged in two bundles.
- Dichasium or Dichotomous Cyme.** (Gr. *dichasio*, division; *dicha*, in two; Gr. *dichotomos*, *dicha*, in two, *temno*, to cut.) An inflorescence in which the axis ends in a terminal flower after producing two daughter axes. (Plate II., Fig. H.)
- Dichlamydeous.** (Gr. *dis*, twice; *chlamus*, a cloak.) Flowers with both calyx and corolla.
- Dichogamy.** (Gr. *dicha*, in two; *gamos*, a marriage.) An arrangement to bring about cross-fertilisation through the stamens and pistil ripening at different times.
- Dichotomous.** (Gr. *dichotomos*; *dicha*, in two; *temno*, to cut.) Forked.
- Diclinous.** (Gr. *dis*, twice; *klinē*, a bed; *klino*, to recline.) Having stamens and pistils in different flowers, each being unisexual.
- Dicotyledons.** (Gr. *dis*, twice; *kotyledon*, *kotyle*, a cup.) Plants having two cup-shaped leaves or lobes in the seed.
- Didynamous.** (Gr. *dis*, twice; *dynamis*, power.) Having two long and two short stamens.
- Digitate.** (L. *digitatus*, having fingers; *digitus*, a finger.) Radiating like fingers.
- Diœcious.** (Gr. *dis*, twice; *oikos*, a house.) Having staminate and pistillate flowers on separate plants.
- Discolor.** (Gr. *dis*, twice; and *color*.) Of two colours, as in the scales of catkins.

GLOSSARY

- Disk.** (A.S. *disc*; L. *discus*; Gr. *diskos*, a round plate, a quoit; *diskein*, to cast.) An outgrowth at the base of stamens or ovary, generally forming a nectary.
- Distichous.** (Gr. *distichos*; *dis*, twice; *stichos*, a line.) Arranged in two rows.
- Drupe.** (L. *drupa*; Gr. *dryppa*, an over-ripe olive; *drypepēs*, very ripe; *drys*, a tree; *pepto*, to ripen.) A succulent fruit containing a stone. (Plate III., Figs. 20-22.)
- Drupel.** (L. *drupa*; Gr. *dryppa*, an over-ripe olive; *drypepēs*, ripened on the tree,—*drys*, a tree, and *pepto*, to ripen.) A little drupe.
- Eglandulose.** (L. *e*, and *glandula*, a gland; dim. of *glands*, *glandis*, an acorn.) Without glands.
- Elliptical.** (L.L. *ellipticus*; Gr. *elleiptikos*; *elleipsis*.) Leaves somewhat narrow, being broad at the middle, and having rounded extremities. (Plate I., Fig. E.)
- Embryo.** (Gr. *embryon*; *em*, in; *bryo*, to swell.) The young plant in the seed.
- Endophytal.** (Gr. *endon*, within; *phyton*, a plant.) Originating within the tissues of the host plant.
- Endosperm.** (Gr. *endon*, within; *sperma*, a seed.) The albumen of a seed; the nutritive substance found within the embryo-sac and serving for the early support of the embryo.
- Entire.** (Fr. *entier*; L. *integer*, whole; from *in*, not; *tango*, I touch.) Leaves having a margin without indentations. (Plate IX.)
- Entomophilous.** (Gr. *entoma*, insects; *philos*, loved.) Flowers pollinated by insects.
- Epicalyx.** (Gr. *epi*, upon; *kalyx*; *kalypto*, to cover.) A series of bracts outside the calyx.
- Epigynous.** (Gr. *epi*, upon; *gyne*, woman.) The attachment of petals and stamens upon the ovary. (Plate XXVIII., Fig. C.)
- Epipetalous.** (Gr. *epi*, upon; *petalon*, a leaf.) the attachment of stamens to the petals. (Plate XLIV., Fig. C.)
- Epiphyllous.** (Gr. *epi*, upon; *phyllon*, a leaf.) Stamens attached to the perianth.
- Epiphytal.** (Gr. *epi*, upon; *phyton*, a plant.) Growing on the surface of the host plant.
- Erose.** (L. *erosus*, p.p. of *erodo*; *e*, off; *rodo*, I gnaw.) Appearing as if gnawed.
- Etærio.** (Gr. *hetairia*, society; *hetairos*, a companion.) An aggregation of several ripened ovaries. (Plate III., Figs. 26-29.)
- Exserted.** (L. *exsertus*; p.p. of *exsero*, I stretch out or forth; *ex*, out; *sero*, I join.) Protruding beyond the throat of the corolla.
- Exstipulate.** (L. *ex*, without; *stipula*, a stalk; dim. of *stipes*.) Without stipules.
- Extra-axillary.** (L. *extra*, beyond, outside of,—*ex*, out, and *tra*, imper. of the obsolete *tro*, *traro*; *axilla*, the armpit.) Growing from above or below the axils of the leaves or branches.
- Falcate.** (L. *falcatus*; *falc*, a sickle.) Curved like the blade of a reaping-hook.
- Fascicled.** (L. *fasciculus*, dim. of *fascis*, a bundle.) In a tuft.
- Fastigate.** (L. *fastigatus*, p.p. of *fastigo*, I raise to a point; *fastigium*, the top, a gable end.) Sloping to a point.
- Female flowers.** Those containing a pistil only, or occasionally with rudimentary stamens.
- Ferruginous.** (L. *ferrugineus*; *ferrugo*, iron-rust; *ferrum*, iron.) Coloured like iron-rust.
- Filament.** (L. *filum*, a thread.) The thread-like stalk supporting the anther.
- Filiform.** (L. *filum*, a thread.) Having the form of a thread.
- Fimbriate.** (L. *fimbriatus*; *fimbria*, fibres, threads, fringe; *fibra*, a fibre.) Fringed.
- Fistular.** (L. *fistula*, a pipe.) Hollow like a pipe.
- Flaccid.** (L. *flaccidus*; *flaccus*, flabby.) Limp.
- Floret.** (Fr. *fleurette*; L.L. *florettus*, dim. of *flos*, a flower.) A separate little flower in an aggregation of flowers. (Plate II., Fig. F².)
- Floriferous.** (L. *flos*, *floris*, a flower; *fero*, to bear.) Flower-bearing.
- Foliaceous.** (L. *foliaceus*; *folium*, a leaf.) Leaf-like in appearance.
- Follicle.** (L. *folliculus*; dim. of *follis*, a wind ball or bag.) A capsule opening along one of its edges.
- Free central placentation.** Ovules arranged on a column in the centre of the ovary perfectly free from the walls.
- Fugacious.** (L. *fugas*, *fugacis*; from *fugio*, I flee.) Falling off very early.
- Fugitive.** (L. *fugitivus*; from *fugio*, I flee.) Perishable, as in the petals.
- Furfuraceous.** (L. *furfur*, bran.) Mealy, scaly, scurfy.
- Fuscous.** (L. *fuscus*, akin to *furrus*.) Dingy, dark, dusky.
- Galbule or Galbulus.** (L. *galbulus*, the nut of the cypress.) A berry-like fruit formed

GLOSSARY

- from the scales of a cone which have become succulent and consolidated into a uniform mass.
- Gamopetalæ** or **Corollifloræ**. (Gr. *gamos*, a marriage; *petalon*, a leaf.) Dicotyledons with united petals.
- Gamopetalous**. Having petals united.
- Geminate**. (L. *geminare*, -atum, to pair; *geminus*, twin.) In pairs.
- Glabrescent**. (L. *glaber*, smooth, akin to *glubo*, to peel; Gr. *glapho*, to carve.) Almost glabrous.
- Glabrous**. (L. *glaber*, smooth, without hairs, a beardless favourite slave.) Smooth; having no hairs or any unevenness.
- Gland**. (Fr. *glande*, L. *glans*, *glandis*, an acorn; from likeness in shape.) A small cellular spot consisting of secretory tissue.
- Glandular disk**. Glandular tissue on the floral axis.
- Glans** or **Nut**. (L. *glans*, *glandis*, an acorn, a beech-nut, &c.) A fruit with a pericarp hard and leathery, or of a woody character. (Plate III., Figs. 3-6.)
- Glaucous**. (L. *glaucus*, bluish; Gr. *glaukos*, blue or grey; originally gleaming, akin to *glauco*, to shine.) Sea-green, and usually waxy.
- Globose**. (L. *globo*; *globatus*, to form into a ball; *globus*, a ball.) Rounded, spherical.
- Glomerule**, or **Glomerulus**. (L. *glomus*, a ball of yarn; *globus*, a ball.) A cyme arranged in a compact head. (Plate II., Fig. K.)
- Glumaceous**. Having flowers invested by scaly bracts.
- Glumes**. (L. *glumo*, husk; *glubo*, to peel off bark.) The scaly bracts in grasses and sedges.
- Gynæcium**. (Gr. *gyne*, a woman; *oikos*, a house.) The pistil or female organ of the flower.
- Gynobasic**. (Gr. *gyne*, a female; *basis*, a base.) Having the central floral axis prolonged beyond the calyx, with the carpels attached to the base.
- Gynophore**. (Gr. *gyne*, a female; *phero*, I bear.) An elongation of the thalamus bearing the ovary.
- Haustoria**. (L. *haustus*, a drinking; *haurio*, *hausi*, *haustum*, I draw up.) The suckers by which the mycelium attaches itself to the host plant.
- Hermaphrodite**. (Gr. *Hermaphroditos*, the son of *Hermes* and *Aphrodite*.) Flowers containing stamens and pistils; bisexual.
- Hispid**. (L. *hispidus*, rough.) Having rough, bristle-like hairs.
- Hoary**. (A.S. *har*, hoary, gray.) Having gray hairs.
- Hypanthodium**. (Gr. *hypo*, under; *anthos*, a flower.) The fleshy, enlarged, hollow receptacle of the Fig. (Plate II., Figs. I, I¹, I².)
- Hypocrateriform**. (Gr. *hypokraterion*, salver; *hypo*, under; *krater*, a bowl.) Salver-shaped.
- Hypogynous**. (Gr. *hypo*, under; *gyne*, a female.) Having petals or stamens inserted below the pistil. (Plate VI., Fig. E.)
- Imbricate**. (L. *imbricatus*, p.p. of *imbrico*, I cover with tiles.) Foliage or flower leaves overlapping one another in bud, but not regularly.
- Imparipinnate**. (L. *impar*, uneven; *pinnatus*, winged.) Leaves in which the leaflets are arranged in pairs with a terminal odd leaflet. (Plate I., Fig. L.)
- Imperfect flowers**. (L. *in*, not; *perfectus*, complete.) Having either pistils or stamens, but not both.
- Incomplete**. (L. *in*, not; *completus*, p.p. of *compleo*; *com*, intensive; *pleo*, I fill.) Flowers in which any of the floral whorls are absent.
- Indefinite**. (L. *indefinitus*; *in*, not; *definitus*, p.p. of *definio*, I set bounds to.) Numerous, but of no definite number.
- Indehiscent**. (L. *in*, not; *dehisco*, to split open.) Fruits which do not break when ripe.
- Inferior**. (L. *inferior*, comp. of *inferus*, low, from *infra*, beneath.) Placed below; as calyx beneath the ovary (Thalamifloræ); or ovary when calyx is above (Gamopetalæ).
- Inflorescence**. (L. *inflorescens*, p.p. of *infloresco*, to begin to blossom.) The arrangement of the flowers upon the stem.
- Infra-axillary**. (L. *infra*, beneath; *axilla*, the armpit.) Below the axil of the leaf.
- Infundibuliform**. (L. *infundibulum*, a funnel; *in*, in; *fundere*, to pour.) Funnel-shaped.
- Internodes**. (L. *internodium*; *inter*, between, *nodus*, a knot.) The stretches of shoots between the nodes.
- Interruptedly pinnate**. (L. *interruptus*, p.p. of *interrumpo*; *inter*, between; *rumpo*, I break.) Pairs of large leaflets alternating with pairs of small ones.
- Introrse**. (L. *introrsus* (for *introversus*); *intro*,

GLOSSARY

- within, *versus*, p.p. of *verto*, I turn.) Anthers turned to face the floral axis.
- Involucre.** (L. *involucrum*, a covering; *involvere*; *in*, in; *volvo*, I roll.) The whorl of bracts around a single flower, or a head of flowers.
- Irregular.** (O.F. *irregulier*; L.L. *irregularis*; *in*, not; *regularis*; *regula*, a rule; *regere*, to rule.) Flowers having petals or sepals unsymmetrical.
- Irritable.** (L. *irritabilis*; *irrito*, I excite.) Responding to the touch.
- Keel.** (A.S. *ceol*, a ship; *cale*, the bottom of a ship.) The two innermost petals of a papilionaceous flower. (Plate XII., Fig. B.)
- Labiate.** (L. *labium*, a lip.) Petals or sepals arranged in a two-lipped manner.
- Laciniate.** (L. *lacinia*, a fringe, a border.) Cut into narrow incisions or lobes.
- Lamina.** (L. a plate, a leaf.) The expanded portion of the leaf.
- Lanceolate.** (L. *lanceolatus*; *lanceola*, dim. of *lancea*, a lance.) Leaves which are lance-shaped—long, narrow, and pointed. (Plate I., Fig. D.)
- Latex.** (L. *lac*, *lactis*, milk.) Milk-like juice.
- Legume.** (Fr. *légume*; L. *legumen*, pulse; *lego*, I gather.) A one-celled pod opening by its edges. (Plate III., Figs. 14, 15.)
- Lenticel.** (Fr. *lenticelle*, dim. of *lenticule*; L. *lenticula*, dim. of *lens*, a lentil.) Cork-like spots on twigs, branches, and stems which admit air.
- Ligulate.** (L. *ligula*, a strap; dim. of *lingua*, a tongue.) A strap-shaped corolla, the lower part forming a tube, and the upper portion flattened out. (Plate II., Fig. F².)
- Linear.** (L. *linearis*; *linea*, a line, a linen thread.) Leaves long and narrow with parallel edges. (Plate I., Fig. B.)
- Lobe.** (Gr. *lobos*; *lepo*, to peel.) A more or less rounded portion of a leaf.
- Lomentum.** (L. *lomentum*, a paste of bean-meal and rice for preserving the skin; *lavo*, *lotum*, I wash.) An indehiscent legume with constrictions or transverse articulations between the seeds.
- Lyrate.** (L.; Gr. *lyra*, a harp.) A pinnatifid leaf with the terminal lobe large and rounded, and the side lobes getting smaller towards the base.
- Male flowers.** Those containing stamens only, or occasionally with a rudimentary ovary.
- Margin.** (O.F. *marginé*; L. *margo*, *marginus*, a brink, a margin.) The edge of the leaf.
- Membranous.** (L. *membrana*, a thin skin; *membrum*, a limb.) Thin, like soft paper in texture.
- Mericarp.** (Gr. *meros*, part; *karpos*, a fruit.) The one-seeded portions into which some fruits break up.
- Midrib.** (A.S. *mid*, middle; *ribb*, rib.) A strand of vascular tissue running through the centre of the leaf.
- Mitraciform.** (Gr. *mitra*, a belt, a turban.) Conical, and somewhat dilated at the base.
- Monadelphous.** (Gr. *monos*, alone; *adelphos*, a brother.) Stamens united by their filaments into one bundle. (Plate XIII., Fig. F.)
- Moniliform.** (L. *monile*, a necklace; *forma*, form.) Like a string of beads.
- Monœcious.** (Gr. *monos*, one; *oikos*, a house.) Having stamens and pistils in separate flowers on the same individual plant.
- Mucronate.** (L. *mucronatus*; *mucro*, a sharp point.) Having a small, sharp point.
- Multicostate.** (L. *multus*, many; *costa*, a rib.) Leaves with a number of chief veins.
- Mycelium.** (Gr. *mykes*, a fungus; *elos*, a nail or wart.) The delicate interwoven threads from which the fungus is developed.
- Nectary.** (L. *nectar*, honey; Gr. *nektar*, drink of the gods.) Glands for the secretion of nectar.
- Neuter.** (L. *neuter*, neither the one nor the other; *ne*, not; *uter*, which of two.) Of neither sex; sterile. (Plate XXXIV.)
- Nodes.** (L. *nodus*, a knot.) Places where leaves are attached to the shoot.
- Nut.** (A.S. *knut*; L. *nut*, a nut.) An achene with hardened walls. (Plate III., Figs. 3-6.)
- Nutlet.** A little nut.
- Obcordate.** (L. *ob*, inversely; *cor*, the heart.) Inversely heart-shaped.
- Oblong.** (L. *ob*; *longus*, long.) A leaf which is long, and fairly broad. (Plate I., Fig. F.)
- Obovate.** (L. *ob*, inversely; *ovatus*, egg-shaped; *orum*, an egg.) Inversely egg-shaped.
- Obsolete.** (L. *obsoletus*, p.p. of *obsoleo*, I go out of use; *ob*, and *soleo*, I use.) All vanished.
- Obtuse.** (L. *obtusus*, p.p. of *obtundo*, blunt; *ob*, and *tundo*, *tudi*, I beat.) Bluntly rounded at apex. (Plate I., Fig. K.)
- Opposite.** (L. *oppositus*, p.p. of *oppo*; *ob*,

GLOSSARY

- before; *pono*, I place. Leaves inserted in pairs on opposite sides of stem. (Plate XXXVII.)
- Orbicular.** (L.L. *orbicularis*; *orbiculus*, dim. of *orbis*, a circle.) Leaves nearly circular. (Plate I., Fig. G.)
- Oval.** (Fr. *ovale*; L.L. *ovalis*; L. *ovum*, an egg.) In shape of an ellipse. (Plate I., Fig. E.)
- Ovary.** (L. *ovum*, an egg.) The lowest part of the pistil containing the ovules.
- Ovate.** (L. *ovatus*, egg-shaped; *ovum*, an egg.) Egg-shaped. (Plate I., Fig. H.)
- Ovule.** (L.L. *ovulum*, dim. of *ovum*, an egg.) The seed of a plant in its rudimentary state, growing from the placenta.
- Ovuliferous scale.** The scale which bears the ovule.
- Palea.** (L. *palea*, chaff.) The inner scale-like glume of grasses.
- Palmate.** (L. *palmatus*; *palma*, the palm of the hand.) A leaf with divisions spreading out like an open hand.
- Panicle.** (L. *panicula*, double dim. of *panus*, thread wound on a bobbin)=A tuft on plants. A raceme in which the branches are themselves branched. (Plate II., Fig. B.)
- Papilionaceous.** (L. *papilio*, *-onis*, a butterfly) = Butterfly-shaped. A blossom consisting of five petals; one large posterior petal called the standard or vexillum, two anterior petals forming the keel, and two lateral called the wings. (Plate XIII., Fig. B.)
- Pappus.** (L. *pappus*, thistle-down; Gr. *pappos*, down.) A calyx in which the sepals are converted into numerous hairs surrounding the ovary. (Plate III., Fig. 2.)
- Paraphysis.** (Gr. *paraphysis*, an offshoot; *para*, beside; *phyllon*, a leaf.) An erect sterile filament accompanying the sexual organs.
- Parietal.** (L.L. *parietalis*; L. *paries*, *parietis*, a wall.) The attachment of ovules to the walls of the ovary.
- Paripinnate.** (L. *par*, equal; *pinnatus*, from *pinna* (= *penna*), a feather.) A leaf with an equal number of lobes arranged in pairs on opposite sides of the central stalk.
- Patens, Patent.** (L. *patens*, *-entis*, pr.p. of *patere*, to lie open.) Spreading widely open, or diverging from an axis.
- Pectinate.** (L. *pectinatus*; *pecten*, a comb; *pecto*, *perum*, to comb.) Comb-like.
- Pedate.** (L. *pedatus*, p.p. of *pedo*, to furnish with feet; *pes*, *pedis*, a foot.) A palmate leaf with the lobes deeply divided.
- Pedicel.** (L. *pediculus*, dim. of *pes*, *pedis*, a foot.) The flower-stalk connecting the flower with the peduncle.
- Pedicellate.** (L. *pediculus*, dim. of *pes*, *pedis*, a foot.) On a little stalk.
- Peduncle.** (L.L. *pedunculus*, dim. of *pes*, *pedis*, a foot.) The stalk upon which the flowers are borne.
- Pedunculate.** Having a stalk.
- Peltate.** (L. *peltatus*, armed with a shield; *pelta*; Gr. *petlē*, a small half-moon shield.) Having a stalk in the middle of the lower surface.
- Perfect.** (L. *perfectus*, p.p. of *perficio*; *per*, thoroughly; *facio*, I do)=Complete. Flowers having both stamens and pistil.
- Perianth.** (Gr. *peri*, around; *anthos*, a flower.) Applied to the calyx and corolla when they are alike in appearance, especially in Monocotyledons.
- Pericarp.** (Gr. *perikarpion*; *peri*, around; *karpos*, fruit.) The outer layer, covering, shell, or rind of fruits.
- Peridium.** (Gr. *peridion*, dim. of *pera*, a wallet.) The outer coat or coats of a fungus, forming an investment of the fructification.
- Perigynous.** (Gr. *peri*, around; *gynē*, a female.) Petals or stamens attached round the ovary. (Plate IX., Fig. D.)
- Perithecium.** (Gr. *peri*, around; *thēkē*, cover.) A narrow-mouthed receptacle containing the fructification.
- Persistent.** (L. *persistens*, pr.p. of *persisto*; *per*, through; *sisto*, I cause to stand; *sto*, to stand.) Remaining beyond the usual time, as when a calyx remains after fruiting.
- Petal.** (Gr. *petalon*, a leaf; neuter of *petalos*, spread out)=A flower-leaf. A separate part of the corolla.
- Petaloid.** (Gr. *petalōdēs*; *petalon*, a leaf; *eidōs*, form.) Having the form or colour of petals; often applied to a division of the perianth.
- Petiolate.** A leaf having a blade and petiole present.
- Petiole.** (L. *petiolus*, a little foot; a fruit-stalk; dim. of *pes*, *pedis*, a foot.) The foot-stalk of a leaf.
- Pilose.** (L. *pilosus*, *pilus*, a hair.) Softly hairy.
- Pinnate.** (L. *pinnatus*, from *pinna* (= *penna*), a feather.) A leaf with the leaflets arranged in pairs, like the barbs of a feather.

GLOSSARY

- Pistil.** (L. *pistillum*, a pestle; *pistus*, p.p. of *pisto*, to pound.) The inner whorl of floral organs, usually divided into ovary, style and stigma. So called from its likeness to the pestle of a mortar. (Plate VI., Fig. E.)
- Pistillate.** A flower having a pistil, but no stamens. (Plate LXI.)
- Placenta.** (L. *placenta*, a cake; akin to Gr. *plakous*, a flat cake, from *plax*, *plakos*, anything flat or broad.) The part of the ovary to which the ovules are attached. (Plate XXVIII., Fig. E.)
- Pollen.** (L. *pollen*, fine flour, mill-dust.) The microscopic dust within the anthers.
- Pollination.** The transference of pollen to the stigma of a flower, especially by the aid of insects or other external agents.
- Polyadelphous.** (Gr. *polys*, many; *adelphos*, a brother.) The cohesion of the stamens into several bundles.
- Polygamous.** (Gr. *polygamos*; *polys*, many; *gamos*, marriage.) Having male, female, and hermaphrodite flowers.
- Polypetalous.** (Gr. *polys*, many; *petalon*, a leaf.) A corolla having the petals separate one from another.
- Polysepalous.** (Gr. *polys*, many; L.L. *sepalum*, a sepal; *separatus*, separate.) A calyx in which the sepals are distinct one from the other.
- Pome.** (L. *pomum*, an apple.) A pseudocarp or spurious fruit in which the calyx-tube or receptacle has grown up and surrounded the pistil, in which case the core is the true fruit. (Plate III., Figs. 23-25.)
- Procumbent.** (L. *procumbens*, p.p. of *procumbo*, I bend forward; *pro*, forward; *cubare*, to lie down.) Trailing; without putting out roots.
- Prostrate.** (L. *prostratus*, p.p. of *prosterno*, *prostratum*, I lay flat; *pro*, before; *sterno*, I strew.) Flung on the ground.
- Proterandrous.** (Gr. *proteros*, first; *aner*, a man.) Perfect flowers in which the anthers are mature before the stigma is ready to receive the pollen.
- Proterogynous.** (Gr. *proteros*, first; *gyne*, a woman.) Perfect flowers in which the pistil is mature before the anthers have ripened.
- Pruinose.** (L. *pruinosis*; *pruina*, hoar frost.) Having a waxy bloom.
- Pseudocarp.** Gr. *pseudōs*, false; *karpos*, a fruit.)
- A fruit in which some part of the flower is attached to the ovary.
- Puberulent.** (L. *pubes*, *puber*, downy; *pubes*, the beard.) Having very fine downy hairs.
- Puberulous.** L. *pubes*, *puber*, downy, pubescent.) Minutely pubescent.
- Pubescent.** (L. *pubes*, *puber*, downy.) Softly hairy.
- Pyriform.** (L. *pirum*, a pear; *forma*, form.) Pear-shaped.
- Raceme.** (L. *racemus*, a bunch.) An indefinite inflorescence in which the flowers are connected with the peduncle by pedicels. (Plate II., Fig. A.)
- Receptacle.** (L. *receptaculum*, a receiving vessel or cavity; *receptus*, p.p. of *recipio*; *re*, back; *capio*, I take.) A multicellular organ bearing spores. The upper portion of the flower-stalk upon which the floral leaves are fixed.
- Reflexed.** (L. *reflexus*, p.p. of *reflecto*; *re*, back; *flexere*, to bend.) Turned back on its insertion.
- Regma.** (G. *rhegma*, a fracture; *rhegnymi*, to break.) A fruit which breaks up into one-seeded dehiscent parts called cocci.)
- Regular.** (L. *regularis*; *regula*, a rule; *regere*, to rule.) Having petals alike in general form.
- Reniform.** (L. *renes*, the kidneys; *forma*, form) = Kidney-shaped. A leaf rounded at the apex and hollowed at the base.
- Repend.** (L. *rependus*; *re*, back; *pandus*, bent.) Having the margin uneven, slightly sinuous.
- Reticulate.** (L. *reticulum*, dim. of *rete*, a net.) Nettled in appearance.
- Revolute.** (L. *revolutus*, p.p. of *revolveo*; *re*, back; *volvare*, to roll.) With margin rolled back.
- Rugose.** (L. *rugosus*, wrinkled; *rugā*, a wrinkle.) Wrinkled, corrugated.
- Saccate.** (L. *saccus*, a bag.) Having sepals swollen at the base.
- Salver-shaped.** (L.L. *salvare*, to save = a plate on which anything is presented.) A corolla having a long tube with spreading lobes. Also called Hypocrateriform.
- Samara.** (L. *samara*, elm-seed.) A dry indehiscent, usually one-seeded, fruit, with a wing. (Plate III., Figs. 10-13.)
- Scabrous.** (L.L. *scabrosus*; L. *scaber*; *scabo*, I scratch.) Rough to the touch, like a file.
- Scale leaves.** Small hard leaves peculiar to the Coniferae.
- Scarious.** (O.F. *escorcher*, *escorcer*, to strip off

GLOSSARY

- the skin; L. *excoriare*, to strip the skin from; *ex*, from, *corium*, the skin.) Thin, dry, membranous; brown, as if scorched.
- Secund.** (L. *secundus*, following; *sequor*, I follow.) Unilateral, turning to one side.
- Sepals.** (F. *sépale*; L. *separe*, to separate.) The divisions of the outermost whorl of floral leaves forming the calyx.
- Septate.** (L. *septatus*; *septum*, a partition; *sep̄io*, I hedge in, I fence.) Separated by a partition or septum.
- Serrate.** (L. *serratus*; *serra*, a saw.) Having the margin cut into saw-like teeth pointing towards the apex. (Plate V.)
- Serratulate.** (L. *serrula*, a small saw.) Having little teeth.
- Serrulate.** (L. *serrula*, dim. of *serra*, a saw.) Finely serrate, with very minute notches.
- Sessile.** (L. *sessilis*, low; *sessus*, p.p. of *sedeo*, I sit.) Growing directly from the stem, without a foot-stalk. (Plate XXXVII., Fig. B.)
- Setaceous, Setigerous, Setose.** (L. *setosus*, bristly; *seta* or *saeta*, a bristle, a thick, stiff hair.) Bearing bristles.
- Sinuate.** (L. *sinuatus*, p.p. of *sinuare*, to bend.) A margin with indentations large and somewhat rounded. (Plate XI.)
- Sinus.** (L. *sinus*, a curve.) The interval between two lobes.
- Solitary.** (L. *solitarius*; *solus*, alone.) Flowers growing singly on the peduncle.
- Sorosis.** (Gr. *sōros*, a heap.) A mass of spurious drupes formed by the consolidation of numerous ripening ovaries, each surrounded by the persistent calyx which has become fleshy. (Plate LI., Fig. C.)
- Spathaceous.** (L. *spatha*; Gr. *spathē*, a broad blade.) Bearing, or having the nature of a spathe.
- Spathulate.** (L. *spatula*; *spathula*, dim. of *spatha*, a broad blade.) A leaf which is spoon-shaped; rounded near the apex and narrowing towards the base.
- Spermatia.** (Gr. *sperma*; *speiro*, to sow.) Minute spores (conidia).
- Spike.** (L. *spica*, an ear of corn.) An indefinite inflorescence in which the flowers are arranged on the peduncle in a sessile manner.
- Spikelet.** (L. *spica*, a spike, an ear of corn.) A secondary spike; usually a small collection of florets, as in the grasses.
- Spinescent, Spinose.** (L. *spinescens*, p.p. of *spinesco*, to grow thorny; *spina*, a thorn; *spinus*, thorny.) Having spines.
- Sporidia.** (Gr. *spora*, seed; *speiro*, to sow.) Minute secondary spores (conidia) borne on a promycelium; or an ascospore.
- Sporules.** (Gr. *spora*, seed; *speiro*, to sow.) Secondary spores (sporidia) of uredineous fungi; conidia borne in a perithecia-like receptacle.
- Spur.** (A.S. *spura*; *spora*, akin to *spar* and *spear*.) A prolongation of some part of the flower, usually forming a nectary.
- Squarrose.** (L.L. *squarrosus*, scurfy.) Rough with projecting or deflexed scales; leaves are said to be squarrose when their tips are pointed and very spreading or recurved.
- Stamens.** (L. *stamen*, a thread; *stare*, to stand.) The male organs of the flower, collectively forming the Andrœcium; usually consisting of a filament or stalk, and anther or pollen box.
- Staminate.** Flowers containing stamens but no pistil.
- Staminode.** (L. *stamen*; Gr. *eidos*, resemblance.) An abortive stamen.
- Standard.** (A.S. *standard*; O.F. *estandard*; L. *extendo*; *ex*, out; *tendo*, I stretch.) The largest petal of a papilionaceous flower; also called Vexillum. (Plate XIII., Fig. B.)
- Stellate.** (L. *stellatus*, p.p. of *stello*, set with stars; *stella*, a star.) Star-shaped.
- Stigma.** (Gr. *stigmē*, a point.) The upper portion of the pistil which receives the pollen.
- Stipel.** (L. *stipes*, a stem.) The stipule of a leaflet.
- Stipitate.** (L. *stipes*, a stem.) Stalked.
- Stipule.** (L. *stipula*, a stalk; dim. of *stipes*, a stem.) Small outgrowths attached to the base of the leaf, often leaf-like in character.
- Stipulate.** (L. *stipula*, a stalk, dim. of *stipes*, a stem.) Possessing stipules.
- Striated.** (L. *striatus*, p.p. of *strio*, I hollow out; *stria*, a furrow.) Marked with fine longitudinal lines, streaks, or small grooves or ridges.
- Strobilus.** L.L. *strobilus*, a pine-cone; Gr. *strobilos*, anything twisted; *strepho*, to twist.) A cone—the fruit of Pines and Firs. (Plate III., Figs. 32–34.)
- Stroma.** (Gr. *stroma*, a bed.) The union of mycelial threads into a dense layer bearing sporophores.
- Style.** (L.L. *stylus*, a column; Gr. *stylos*, a

GLOSSARY

- pillar.) The stalk which stands upon the ovary and carries the stigma.
- Subrotund.** (L. *sub*, towards; *rotundus*—*rota*, a wheel.) A leaf which is nearly round.
- Subulate.** (L. *subula*, an awl.) Awl-shaped. (Plate I., Figs. C,¹ C².)
- Sucker.** (A.S. *sucan*, *sugan*, to suck.) A shoot rising from a subterranean stem.
- Suffrutescent.** (L. *sub*, slightly; *frutex*, a shrub.) Slightly shrubby.
- Superior.** (L. *superior*, comp. of *superus*, high; *super*, above.) Placed above.
- Syngenesious.** (G. *syn*, together; *genesis*, generation.) Stamens united by means of their anthers.
- Teleutospore.** (Gr. *teleute*, finishing; *telos*, the end; *spora*, seed; *speiro*, to sow.) The last formed or winter spore of the Rust-fungi. (Uredineæ.)
- Tendril.** (F. *tendrille*; *tendre*; L. *tener*, tender.) A modified leaf or other part of a plant, which, being sensitive to touch, enables the plant to cling to foreign objects for support.
- Terete.** (L. *teres*, *teretis*, rubbed smooth, round; *terere*, to rub.) Cylindroid, but slightly tapering.
- Terminal.** (L.L. *terminalis*; L. *terminus*, a boundary.) Growing singly at the apex of a shoot.
- Ternate.** (L. *terni*, three each; *tres*, three.) A leaf having three leaflets. (Plate I., Fig. K.)
- Testa.** (L. *testa*, a shell.) The outer coat of the seed.
- Tetragonal.** (Gr. *tetragonon*; *tetra*, four; *gonia*, an angle.) Four-angled.
- Thalamifloræ.** (L. *thalamus*, a bed-chamber; *flos*, *floris*, a flower.) The division of Dicotyledons having hypogynous stamens and superior pistil. (Plate VI., Fig. E.)
- Thalamus.** (L. *thalamus*, a bed-chamber.) The end of the flower-stalk to which the flower is attached.
- Throat.** (A.S. *throthe*, the throat.) The aperture of a corolla-tube.
- Thyrus.** (Gr. *thyrsos*, a light, straight shaft.) A panicle-like inflorescence, the branches of which pass into cymes. (Plate II., Fig. G.)
- Tomentose.** (L. *tomentum*, material used for stuffing cushions; akin to *stappa* or *stupa*, tow.) Loosely or woolly haired.
- Trifoliate.** (L. *tres*, three; *folium*, a leaf.) Having three leaflets. (Plate I., Fig. K.)
- Trigonal. Trigonous.** (Gr. *trigonon*; *tri*, *tris*, three; *gonia*, an angle.) Three-angled.
- Tripinnate.** (L. *tres*, three; *pinna*, a feather.) A bipinnate leaf in which the secondary divisions are again divided in a pinnate manner.
- Triquetrous.** (L. *tres*, three; *quetrous*, probably a formative.) Three-sided.
- Truncate.** (L. *truncatus*, p.p. of *trunco*, I cut off; *truncus*, maimed, mutilated.) Sharply cut off at the apex.
- Tubular.** (L. *tubulus*, dim. of *tubus*, -a tube.) Drawn out to a tube.
- Turbinate.** (L. *turbinatus*; *turbo*, *turbinus*, a top.) Top-shaped, like an inverted cone.
- Umbel.** (L. *umbella*, dim. of *umbra*, a shade.) An indefinite inflorescence in which the pedicels spring from one point, and the flowers are brought to the same level. (Plate II., Fig. E.)
- Unguiculate.** (*unguiculus*, dim. of *unguis*, a nail of the finger)=Clawed. Petals which are broad above and form a narrow limb below.
- Unicostate.** (L. *unus*, one; *costa*, a rib.) A leaf having one chief vein—the midrib.
- Unisexual.** (L. *unus*, one; *sexus*, a sex.) Having the stamens and pistil on separate flowers.
- Urceolate.** (L. *urceolus*, dim. of *urceus*, a pitcher.) Urn-shaped.
- Uredospore.** (L. *uredo*, blight; *uro*, I burn.) A non-sexual spore (conidium) in the Rust-fungi which, after germination and the formation of mycelium, gives rise to other euredospores, either alone or together with teleutospores.
- Valvate.** (L. *valvatus*, with folding doors; *valva*, a folding door.) When the young leaves in the bud touch each other latterly, but do not overlap.
- Ventricose.** (L. *venter*, the belly, a swelling.) Swelling unequally, or inflated on one side.
- Versatile.** (L. *versatilis*; *versare*, freq. of *vertere*, to turn.) An anther which swings on top of the filament.
- Verticillaster.** (L.L. *verticillus*, dim. of *vertere*, a whorl; *aster*, a star.) A cymose inflorescence in which the flowers stand tier upon tier, having the appearance of whorls. (Plate II., Figs. J, J¹.)
- Vexillum.** (L. *vexillum*, an ensign, a standard;

GLOSSARY

- vehere*, to carry.) The large posterior petal of a papilionaceous flower. Also called the standard. (Plate XIII., Fig. B.)
- Villose, Villous.** (L. *villosus*, shaggy, rough; *villus*, a tuft of hair.) Velvet-like hairiness.
- Whorl.** (Contr. of M.E. *whorwhil*; A.S. *wheorfan*, to turn.) Leaves or parts of flowers arranged in a circle around the central axis.
- Whorled.** Inserted at the same level around the axis.
- Wing.** (Sw. and Da. *vinge*, a wing.) One of the side petals in a papilionaceous flower. (Plate XIII., Fig. B.)
- Winged.** Having a membranous margin.
- Zoospore.** (Gr. *zoon*, an animal; *zao*, to live; *spora*, seed; *speiro*, to sow.) A spore possessing the power of independent motion, generally by means of cilia.

LATIN ROOTS USED IN BOTANICAL NOMENCLATURE

- Acer, acris, acre.* Sour, tart, acrid.
- Aculeatus, a, um.* Prickly, stinging (*aculeus*, a prickle, a sting; *acus*, a needle; *acies*, a sharp point).
- Acuminata, e.* Sharp-pointed (*acumen*, a sharp point; *acuo*, I sharpen).
- Affinis.* Resembling (*lit.* related by marriage; *ad*, to; and *finis*, a boundary).
- Alatus, a, um.* Winged (*ala*, a wing).
- Albus, a, um.* White, pale.
- Alpester, tris, tre.* } Pertaining to the Alps, or high
Alpinus, a, um. } ground.
- Angustifolia.* Narrow-leaved (*angustus, a, um*, narrow; and *folium*, a leaf).
- Aquaticus, a, um* } Living or growing in water
Aquatilis. } (*aqua*, water).
- Arborescens.* } Tree-like (*arbor, oris*, a tree).
Arboreus, a, um. }
- Argenteus, a, um.* Silvery (*argentum*, silver).
- Arvensis, e.* Growing in a field (*arvum*, a ploughed field; *arvus*, having been ploughed).
- Augustus, a, um.* Majestic (*augeo*, I adorn).
- Aureus, a, um.* Golden (*aurum*, gold).
- Autumnalis.* Autumnal (*auctumnalis*; *auctumnus*, autumn, harvest).
- Barbatus, a, um.* Bearded (*barba*, a beard).
- Bellus, a, um.* Beautiful, elegant.
- Caeruleus, a, um.* } Blue, green, greenish (*caelum*,
Caeulus, a, um. } heaven).
- Caeulescens.* Bluish.
- Campester, tris, tre.* Of the field (*campus*, an open field).
- Canescens.* Grey, hoary (*canesco*, I become grey).
- Caninus, a, um.* Fit for dogs (*canis*, a dog).
- Canus, a, um.* Grey, greyish, white, hoary.
- Capitata.* Round-headed (*caput*, the head).
- Ciliata.* } Having fine hairs (*cilium*, an eyelid or
Ciliaris. } eyelash).
- Communis.* Common.
- Crispus, a, um.* Curled, uneven, wrinkled.
- Cristatus, a, um.* Tufted, crested (*crista*, a head-tuft, a cock's-comb).
- Dentatus, a, um.* Toothed (*dens, dentis*, a tooth).
- Ferrugineus, a, um.* Rusty-coloured, dusky, dark green (*ferrugo, inis*, iron-rust colour; *ferrum*, iron).
- Flavus, a, um.* Flaxen-coloured, golden-yellow, reddish-yellow.
- Flexuosus, a, um.* Tortuous (*flexus*, a bending).
- Floridus, a, um.* Flowery.
- Florus, a, um.* Flowery (*flos, floris*, a flower).
- Fœtidissima.* } Fetid, stinking (*fœtor*, a strong
Fœtidus, a, um. } offensive smell).
- Foliatus, a, um.* } Leafy (*folium*, a leaf).
Folius, a, um. }
- Formosus, a, um.* Beautiful (*forma*, a fine form, beauty).
- Fragilis, e.* Fragile, brittle, perishable (*frango*, I break).
- Fragrans, antis.* Fragrant, odorous, sweet-scented (*fragro*, to emit a smell).
- Frigidus, a, um.* Growing in the cold (*frigeo*, I stiffen with cold).
- Fruticans.* } Shrubby, bushy (*frutex*, a
Fruticosus, a, um. } shrub, a bush).
- Giganteus, a, um.* Large, tall (*gigas, antis*, a giant).
- Glaber, a, um.* Smooth (*glaber*, smooth).

GLOSSARY

- Glandulosus, a, um.* Glandular.
- Glaucus, a, um.* Bluish-grey.
- Globosus, a, um.* Spherical (*globus*, a ball, a sphere).
- Glomeratus, a, um.* With a globular head (*glomus*, a ball of yarn).
- Gramineus, a, um.* Grassy (*gramen*, grass).
- Grandifolius, a, um.* Large-leaved (*grandis*, great; and *folium*, a leaf).
- Hirsutus, a, um.* Rough, bristly, prickly (*hirsus*, primitive form of *hirtus*).
- Hirtus, a, um.* Rough, hairy (*hircus*, a he-goat).
- Incanus, a, um.* Quite grey, hoary.
- Inodorus, a, um.* Inodorous, unperfumed.
- Lanatus, a, um.* Downy, woolly (*lana*, wool, soft hair, down).
- Lanceolatus, a, um.* Tapering towards both ends.
- Litoralis, e.* Of the sea-shore (*litus*, the sea-shore, the coast).
- Lucidus, a, um.* Shining (*lux*, light, brightness).
- Luteolus, a, um.* Yellowish (*luteus*, yellow).
- Luteus, a, um.* Yellow, golden-coloured (*lutum*, a yellow weed, weld).
- Maculatus, a, um.* Spotted (*macula*, a spot).
- Magnus, a, um.* Great, tall, broad.
- Marinus, a, um.* Marine, of the coast (*mare*, the sea).
- Maritimus, a, um.* On the sea-coast (*mare*, the sea).
- Masculus, a, um.* Male, vigorous (*mas*, *maris*, a male).
- Minor, us.* Smaller.
- Mollis, e.* Soft.
- Montanus, a, um.* Belonging to the mountains (*mons*, *montis*, a mountain).
- Nanus, a, um.* Dwarf (*nanus*, a dwarf).
- Nemoralis, e.* Of the woods (*nemus*, *oris*, a wood, a forest).
- Nemorosus, a, um.* Of the woods, bushy (*nemus*, a wood, a forest, a grove containing pastures and open meadows).
- Niger, nigra, nigrum.* Black, dark, dusky.
- Nodosus, a, um.* Knotty, full of knots (*nodus*, a knot).
- Nutans.* Nodding (*nuto*, I nod).
- Obtusus, a, um.* Blunt, obtuse.
- Occidentalis, e.* Of the west (*occidens*, *entis*, the west; *occidere*, to go down, to set).
- Oloratus, a, um.* Sweet-scented (*odoro*, I perfume).
- Officinalis, e.* Used medicinally (*officina*, a workshop, a laboratory).
- Orientalis, e.* Of the east (*oriens*, *entis*, the East, the Orient).
- Ovatus, a, um.* Ovate, egg-shaped (*ovum*, an egg).
- Paluster, tris, tre.* Fenny, marshy, swampy (*palus*, a marsh, a swamp).
- Parviflorus, a, um.* Small-flowered (*parvus*, *a, um*, small; and *flos*, *floris*, a flower).
- Pectinatus, a, um.* Comb-like (*pecten*, *inis*, a comb).
- Perennis, e.* Lasting the whole year, perennial (*annus*, a year).
- Perfoliatus, a, um.* Growing through the leaf (*per*, through; and *folium*, a leaf).
- Perforatus, a, um.* Having pellucid dots (*perforo*, I perforate).
- Pilosella.* } Hairy (*pilus*, a hair).
- Pilosus, a, um.* }
- Pratensis, e.* Of the meadow or field (*pratium*, a meadow, a broad field).
- Procumbens.* Prostrate, trailing (*procumbo*, I fall forward, I lie down).
- Pulcellus, a, um.* }
- Pulcer, cra, crum.* } Beautiful, pretty.
- Pulchellus, a, um.* }
- Pulcher, chra, chrum.* }
- Punctatus, a, um.* Dotted (*punctum*, a point).
- Purpureus, a, um.* Purple-coloured, including many shades, as red, reddish, violet, &c.
- Pusillus, a, um.* Very small (*pusus*, a little boy).
- Racemosus, a, um.* Like a string of currants (*racemus*, a stalk, a cluster of grapes).
- Repens.* Creeping (*repto*, I crawl).
- Reptans.* Creeping (*repto*, I crawl).
- Rigidus, a, um.* Stiff, hard, rigid (*rigeo*, I am stiff, I stand on end).
- Roseus, a, um.* Rose-coloured, rosy (*rosa*, a rose).
- Rotundifolius, a, um.* Round-leaved (*rotundus*, round; *rota*, a wheel; and *folium*, a leaf).
- Ruber, rubra, rubrum.* Red, ruddy.
- Rufescens.* Reddish (*rufus*, red).
- Rugosus, a, um.* Wrinkled, corrugated (*ruja*, a wrinkle).
- Rupestris, e.* Of rocky places (*rupes*, a crag, a rock).
- Sanguineus, a, um.* Blood-red (*sanguis*, *inis*, blood).
- Sativus, a, um.* Sown as in a garden (*sero*, I sow).
- Saracensis, e.* Found among rocks (*sarum*, a large rough stone, a fragment of rock).
- Sepium.* Belonging to the hedge (*sepimentum*, a hedge; *sepio*, I hedge in, I enclose).

GLOSSARY

- Speciosus, a, um.* Showy, beautiful (*species, a sight, an ornament; specio, I see*).
- Spectabilis, e.* Worth seeing (*specto, I look at*).
- Spinosus, a, um.* Full of thorns or prickles, thorny (*spina, a thorn, a prickles*).
- Stellatus, a, um.* Starry (*stella, a star*).
- Striatum.* Streaked, striped (*stria, a streak; striare, atum, to furrow*).
- Strictus, a, um.* Narrow, straight, erect, drawn together (*stringo, I draw or bind together*).
- Sylvaticus, a, um.* Of the woodland or forest (*silva, a wood, a forest*).
- Sylvestris, e.* Of the wood, growing wild (*silva, a wood, a forest, a plantation, an orchard*).
- Tinctoria.* Used for dyeing (*tingere, to dye*).
- Tomentosa, um.* Loosely or woolly haired (*tomentum, material used for stuffing cushions*).
- Trivialis, e.* Common (*trivium, the public street; a place where three ways met; tres, three; and via, a way, a road*).
- Villosus, a, um.* Rough (*villus, a tuft of hair*).
- Viridis, e.* Green (*vireo, I grow, I am green*).
- Viscosus, a, um.* Sticky (*viscum, bird-lime, mistletoe*).
- Vulgaris, e.* Common (*vulgus, the common people*).
- Vulgatus, a, um.* Common (*vulgo, I spread among the people; vulgus, the common people*).

GREEK ROOT-WORDS USED IN BOTANICAL NOMENCLATURE

- Acantha.* A thorn (*Oxyacantha*).
- Ampelos.* A vine-plant (*Ampelopsis*).
- Anthemon.* A flower (*Helianthemum*).
- Brachys.* Short (*brachyphylla*).
- Calyx.* A husk, a shell, the calyx of a flower, a flower-bud (*Calycanthus*).
- Caryon.* A nut, a fruit-stone (*Caryopteris*).
- Cephale.* A head (*Cephalanthus*).
- Chamae.* On the ground, dwarf (*Chamaecyparis*).
- Cheima, chima, chimatedos.* Winter-weather, cold, frost (*Chimonanthus*).
- Dasys.* Thick, thickly covered with hair, downy (*dasyacarpum*).
- Dendron.* A tree (*Liriodendron, Rhododendron*).
- Hedys.* Sweet (*Hedysarum*).
- Helios.* The sun (*Helianthemum*).
- Hydor, hydatos, hydar, hydro.* Water (*Hydrangea*).
- Hypo.* Beneath, inferior (*Hypericum*).
- Karpus.* A fruit (*Podocarpus*).
- Leirion, lirion.* A lily (*Liriodendron*).
- Macros.* Large (*macrophyllum*).
- Micros.* Small (*microphylla*).
- Ocys.* Sharp (*Oxyacantha*).
- Peri.* Round (*Pericyclenum*).
- Philos.* Loved, beloved (*Philadelphus*).
- Phyllon.* A leaf (*Hypophyllum*).
- Pitys.* A pine or fir-tree (*Prumnopitys*).
- Platys.* Broad, flat (*platyphyllos*).
- Pseudo.* False (*Pseudacacia*).
- Pteron.* Feathers, wings, leaves (*Pterocarya*).
- Pyr, pyros.* Fire (*Pyracantha*).
- Rholon.* A rose (*Rhododendron*).
- Scias, sciaulos.* A shade, an umbrella (*Sciadopitys*).
- Spira, speira.* A coil (*Spiraea*).
- Staphyle.* A bunch of grapes (*Staphylea*).
- Syrinx, syringos.* A pipe (*Syringa*).
- Xylon.* Wood (*Xylosteum*).

CALENDAR OF TREES AND SHRUBS

GIVING THE AVERAGE DATES OF FLOWERING IN MILD LATITUDES

NAME.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	NAME.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
Abelia floribunda			*										Arctostaphylos pungens		*										
Abies balsamea						*							" Uva-ursi				*	*	*						
" brachyphylla					*	*							Artemisia Abrotanum										*	*	*
" cephalonica					*	*							" tridentata										*	*	*
" cilicica					*	*							Arundo Donax					*					*	*	
" concolor					*	*							Aucuba japonica					*							
" firma					*	*							Berberidopsis corallina												
" grandis					*	*							Berberis Aquifolium			*	*	*	*						
" nobilis					*	*							" buxifolia				*	*	*	*					
" nordmanniana				*	*	*							" Darwinii				*	*	*	*					
" pectinata				*	*	*							" empetrifolia				*	*	*	*					
" Pinsapo				*	*	*							" japonica		*	*	*	*	*	*					
Abutilon vitifolium					*	*	*						" nepalensis				*	*	*	*					
Acer campestre					*	*	*						" vulgaris				*	*	*	*					
" circinatum					*	*	*						" wallichiana				*	*	*	*					
" dasycarpum					*	*	*						Betula alba				*	*	*	*	*				
" japonicum					*	*	*						" lenta				*	*	*	*	*				
" macrophyllum					*	*	*						" leutica				*	*	*	*	*				
" monspessulanum					*	*	*						" nana				*	*	*	*	*				
" Negundo				*	*	*	*						" nigra				*	*	*	*	*				
" opulifolium				*	*	*	*						" papyrifera				*	*	*	*	*				
" palmatum				*	*	*	*						Broussonetia papyrifera				*	*	*	*	*				
" pennsylvanicum				*	*	*	*						Bryanthus taxifolius				*	*	*	*	*				
" platanoides				*	*	*	*						Buddleia Colvillei				*	*	*	*	*	*			
" Pseudo-platanus				*	*	*	*						" globosa				*	*	*	*	*	*			
" rubrum			*	*	*	*	*						" paniculata				*	*	*	*	*	*			
" saccharinum			*	*	*	*	*						Buxus balearica				*	*	*	*	*	*			
" tartaricum			*	*	*	*	*						" sempervirens				*	*	*	*	*	*			
Æsculus carnea						*	*						Cesalpinia japonica				*	*	*	*	*	*			
" glabra						*	*						Calluna vulgaris				*	*	*	*	*	*			
" Hippocastanum						*	*						Calycanthus floridus				*	*	*	*	*	*			
" parviflora						*	*						" glaucus				*	*	*	*	*	*			
Ailanthus glandulosa						*	*						" occidentalis				*	*	*	*	*	*	*		
Alnus cordifolia			*	*									Caragana arborescens				*	*	*	*	*	*			
" glutinosa			*	*									Carpenteria californica				*	*	*	*	*	*			
" maritima			*	*					*				Carpinus Betulus				*	*	*	*	*	*			
" oregona			*	*									" caroliniana				*	*	*	*	*	*			
" rhombifolia			*	*									Carya alba				*	*	*	*	*	*			
Amelanchier alnifolia				*	*								Caryopteris Mastacanthus				*	*	*	*	*	*			
" canadensis				*	*								Castanea sativa				*	*	*	*	*	*			
Amorpha canescens						*	*	*					Castanopsis chrysophylla				*	*	*	*	*	*			
" fruticosa						*	*	*					Catalpa bignonioides				*	*	*	*	*	*			
Andromeda polifolia					*	*	*	*					" cordifolia				*	*	*	*	*	*			
Aralia chinensis					*	*	*	*					" Kampferi				*	*	*	*	*	*			
" spinosa					*	*	*	*		*	*		Ceanothus americanus				*	*	*	*	*	*			
Araucaria imbricata					*	*	*	*		*	*		" azureus				*	*	*	*	*	*			
Arbutus Unedo					*	*	*	*		*	*						*	*	*	*	*	*			
Arctostaphylos alpina					*	*	*	*		*	*						*	*	*	*	*	*			

CALENDAR OF TREES AND SHRUBS

NAME.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	NAME.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
Ceanothus dentatus					*	*	*	*	*				Cratægus Oxyacantha						*	*	*	*			
" divaricatus					*	*	*	*	*				" punctata						*	*	*	*			
" papillosus					*	*	*	*	*				" Pyracantha						*	*	*	*			
" rigidus				*	*	*	*	*	*				" tanacetifolia						*	*	*	*			
" thyrsiflorus					*	*	*	*	*				Cryptomeria japonica						*	*	*	*			
" veitchianus					*	*	*	*	*				Cupressus lawsoniana				*	*	*	*	*				
Cedrus atlantica										*	*		" macrocarpa		*	*									
" Deodara										*	*		" nootkatensis				*	*	*	*					
" Libani					*								" obtusata				*	*	*	*					
Cephalanthus occidentalis							*						" pisifera				*	*	*	*					
Cephalotaxus drupacea				*	*								" sempervirens				*	*	*	*					
" Fortuni				*	*								Cydonia japonica			*	*	*	*	*					
" pedunculata				*	*								" Maulei			*	*	*	*	*					
Cercis canadensis				*	*								" vulgaris			*	*	*	*	*					
" Siliquastrum				*	*								Cytisus albus				*	*	*	*					
Chimonanthus fragrans	*	*									*	*	" Ardoini				*	*	*	*					
Chionanthus virginica					*	*	*	*	*				" scoparius				*	*	*	*					
Cistus corbariensis					*	*	*	*	*				Daboëcia polifolia				*	*	*	*					
" crispus					*	*	*	*	*				Danæa Laurus				*	*	*	*					
" ladaniferus					*	*	*	*	*				Daphne blagayana			*	*	*	*	*					
" laurifolius					*	*	*	*	*				" Cneorum			*	*	*	*	*					
" lusitanicus					*	*	*	*	*				" Laureola	*	*	*	*	*	*	*					
" monspeliensis					*	*	*	*	*				" Mezereum	*	*	*	*	*	*	*					
" purpureus					*	*	*	*	*				" pontica			*	*	*	*	*					
Cladrastis amurensis					*		*						Daphniphyllum macropodum								*				
" tinctoria				*									Deutzia corymbosa				*	*	*	*					
Clematis Flammula					*	*	*	*	*	*			" crenata				*	*	*	*					
" montana					*	*	*	*	*	*			" gracilis				*	*	*	*					
" Vitalba					*	*	*	*	*	*			Diervilla florida				*	*	*	*					
" Viticella					*	*	*	*	*	*			" grandiflora				*	*	*	*					
Clerodendron fœtidum					*	*	*	*	*	*			" middendoriana				*	*	*	*					
" trichotomum					*	*	*	*	*	*			Elæagnus angustifolia				*	*	*	*					
Clethra acuminata					*	*	*	*	*	*			" argentea				*	*	*	*					
" alnifolia					*	*	*	*	*	*			" macrophylla				*	*	*	*				*	
Colutea arborescens					*	*	*	*	*	*			" multiflora				*	*	*	*					
" cruenta					*	*	*	*	*	*			Empetrum nigrum				*	*	*	*					
Cornus florida				*	*		*						" carnea	*	*	*	*	*	*	*					
" macrophylla				*	*		*						" ciliaris				*	*	*	*					
" Mas	*	*	*	*			*						" cinerea				*	*	*	*					
" sanguinea	*	*	*	*			*						" mediterranea			*	*	*	*	*					
" stolonifera	*	*	*	*			*						" stricta			*	*	*	*	*					
Coronilla Emerus		*	*	*	*		*						" Tetralix			*	*	*	*	*			*	*	
Corylopsis spicata		*	*	*	*		*						" vagans			*	*	*	*	*			*	*	
Corylus Avellana		*	*	*	*		*						Eucryphia pinnatifolia			*	*	*	*	*					
" Colurna		*	*	*	*		*						Euonymus americanus			*	*	*	*	*					
Cotoneaster affinis				*	*		*						" atropurpureus			*	*	*	*	*					
" bacillaris				*	*		*						" europæus			*	*	*	*	*					
" buxifolia				*	*		*						" japonicus			*	*	*	*	*					
" frigida				*	*		*						" latifolius			*	*	*	*	*					
" horizontalis				*	*		*						Fagus sylvatica			*	*	*	*	*					
" integerrima				*	*		*						Ficus Carica			*	*	*	*	*					
" laxiflora				*	*		*						Forsythia suspensa			*	*	*	*	*					
" microphylla				*	*		*						" viridissima			*	*	*	*	*					
" Nummularia				*	*		*						Fraxinus excelsior			*	*	*	*	*					
" rotundifolia				*	*		*						" Ornus			*	*	*	*	*					
" Simonsii				*	*		*						Fremontia californica			*	*	*	*	*					
Cratægus coccinea				*	*		*						Garrya elliptica	*	*	*						*	*	*	
" cordata				*	*		*						Genista æthnensis						*	*	*				
" Crus-galli				*	*		*												*	*	*				
" Douglasii				*	*		*												*	*	*				
" mollis				*	*		*												*	*	*				
" orientalis				*	*		*												*	*	*				

CALENDAR OF TREES AND SHRUBS

NAME.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	NAME.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
Genista anglica					*	*							Ligustrum lucidum												
" hispanica					*	*							" ovalifolium												
" pilosa					*	*	*	*	*				" sinense						*	*	*	*			
" sagittalis					*	*	*	*	*				" vulgare						*	*	*	*			
" tinctoria					*	*	*	*	*				Liquidambar styraciflua				*								
" virgata					*	*	*	*	*				Liriodendron tulipifera					*	*	*	*	*			
Ginkgo biloba				*	*	*	*	*	*				Loiseleura procumbens					*	*	*	*	*			
Gleditschia triacanthos					*	*	*	*	*				Lonicera Caprifolium					*	*	*	*	*			
Gymnocladus canadensis					*	*	*	*	*				" etrusca					*	*	*	*	*			
Halesia tetraptera				*	*	*	*	*	*				" flava					*	*	*	*	*			
Hamamelis arborea	*	*	*										" fragrantissima	*	*	*									
" virginica	*	*	*										" japonica												
Hedera Helix										*	*	*	" " v. flexuosa				*	*	*	*	*				
Hedysarum multijugum					*	*	*	*	*				" nigra				*	*	*	*	*				
Helianthemum formosum					*	*	*	*	*				" Periclymenum					*	*	*	*	*			
Helichrysum rosmarinifolium					*	*	*	*	*				" sempervirens					*	*	*	*	*			
Hibiscus syriacus					*	*	*	*	*				" tartarica				*	*	*	*	*	*			
Hippophaë rhamnoides					*	*	*	*	*				" Xylosteum				*	*	*	*	*	*			
Hydrangea hortensis				*	*	*	*	*	*				Lycium chinense				*	*	*	*	*	*			
" paniculata					*	*	*	*	*	*			" halimifolium				*	*	*	*	*	*			
" " v. grandiflora					*	*	*	*	*	*			Magnolia acuminata				*	*	*	*	*	*			
Hypericum Androsæmum					*	*	*	*	*	*			" conspicua		*	*	*	*	*	*	*	*			
" calycinum					*	*	*	*	*	*			" Fraseri				*	*	*	*	*	*			
" hookerianum					*	*	*	*	*	*			" glauca				*	*	*	*	*	*			
" moserianum					*	*	*	*	*	*			" grandifolia				*	*	*	*	*	*			
" patulum					*	*	*	*	*	*			" macrophylla				*	*	*	*	*	*			
Hex Aquifolium					*	*	*	*	*	*			" obovata				*	*	*	*	*	*			
" crenata					*	*	*	*	*	*			" parviflora			*	*	*	*	*	*	*			
" dipyrena				*	*	*	*	*	*	*			" stellata			*	*	*	*	*	*	*			
" opaca				*	*	*	*	*	*	*			" tripetala			*	*	*	*	*	*	*			
Indigofera gerardiana					*	*	*	*	*	*			Menziesia globularis				*	*	*	*	*	*			
Jasminum fruticans					*	*	*	*	*	*			Morus nigra				*	*	*	*	*	*			
" nudiflorum	*	*	*										Myrica Gale				*	*	*	*	*	*			
" officinale					*	*	*	*	*	*			Myrtus communis				*	*	*	*	*	*			
" revolutum					*	*	*	*	*	*			Neviusia alabamensis				*	*	*	*	*	*			
" wallichianum					*	*	*	*	*	*			Neillia opulifolia				*	*	*	*	*	*			
Juglans regia			*		*	*	*	*	*	*			Nuttalia cerasiformis	*	*		*	*	*	*	*	*			
Juniperus chinensis				*	*	*	*	*	*	*			Olearia Haastii				*	*	*	*	*	*			
" communis				*	*	*	*	*	*	*			" macrodongta				*	*	*	*	*	*			
" Sabina				*	*	*	*	*	*	*			" stellulata				*	*	*	*	*	*			
" virginiana				*	*	*	*	*	*	*			Osmanthus Aquifolium				*	*	*	*	*	*			
Kalmia angustifolia					*	*	*	*	*	*			Oxycoccus palustris				*	*	*	*	*	*			
" glauca					*	*	*	*	*	*			Passiflora cœrulea				*	*	*	*	*	*			
" latifolia					*	*	*	*	*	*			Paulownia imperialis				*	*	*	*	*	*			
Kerria japonica				*	*	*	*	*	*	*			Philadelphus coronarius				*	*	*	*	*	*			
Laburnum alpinum					*	*	*	*	*	*			Phillyræa angustifolia				*	*	*	*	*	*			
" vulgare					*	*	*	*	*	*			" decora				*	*	*	*	*	*			
Larix europæa					*	*	*	*	*	*			" latifolia				*	*	*	*	*	*			
Lavandula vera					*	*	*	*	*	*			" media				*	*	*	*	*	*			
Laurus nobilis					*	*	*	*	*	*			Phlomis fruticosa				*	*	*	*	*	*			
Ledum latifolium					*	*	*	*	*	*			Picea alcockiana				*	*	*	*	*	*			
" palustre					*	*	*	*	*	*			" excelsa				*	*	*	*	*	*			
Leycesteria formosa					*	*	*	*	*	*			" Morinda				*	*	*	*	*	*			
Libocedrus decurrens	*				*	*	*	*	*	*			" nigra				*	*	*	*	*	*			
Ligustrum Ibotæ					*	*	*	*	*	*			" orientalis				*	*	*	*	*	*			
" japonicum					*	*	*	*	*	*			" polita				*	*	*	*	*	*			
													" pungens				*	*	*	*	*	*			
													Pieris floribunda				*	*	*	*	*	*			

CALENDAR OF TREES AND SHRUBS

NAME.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	NAME.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
Pieris japonica			*	*	*	*							Quercus pedunculata				*	*	*						
Pinus Cembra					*	*	*						" rubra				*	*	*						
" Coulteri						*	*						" sessiliflora				*	*	*						
" excelsa						*	*						" Suber				*	*	*						
" Laricio						*	*						" velutina				*	*	*						
" " v. nigricans						*	*										*	*	*						
" Pinaster					*	*	*						Rhamnus Alerternus				*	*	*						
" Pinea					*	*	*						" cathartica				*	*	*						
" ponderosa					*	*	*						" Frangula				*	*	*						
" Strobus					*	*	*						Rhododendron calendulaceum				*	*	*						
" sylvestris					*	*	*						" californicum				*	*	*						
Platanus acerifolia				*	*	*	*						" catawbiense				*	*	*						
" cuneata				*	*	*	*						" ferrugineum				*	*	*						
" occidentalis				*	*	*	*						" flavum				*	*	*						
" orientalis				*	*	*	*						" Fortunei				*	*	*						
Populus alba				*	*	*	*						" nudiflorum			*	*	*							
" balsamifera			*	*	*	*	*						" ponticum			*	*	*							
" " v. candicans			*	*	*	*	*						" racemosum			*	*	*							
" canescens			*	*	*	*	*						" sinense			*	*	*							
" deltoides			*	*	*	*	*						" Vaseyi			*	*	*							
" monilifera			*	*	*	*	*						" viscosum			*	*	*		*	*				
" nigra			*	*	*	*	*						" yunnanense			*	*	*		*	*				
" " v. pyramidalis			*	*	*	*	*						Rhodotypos kerrioides			*	*	*		*	*				
" tremula			*	*	*	*	*						Rhus copallina			*	*	*		*	*				
" tremuloides			*	*	*	*	*						" cotinoides			*	*	*		*	*				
Potentilla fruticosa					*	*	*						" Cotinus			*	*	*		*	*				
Prumnopitys elegans					*	*	*						" glabra			*	*	*		*	*				
Prunus Amygdalus			*	*	*	*	*						" Toxicodendron			*	*	*		*	*				
" Avium			*	*	*	*	*						" typhina			*	*	*		*	*				
" Cerasus			*	*	*	*	*						" venenata			*	*	*		*	*				
" communis			*	*	*	*	*						Ribes alpinum			*	*	*		*	*				
" insititia			*	*	*	*	*						" aureum			*	*	*		*	*				
" Laurocerasus			*	*	*	*	*						" Grossularia			*	*	*		*	*				
" lusitanica			*	*	*	*	*						" nigrum			*	*	*		*	*				
" Padus			*	*	*	*	*						" rubrum			*	*	*		*	*				
" spinosa			*	*	*	*	*						" sanguineum			*	*	*		*	*				
Pseudolarix Kämpferi			*	*	*	*	*						" speciosum			*	*	*		*	*				
Pseudotsuga Douglasii			*	*	*	*	*						Robinia hispida			*	*	*		*	*				
Ptelea trifoliata			*	*	*	*	*						" neo-mexicana			*	*	*		*	*				
Pterocarya caucasica			*	*	*	*	*						" Pseudacacia			*	*	*		*	*				
Pyrus americana			*	*	*	*	*						" viscosa			*	*	*		*	*				
" amygdaliformis			*	*	*	*	*						Rosa arvensis			*	*	*		*	*				
" arbutifolia			*	*	*	*	*						" canina			*	*	*		*	*				
" Aria			*	*	*	*	*						" moschata			*	*	*		*	*				
" Aucuparia			*	*	*	*	*						" rubiginosa			*	*	*		*	*				
" baccata			*	*	*	*	*						" rugosa			*	*	*		*	*				
" communis			*	*	*	*	*						" spinosissima			*	*	*		*	*				
" coronaria			*	*	*	*	*						" villosa			*	*	*		*	*				
" floribunda			*	*	*	*	*						Rosmarinus officinalis		*	*	*		*	*					
" germanica			*	*	*	*	*						Rubus biflorus			*	*	*		*	*				
" Malus			*	*	*	*	*						" cæsius			*	*	*		*	*				
" prunifolia			*	*	*	*	*						" deliciosus			*	*	*		*	*				
" Sorbus			*	*	*	*	*						" fruticosus			*	*	*		*	*				
" spectabilis			*	*	*	*	*						" Idæus			*	*	*		*	*				
" Tormalis			*	*	*	*	*						" nutkanus			*	*	*		*	*				
" vestita			*	*	*	*	*						" odoratus			*	*	*		*	*				
Quercus Cerris			*	*	*	*	*						" phœnicolasius			*	*	*		*	*				
" coccinea			*	*	*	*	*						" spectabilis			*	*	*		*	*				
" Ilex			*	*	*	*	*						Ruscus aculeatus		*	*	*		*	*					
" marilandica			*	*	*	*	*						" Hypophyllum		*	*	*		*	*					
" palustris			*	*	*	*	*						Salix alba			*	*	*		*	*				

CALENDAR OF TREES AND SHRUBS

NAME.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	NAME.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
<i>Salix alba</i> , v. <i>vitellina</i>				*	*								<i>Syringa vulgaris</i>					*							
<i>Arbuscula</i>				*	*	*							<i>Tamarix gallica</i>												
<i>aurita</i>				*	*	*							<i>Pallasii</i>												
<i>babylonica</i>				*	*	*							<i>Taxodium distichum</i>					*							
<i>Caprea</i>				*	*	*							<i>Taxus baccata</i>					*							
<i>cinerea</i>				*	*	*							<i>Thuja dolabrata</i>					*							
<i>fragilis</i>				*	*	*							<i>occidentalis</i>					*							
<i>herbacea</i>				*	*	*							<i>orientalis</i>					*							
<i>lanata</i>				*	*	*							<i>plicata</i>					*							
<i>Lapponum</i>				*	*	*							<i>Tilia americana</i>					*							
<i>Myrsinites</i>				*	*	*							<i>cordata</i>					*							
<i>nigricans</i>				*	*	*							<i>platyphyllos</i>					*							
<i>pentandra</i>				*	*	*							<i>vulgaris</i>					*							
<i>phylicifolia</i>				*	*	*							<i>Tsuga brunoniana</i>					*							
<i>purpurea</i>			*	*	*	*							<i>canadensis</i>					*							
<i>repens</i>			*	*	*	*							<i>canadensis</i>					*							
<i>reticulata</i>				*	*	*							<i>mertensiana</i>					*							
<i>triandra</i>				*	*	*							<i>Sieboldi</i>					*							
<i>viminialis</i>				*	*	*							<i>Ulex europæus</i>					*							
<i>viridis</i>				*	*	*							<i>nanus</i>			*	*	*							
<i>Sambucus canadensis</i>				*	*	*							<i>Ulmus alata</i>			*	*	*							
<i>glauca</i>				*	*	*							<i>americana</i>			*	*	*							
<i>nigra</i>				*	*	*							<i>campestris</i>			*	*	*							
<i>racemosa</i>				*	*	*							<i>montana</i>			*	*	*							
<i>Sciadopitys verticillata</i>				*	*	*							<i>Vaccinium Myrtilloides</i>					*							
<i>Sequoia gigantea</i>				*	*	*							<i>uliginosum</i>					*							
<i>sempervirens</i>				*	*	*							<i>Vitis-idaea</i>					*							
<i>Skimmia fragrans</i>				*	*	*							<i>Veronica buxifolia</i>					*							
<i>japonica</i>			*	*	*	*							<i>cupressoides</i>					*							
<i>Laureola</i>			*	*	*	*							<i>pinguifolia</i>					*							
<i>oblata</i>			*	*	*	*							<i>Traversii</i>					*							
<i>rubella</i>			*	*	*	*							<i>Viburnum Lantana</i>					*							
<i>Sophora japonica</i>				*	*	*							<i>Lentago</i>					*							
<i>Spartium junceum</i>				*	*	*							<i>macrocephalum</i>					*							
<i>Spiræa bella</i>				*	*	*							<i>Opulus</i>					*							
<i>bullata</i>				*	*	*							<i>v. sterile</i>					*							
<i>canescens</i>				*	*	*							<i>Tinus</i>		*	*	*	*					*	*	*
<i>chamædrifolia</i>				*	*	*							<i>tomentosum</i> , v. <i>pl-</i>					*							
<i>discolor</i>				*	*	*							<i>catum</i>					*							
<i>Douglasi</i>				*	*	*							<i>Vinca major</i>					*							
<i>japonica</i>				*	*	*							<i>minor</i>					*							
<i>lindleyana</i>				*	*	*							<i>Viscum album</i>			*	*	*							
<i>media</i>				*	*	*							<i>Vitis inconstans</i>					*							
<i>prunifolia flore-pleno</i>				*	*	*							<i>quinquefolia</i>					*							
<i>salicifolia</i>				*	*	*							<i>vinifera</i>					*							
<i>sorbifolia</i>				*	*	*							<i>Wistaria chinensis</i>					*							
<i>Thunbergi</i>			*	*	*	*							<i>multijuga</i>					*							
<i>Staphylea colchica</i>			*	*	*	*							<i>Xanthoceras sorbifolia</i>				*	*							
<i>pinnata</i>			*	*	*	*							<i>Yucca angustifolia</i>					*							
<i>Stephanandra Tanakæ</i>			*	*	*	*							<i>filamentosa</i>					*							
<i>Stuartia pentagyna</i>			*	*	*	*							<i>gloriosa</i>					*							
<i>Pseudo-camellia</i>			*	*	*	*							<i>Zenobia speciosum</i>					*							
<i>virginica</i>			*	*	*	*												*							
<i>Styrax japonicum</i>			*	*	*	*												*							
<i>Obassia</i>			*	*	*	*												*							
<i>officinale</i>			*	*	*	*												*							
<i>Symphoricarpus racemosus</i>			*	*	*	*												*							
<i>Syringa Emodi</i>			*	*	*	*												*							
<i>japonica</i>			*	*	*	*												*							

TREES AND SHRUBS FOR CERTAIN SOILS AND SITUATIONS

I.—TREES AND SHRUBS WHICH WILL WITHSTAND THE SMOKE AND FUMES OF TOWNS

<i>Acer dasycarpum</i>	<i>Forsythia suspensa</i>	<i>Prunus Amygdalus</i>
„ <i>macrophyllum</i>	„ <i>viridissima</i>	„ <i>Laurocerasus</i>
„ <i>platanoides</i>	<i>Fraxinus excelsior</i>	„ <i>Padus</i>
„ <i>Pseudo-platanus</i>	<i>Ginko biloba</i>	<i>Pyrus Aucuparia</i>
„ <i>saccharinum</i>	<i>Gleditschia triacanthos</i>	<i>Quercus Cerris</i>
<i>Æsculus carnea</i>	<i>Hedera Helix</i>	<i>Rhamnus Alerternus</i>
„ <i>Hippocastanum</i>	<i>Hibiscus syriacus</i>	<i>Rhus Cotinus</i>
<i>Ailanthus glandulosa</i>	<i>Hypericum calycinum</i>	„ <i>typhina</i>
<i>Alnus cordifolia</i>	<i>Ilex Aquifolium</i>	<i>Ribes aureum</i>
<i>Arbutus Unedo</i>	<i>Laburnum alpinum</i>	„ <i>sanguineum</i>
<i>Ancuba japonica</i>	„ <i>vulgare</i>	„ <i>speciosum</i>
<i>Berberis Aquifolium</i>	<i>Leycesteria formosa</i>	<i>Robina Pseudacacia</i>
„ <i>vulgaris</i>	<i>Ligustrum vulgare</i>	<i>Ruscus aculeatus</i>
<i>Buxus balearica</i>	<i>Liriodendron tulipifera</i>	<i>Sambucus nigra</i>
„ <i>sempervirens</i>	<i>Magnolia acuminata</i>	„ <i>racemosa</i>
<i>Catalpa bignonioides</i>	„ <i>glauca</i>	<i>Skimmia japonica</i>
„ <i>cordifolia</i>	<i>Morus nigra</i>	<i>Sophora japonica</i>
<i>Cistus ladaniferus</i>	<i>Olearia Haastii</i>	<i>Staphylea colchica</i>
„ <i>laurifolius</i>	<i>Osmanthus Aquifolium</i>	<i>Syringa vulgaris</i>
<i>Colutea arborescens</i>	<i>Paulownia imperialis</i>	<i>Taxodium distichum</i>
<i>Cratægus Oxyacantha</i>	<i>Phillyræa decora</i>	<i>Taxus baccata</i>
„ <i>Pyracantha</i>	„ <i>latifolia</i>	<i>Tilia cordata</i>
„ <i>tanacetifolia</i>	„ <i>media</i>	„ <i>vulgaris</i>
<i>Cupressus lawsoniana</i>	<i>Pinus Laricio, v. nigricans</i>	<i>Thuya dolabrata</i>
<i>Cydonia japonica</i>	<i>Platanus acerifolia</i>	<i>Viburnum Opulus</i>
<i>Daphne Laureola</i>	„ <i>occidentalis</i>	„ „ <i>v. sterile</i>
„ <i>Mezereum</i>	„ <i>orientalis</i>	„ <i>Tinus</i>
<i>Deutzia crenata</i>	<i>Populus alba</i>	<i>Ulex europæus</i>
„ <i>gracilis</i>	„ <i>nigra</i>	<i>Vitis quinquefolia</i>
<i>Enonymus europæus</i>	„ <i>tremula</i>	<i>Yucca gloriosa</i>

II.—TREES AND SHRUBS FOR TOWN PLANTING IN PARKS, GARDENS, AND SQUARES

<i>Amelanchier canadensis</i>	<i>Azalea mollis</i>	<i>Calycanthus floridus</i>
<i>Amorpha fruticosa</i>	<i>Berberis buxifolia</i>	„ <i>occidentalis</i>
<i>Aralia chinensis</i>	„ <i>Darwinii</i>	<i>Carpinus Betulus</i>
<i>Arbutus Unedo</i>	<i>Betula alba</i>	<i>Cercis Siliquastrum</i>

TREES AND SHRUBS

Cladrastis tinctoria	Hamamelis virginica	Pterocarya caucasica
Cotoneaster baccillaris	Hedysarum multijugum	Pyrus baccata
" buxifolia	Hydrangea paniculata, v. grandiflora	" coronaria
" frigida	Hypericum patulum	" floribunda
" microphylla	Indigofera gerardiana	Quercus coccinea
" Simonsii	Kerria japonica	" palustris
Cratægus coccinea	Larix europæa	" pedunculata
" Crus-galli	Ligustrum japonicum	Robinia hispida
Cydonia Maulei	" ovalifolium	" neo-mexicana
Cytisus albus	Liquidambar styraciflua	" viscosa
" scoparius	Magnolia conspicua	Rubus deliciosus
Diervilla grandiflora	" Fraseri	" odoratus
Fagus sylvatica	" stellata	Salix alba
Fraxinus Ornus	" tripetala	" babylonica
Euonymus japonicus	Nuttalia cerasiformis	Spiræa Douglasi
" latifolius	Philadelphus coronarius	" lindleyana
Genista hispanica	Populus monilifera	Tamarix gallica
Gymnocladus canadensis	Potentilla fruticosa	Ulmus campestris
Halesia tetraptera		Wistaria chinensis

III.—TREES AND SHRUBS THAT THRIVE WELL AT THE SEASIDE

Acer campestre	Euonymus europæus	Pyrus Sorbus
" Pseudo-platanus	" japonicus	Quercus Ilex
" saccharinum	Fagus sylvatica	Rhamnus Alaternus
Æsculus Hippocastanum	Fraxinus excelsior	" cathartica
Ailanthus glandulosa	Hedera Helix	" Frangula
Alnus glutinosa	Hippophaë rhamnoides	Rhododendron catawbiense
Berberis Aquifolium	Hydrangea hortensis	" ponticum
" Darwinii	Ilex Aquifolium	Ribes sanguineum
" empetrifolia	Juniperus communis	Rosa rubiginosa
" vulgaris	Laburnum alpinum	" rugosa
Betula alba	Leycesteria formosa	" spinosissima
Carpinus Betulus	Lycium halimifolium	Salix alba
Catalpa bignonioides	Phillyræa angustifolia	" Caprea
Ceanothus americanus	" latifolia	" cinerea
Cistus ladaniferus	" media	" viminalis
Coronilla Emerus	Pinus Laricio	Sambucus nigra
Corylus Avellana	" " v. nigricans	Symphoricarpos racemosus
Cotoneaster microphylla	" Pinaster	Tamarix gallica
" Simonsii	" sylvestris	Thuya plicata
Cratægus Oxyacantha	Populus canescens	Ulex europæus
" Pyracantha	Prunus Padus	Ulmus montana
Cupressus macrocarpa	Pyrus Aucuparia	Veronica Traversii
" nootkatensis	" baccata	
Cytisus scoparius	" coronaria	

TREES AND SHRUBS

IV.—TREES AND SHRUBS THAT WILL WITHSTAND SEA BREEZES WHEN SLIGHTLY SCREENED OR PARTIALLY SHELTERED

<i>Abies concolor</i>	<i>Daphne Laureola</i>	<i>Populus alba</i>
„ <i>nobilis</i>	<i>Deutzia crenata</i>	„ <i>nigra</i>
„ <i>nordmanniana</i>	<i>Diervilla florida</i>	„ <i>tremula</i>
„ <i>pectinata</i>	„ <i>grandiflora</i>	<i>Prunus Avium</i>
„ <i>Pinsapo</i>	<i>Elæagnus argentea</i>	„ <i>Laurocerasus</i>
<i>Acer platanoides</i>	<i>Garrya elliptica</i>	„ <i>Padus</i>
<i>Araucaria imbricata</i>	<i>Laburnum vulgare</i>	<i>Rhododendron flavum</i>
<i>Arbutus Unedo</i>	<i>Laurus nobilis</i>	<i>Spartium junceum</i>
<i>Aucuba japonica</i>	<i>Ligustrum vulgare</i>	<i>Spiræa Douglasi</i>
<i>Buddleia globosa</i>	„ <i>japonicum</i>	„ <i>lindleyana</i>
<i>Buxus balearica</i>	„ <i>ovalifolium</i>	<i>Syringa vulgaris</i>
„ <i>sempervirens</i>	<i>Olearia Haastii</i>	<i>Thuya occidentalis</i>
<i>Colutea arborescens</i>	<i>Philadelphus coronarius</i>	<i>Viburnum Opulus, v. sterile</i>
<i>Cornus sanguinea</i>	<i>Pieris floribunda</i>	„ <i>Tinus</i>
<i>Cupressus lawsoniana</i>	<i>Pinus Pinaster</i>	
<i>Cytisus albus</i>	<i>Platanus orientalis</i>	

V.—TREES AND SHRUBS THAT WILL THRIVE IN A CHALKY SOIL

<i>Abies cephalonica</i>	<i>Deutzia gracilis</i>	<i>Prunus lusitanica</i>
„ <i>nobilis</i>	<i>Diervilla florida</i>	„ <i>Padus</i>
„ <i>nordmanniana</i>	<i>Euonymus japonicus</i>	<i>Pyrus Aucuparia</i>
„ <i>Pinsapo</i>	<i>Fagus sylvatica</i>	„ <i>Malus</i>
<i>Æsculus Hippocastanum</i>	<i>Fraxinus excelsior</i>	„ <i>spectabilis</i>
<i>Alnus glutinosa</i>	<i>Garrya elliptica</i>	<i>Quercus Ilex</i>
<i>Amelanchier canadensis</i>	<i>Ginko biloba</i>	<i>Rhus Cotinus</i>
<i>Amorpha fruticosa</i>	<i>Hamamelis virginica</i>	<i>Ribes aurum</i>
<i>Aralia chinensis</i>	<i>Hypericum calycinum</i>	„ <i>sanguineum</i>
<i>Berberis Aquifolium</i>	<i>Ilex Aquifolium</i>	<i>Robinia Pseudacacia</i>
<i>Betula alba</i>	<i>Jasminum nudiflorum</i>	<i>Rosa rubiginosa</i>
<i>Buddleia globosa</i>	<i>Juniperus chinensis</i>	<i>Salix alba</i>
<i>Calycanthus floridus</i>	„ <i>communis</i>	<i>Sequoia gigantea</i>
<i>Catalpa bignonioides</i>	„ <i>Sabina</i>	<i>Spartium junceum</i>
<i>Ceanothus americanus</i>	„ <i>virginiana</i>	<i>Spiræa bella</i>
<i>Cedrus atlantica</i>	<i>Kerria japonica</i>	„ <i>discolor</i>
„ <i>Deodara</i>	<i>Larix europæa</i>	„ <i>japonica</i>
„ <i>Libani</i>	<i>Leycesteria formosa</i>	„ <i>lindleyana</i>
<i>Cercis Siliquastrum</i>	<i>Magnolia glauca</i>	<i>Tamarix gallica</i>
<i>Cistus ladaniferus</i>	<i>Picea excelsa</i>	<i>Taxus baccata</i>
<i>Cladrastis tinctoria</i>	<i>Pinus Cembra</i>	<i>Thuya occidentalis</i>
<i>Colutea arborescens</i>	„ <i>excelsa</i>	„ <i>orientalis</i>
<i>Cornus Mas</i>	„ <i>Laricio</i>	<i>Tilia vulgaris</i>
<i>Corylus Avellana</i>	„ „ <i>v. nigricans</i>	<i>Ulmus americana</i>
<i>Cratægus Oxyacantha</i>	„ <i>Pinaster</i>	„ <i>montana</i>
„ <i>Pyracantha</i>	„ <i>Strobus</i>	<i>Viburnum Opulus</i>
<i>Cupressus lawsoniana</i>	„ <i>sylvestris</i>	„ <i>Tinus</i>
„ <i>macrocarpa</i>	<i>Populus alba</i>	<i>Yucca gloriosa</i>
„ <i>nootkatensis</i>	<i>Prunus Amygdalus</i>	
<i>Deutzia crenata</i>	„ <i>Laurocerasus</i>	

TREES AND SHRUBS

VI.—TREES AND SHRUBS THAT GROW WELL IN SANDY SOIL

Caragana arborescens	Genista virgata	Pinus Pinaster
Cercis Siliquastrum	Halesia tetraptera	„ sylvestris
Cladrastis amurensis	Hamamelis arborea	Populus alba
Colutea arborescens	Hypericum Androsæmum	Taxus baccata
Corylus Avellana	Juniperus communis	Thuya plicata
Cupressus lawsoniana	„ Sabina	Ulex europæas
„ nootkatensis	Pinus Laricio	Xanthoceras sorbifolia
Fraxinus Ornus	„ „ v. nigricans	Yucca gloriosa

VII.—TREES AND SHRUBS THAT WILL THRIVE ON CLAYEY SOIL

Buddleia globosa	Hamamelis arborea	Thuya plicata
Cercis Siliquastrum	Jasminum nudiflorum	„ occidentalis
Corylus Avellana	Leycesteria formosa	Xanthoceras sorbifolia
Cryptomeria japonica	Osmanthus Aquifolium	Yucca gloriosa
Fraxinus Ornus	Pyrus Torminalis	
Halesia tetraptera	Quercus pedunculata	

VIII.—IN ADDITION TO THE MANY SPECIES BELONGING TO THE ERICACEÆ, THE FOLLOWING WILL THRIVE IN A PEATY SOIL

Abelia floribunda	Cornus florida	Pseudotsuga Douglasii
Abies concolor	Cryptomeria japonica	Sciadopitys verticillata
„ nobilis	Cupressus lawsoniana	Sequoia sempervirens
„ nordmanniana	„ macrocarpa	Stuartia pentagyna
Berberis empetrifolia	Halesia tetraptera	„ virginica
Calycanthus occidentalis	Juniperus chinensis	Taxus baccata
Cedrus Deodara	Larix europæa	Thuya occidentalis
Cephalanthus occidentalis	Magnolia glauca	Veronica cupressoides
Cephalotaxus drupacea	Myrica Gale	Viburnum Opulus
„ Fortuni	Pinus excelsa	„ tomentosum, v. plicatum
„ pedunculata	„ sylvestris	
Chionanthus virginica	Pseudolarix Kæmpferi	

IX.—TREES AND SHRUBS FOR UNDERGROWTH OR SHADY PLACES

Acer campestre	Hypericum calycinum	Ruscus aculeatus
Aucuba japonica	Ilex Aquifolium	„ Hypophyllum
Berberis Aquifolium	Leycesteria formosa	Symphoricarpus racemosus
Calycanthus occidentalis	Ligustrum japonicum	Taxus baccata
Cistus ladaniferus	„ ovalifolium	Thuya dolabrata
Cornus Mas	Prunus Laurocerasus	Viburnum Tinus
Danæa Laurus	Ptelea trifoliata	Vinca major
Daphne Laureola	Rhododendron ponticum	„ minor
„ Mezereum	Rhus Cotinus	Veronica buxifolia
Genista sagittalis	Rosa rubiginosa	„ cupressoides
Hedera Helix	Rubus nutkanus	
Hypericum Androsæmum	„ odoratus	

TREES AND SHRUBS

X.—TREES AND SHRUBS THAT WILL THRIVE IN A MOIST SITUATION

Acer rubrum	Daphne Mezereum	Salix alba
Æsculus parviflora	Empetrum nigrum	„ „ v. vitellina
Alnus glutinosa	Erica Tetralix	„ babylonica
„ maritima	Halesia tetraptera	„ Caprea
„ oregona	Hamamelis arborea	„ cinerea
„ rhombifolia	Hippophaë rhamnoides	„ fragilis
Arbutus Unedo	Kalmia angustifolia	„ nigricans
Betula lutea	Ledum latifolium	„ pentandra
„ nana	„ palustre	„ purpurea
Calycanthus floridus	Ligustrum vulgare	„ triandra
„ occidentalis	Menziesia globularis	„ viminalis
Catalpa bignonioides	Myrica Gale	Sciadopitys verticillata
Chionanthus virginica	Myrtus communis	Spiræa Douglasi
Clethra acuminata	Picea nigra	„ salicifolia
„ alnifolia	Populus alba	„ sorbifolia
Cornus macrophylla	„ balsamifera	Staphylea colchica
„ stolonifera	„ „ v. candicans	Styrax japonica
Corylopsis spicata	„ canescens	Taxodium distichum
Cratægus coccinea	„ monilifera	Thuya dolabrata
„ cordata	„ nigra	„ occidentalis
„ Oxyacantha	„ tremula	Tsuga canadensis
„ Pyracantha	Potentilla fruticosa	Ulmus americana
Cryptomeria japonica	Quercus palustris	
Cupressus macrocarpa	Rubus nutkanus	

XI.—FLOWERING SHRUBS SUITABLE FOR THE ROCK-GARDEN

Arctostaphylos alpina	Genista anglica	Rhododendron racemosum
„ pungens	„ hispanica	Rubus phœnicolasius
„ Uva-ursi	„ sagittalis	Spiræa bullata
Cistus crispus	Juniperus Sabina	Vaccinum Myrtillus
Cotoneaster horizontalis	Loiseleuria procumbens	„ uliginosum
Cytisus Ardoini	Myrica Gale	„ Vitis-idæa
Daphne blagayana	Potentilla fruticosa	Veronica cupressoides
„ Cneorum	Rhododendron ferrugineum	„ pinguiifolia

INTRODUCTION

The scope of this work—Influence of soil upon trees—Influence of trees upon soil—Methods of rooting—Situation and its influence—Shapes of trees—Importance of studying the spray—Main stem or trunk—The bark and its uses—Uses of timber and trees generally—Plea for an Arbor Day and re-afforestation—The advent of the Garden City—Study of winter buds—Insect pests—Fungoid pests—Age of trees—Nature's laboratory and coal—Leaf structure, form, and functions—Autumnal beauty of hedgerow, wood, and garden—Floral structure and pollination—Commercial products of flowers, trees, and shrubs—Fruit and seed—Fine-fruited trees and shrubs for decorative effect—Pendulous trees and shrubs—The scent of trees—The beauty of the Lime—Companionship of trees—Our woodlands of to-day—A good story by Dean Hole—The mission of the trees—An English wood in springtime—Some woodland pictures—How to read the story of the year—Conclusion.

THE SCOPE OF THIS WORK

IN the present volume it has been the intention of the authors to provide some help to the Nature-student and others in the identification of not only the British trees and shrubby plants, but also of the more common cultivated trees and shrubs. This branch of Botany has been sadly neglected in the past, with the result that although the young student, and even those of an older growth, may be familiar with most of the native herbaceous plants, so ably described in the many popular books on wild flowers, there is a want of familiarity with the great majority of the trees and flowering shrubs which one may see in our public and private parks and gardens.

Not only does this remark apply to the inquiring student, but it is astonishing how many so-called gardeners and owners of beautiful gardens are unfamiliar with the names and uses of many of the botanical treasures which lie at their very feet. Many such will be well informed as to the newest and latest varieties of herbaceous plants, but at the same time quite unable to say whether a certain tree in the garden is a Deodar or an Atlantic Cedar, a Wellingtonia or a Lawson's Cypress. Such at least has been the experience of the authors. Or again, how many could identify

INTRODUCTION

the Tree of Heaven (*Ailantus*), the Kidney-bean Tree (*Wistaria*), Tulip Tree, or Evergreen Oak? Yet these are by no means uncommon even in our thickly populated towns.

Naturally all trees appeal to us most strongly when in leaf, but to those who will observe, many are the beauties to be found in the leafless tree, and much can be done to identify them by their bark, buds, and manner of growth.

The botanist will of course examine the flowers, but possibly even in these days of enlightenment it does not always occur to the unscientific that even Oaks and Elms, and all our forest trees, are in their turn laden with floral treasures which will well repay close study.

It has been our endeavour, therefore, to collect together from our personal observation and other sources, and present in a condensed form, much valuable information which it is hoped will interest the young student, and lead him to ask the why and wherefore of those many facts which he may observe around him.

Our attention is here confined for the most part to the species of hardy trees and shrubs which we may find growing either as indigenous plants in their natural surroundings, or under cultivation in the modern garden of any pretension. The number of hardy trees and shrubs enumerated as growing in the Royal Botanic Gardens, Kew, amounts to about 4500, and the Conifers reach a total of 700. Of this vast number we have endeavoured to mention all our native trees and shrubby plants, and most of the more commonly cultivated species. Very few varieties are described as their number is an ever-increasing quantity, and often the minor distinctions are of but little interest to the serious student, who in such a vast subject must be content to work on broad lines. The Kew Hand-list gives the names of fifty slight forms of *Berberis vulgaris*, which by some might be considered as distinct species. The plan of the work is rather of the nature of a scientific flora than a popular treatise, but it may be worth while to offer the student some suggestions as to how he may best utilise the information presented in these pages. The Latin names used are those of the Kew Hand-lists. In a few cases it has been found

INTRODUCTION

advisable to give one or more synonyms, especially when these are in common use among horticulturists, but the choice is a matter of great difficulty, as may be judged when it is remembered that the Hand-list often gives ten to fifteen to a species, and as an extreme case we find twenty-four allotted to *Spiraea canescens*. The difficulty is especially felt when dealing with the Conifers, for many of these have been at different times described under the generic names of *Abies* (Firs), *Picea* (Spruces), and *Pinus* (Pines).

In the case of certain genera which contain several cultivated species we have added a few simple cultural directions as to propagation. These will be found under the first specimen described, and, unless otherwise stated, may be taken broadly to apply to the species generally.

INFLUENCE OF SOIL UPON TREES

Having introduced our plant by its popular and scientific names, we point out its habits, and much may be learned as to which trees and shrubs thrive best in particular soils. Such is the constitution of plants that while some must be supplied with soil rich in organic material, some few others will make larger bushes and blossom with greater profusion in soil which the horticulturist would describe as poor. The Birch, Holly, Mountain Ash, and Scots Fir are found wild on the poorest of sandy soils.

The Maple and Wild Service Tree will thrive in dry situations, whilst Willows, Alders, and Poplars will succeed best when near water.

The Elder, Privet, Colchican Bladder Nut, and many others grow best in a moist loamy soil, and the Oak thrives on clay, whilst such as the Furze, Tutsan, Bladder Senna, Stone Pine, and Evergreen Cypress prefer a sandy soil. Rhododendrons, Azaleas, Kalmias, Ericas, and others of the same family require rich soil, readily permeable to moisture, sandy peat or heath-mould being the best, but a rich sandy loam mixed with leaf-mould and rotten turf will also answer well. Whilst the Heath family refuse to grow in soil permeated by lime, the Beech and Yew will flourish and do well, and the native flora of our chalk districts includes such

INTRODUCTION

well-known trees as the White Beam, Wayfaring Tree, Box, and Purging Buckthorn.

The list of flowering shrubs, deciduous trees, and conifers which may be planted on a chalk soil is a long one indeed, and many of these will flourish where the layer of soil resting on the chalk is often not more than six inches deep.

INFLUENCE OF TREES UPON SOIL

We have written at some length as to the influence of soil upon the growth of trees, but we may also note that the converse of this is true, namely, that trees largely influence the composition of soils in providing that humus which is so necessary for vegetable growth. It has been estimated "that after a sandy soil in New England is so exhausted that it will produce nothing but red mosses, it may be renewed to its pristine vigour and productiveness by the growth of trees on it for thirty years."

METHODS OF ROOTING

Trees and shrubs vary considerably in their method of rooting, for while the Ash, Birch, Cedar of Lebanon, Horse Chestnut, Oak, and Plane are inclined to root deeply, others, as the Beech, Elm, Lime, and Sycamore, often ramify so near to the surface as to kill plants growing near them, and frequently make it difficult or impossible for even grass to grow beneath their shade.

SITUATION AND ITS INFLUENCE

Not only does the soil decide the fate of trees and shrubs, but the question of sunshine or shade, exposure or shelter, are important factors in their life-history. Many will thrive best when able to bask in sunshine, as the Satin Flower and Golden Bell, while others delight in shade, as the Tutsan and Large-flowered St. John's Wort.

Many evergreens will do well under the shade of trees, among them

INTRODUCTION

being Box, Yew, Cherry Laurel, Portugal Laurel, Butcher's Broom, and Holly-leaved Barberry.

The outdoor student will probably have but little to do with the roots of trees, though many interesting questions are connected with their functions. Above ground, however, he has much to interest him and help him in the identification of the species at all seasons.

SHAPES OF TREES

Viewed from a distance most of our trees will be found to have a more or less distinctive shape, and much can be done to take this as a rough identification mark, but the peculiar characteristics of each tree are most apparent in late autumn and winter when the leaves are fallen and the different modes of branching are laid bare. In the Oak, with its expansive spread and large rounded head, we then notice the stoutness of its limbs, which, continually subdividing at right angles, twist here and there horizontally in various contortions, at once adding the idea of great strength to that of beauty. On the other hand, the Ash, with its easy-flowing lines and loose pendent branches, rather suggests the idea of beauty and elegance. Compare again the massive form of the Elms with the light gracefulness of the Silver Birch, and the tall spire-like column of the Lombardy Poplar, or the elongated pyramidal growth of the Deodar, with the broadly pyramidal head or flattened top of the Cedar of Lebanon. In their general conical outline, how well are many of the Conifers adapted for bearing the masses of snow in their native climes.

IMPORTANCE OF STUDYING THE SPRAY

To obtain a more accurate idea of the nice peculiarities and distinctions of trees we must examine their smaller parts with more precision, and a study of the spray is an interesting one for the winter months. We shall see that the mode of growth in the spray corresponds with that of the larger branches. In the Oak it breaks out in right angles, or nearly so, in a series of long and short shoots, giving that abrupt mode of ramification for which the Oak

INTRODUCTION

is remarkable, and generally springing from the upper side, running in such directions as to give the branches a horizontal appearance. The spray of the Ash runs in a series of irregular parallels, the shoots springing out in opposite pairs, often only one coming to maturity, and that usually on the under side, so as to form elegant pendent boughs. In the Elm we find spray forming a series of acute angles with the parent branch, being given off on alternate sides, often becoming pendent with age. The Beech exhibits the same kind of alternacy, but the acute angles are smaller, the distance between the twigs is wider, and the whole runs a kind of zigzag course, becoming pendent, but twisted and entangled. The subject may be pursued in other trees, but enough has been said to show that much may be learned towards recognising the species even in the leafless stage.

MAIN STEM OR TRUNK

The main stem or trunk of the tree is also in many instances peculiarly characteristic, as we may see in the leaden-grey, smooth trunk of the Beech, the peculiarly twisted stem of the Sweet Chestnut, or the rough, red-brown trunk of the Scots Fir, so frequently bent over near the top and denuded of its lower branches.

THE BARK AND ITS USES

The bark also serves very largely as a distinguishing mark, as in the thick, deeply furrowed, corky bark of the Oak, the shallower grooves in the Ash, the silvery-white peeling layers of the Birch, or the flaking plates of the Planes. The outer bark of trees is usually dead and dry, and in many cases is corky, giving a rugged appearance to the stem, as in the Elm and Oak, whilst in others it is capable of great distension, and presents a smooth appearance, as in the Beech. It is a protective tissue, acting as a buffer to the soft delicate structures that lie beneath, and one of its chief uses is to prevent excessive evaporation of the cell sap.

In the bark of stem and branches we may often observe small transpiration pores known as lenticels. They assume characteristic forms according to

INTRODUCTION

the species, and are well seen in Elder, Beech, and Birch, in the latter being conspicuous as narrow slits measuring from a half to four inches in length.

The bark of many deciduous trees and shrubs is brightly coloured, and advantage is often taken of this in planting for winter effect.

Several of the Dogwoods have red stems, and browns are common among the Spiræas and Syringas (*Philadelphus*). White is familiar in Silver Birch and the White-stemmed Bramble, greens in the Kerrias, Genistas, and Brooms, while in the Willows we have all shades of orange, yellow, and purple.

The bark of many trees is subject to the attacks of Scale insects, Aphides, and various species of Bark Beetles, some of which are mentioned in the detailed descriptions, while the leaves of trees and shrubs are also largely eaten by various kinds of larvæ. Man utilises the bark of the Cork Oak in many ways, and that of Oak and Birch is much used in tanning, though fast being superseded in this country by chemicals.

The valuable alkaloid quinine is obtained from the bark of several species of Cinchona, and the popular Cascara Sagrada or Sacred Bark comes from the *Rhamnus Purshiana*, a small tree closely allied to the English Buckthorn, and found in abundance in the United States of America.

USES OF TIMBER AND TREES GENERALLY

Before leaving the main stem of the tree we may refer to the innumerable uses to which the timber is applied. The mere mention of only the principal would occupy several pages, and the ever-increasing demand being made on the world's forests by the advance of civilisation is becoming a serious problem. It has been said that forests have a remarkable influence on climate, especially as regards the rainfall, that forests check evaporation, and, by cooling the air above them, act as condensers of the aqueous vapour, causing the minute particles to unite and form drops which fall through the action of gravity. But recent research tends to prove this to be somewhat exaggerated, though over forests the rainfall *may* be slightly greater than in the open. In many districts, where the land has been cleared of trees, a diminution in the rainfall has occurred. The presence of trees tends directly to keep up and

INTRODUCTION

render more uniform the water supply, by reducing the mechanical force of very heavy rain, and by means of their roots and the accumulation of humus retarding the passage of water through the soil.

PLEA FOR AN ARBOR DAY AND RE-AFFORESTATION

This state of things can be remedied only by scientific methods of re-planting, and in India and many parts of Europe a great deal is done to replace the timber-trees which have been cut down, while in Canada and the U.S.A. the younger generation are encouraged to plant trees on Arbor Day, a day set apart in each year for that purpose. That an Arbor Day will soon be instituted in this country is our earnest wish, for there can surely be no better or more commendable manner of commemorating any event than by planting a tree. Some barren spot will, as a consequence, be made brighter, some neighbourhood will become healthier, some poor mortal may perchance shelter under its welcome shade, some bird build its mossy cradle among its pliant branches.

A land without trees is as hopeless, and as barren, as a well without water! The very thought is sufficient to send a shudder through the frame of any man or woman worthy of the name, and in view of the continual outcry that we are hearing as to the means to be adopted for bringing people back to the land, here is one of the most cogent answers to the appeal. Dr. John Nisbet, in his revised edition of "Our Forests and Woodlands," gives a *résumé* of the progress of British Forestry since the first edition of the book appeared some seven years ago, and the important question of State afforestation is treated of briefly but with telling effect in view of our present enormous imports of hewn timber for pit-wood and of wood pulp for paper-making. We imported over two and a half million loads of pit-wood and more than half-a-million tons of wood pulp in 1907; and if our waste lands and poor pastures can be afforested with profit at all, it is precisely this class of coniferous timber that could be grown on them, and it would take thirty million acres of well-managed woodlands to simply supply these, our present imports.

INTRODUCTION

While a great deal more might be done by judicious husbandry in utilising waste lands and making desolate places beautiful, affording work for those willing to till the soil, and generally encouraging a love for the country, fortunately the tendency seems to be in the right direction.

THE ADVENT OF THE GARDEN CITY

The Garden City, for instance, has come to stay. It is the beginning of a new era. It is as yet neither Paradise nor Utopia, but it is a start on the road to better housing, healthier conditions for the people, more social intercourse, a love for the country, gardening, outdoor recreation, pursuits, and pleasures. "And what," you may ask, "has the advent of Garden Cities to do with trees?" The answer is obvious, for, if a Garden City is to be worthy of the name, trees and shrubs must of necessity play an important part in its upbuilding, its charm, its attractions, and its welfare.

In more than one Garden City of our acquaintance we have been pleased to observe that tree planting is one of the chief and essential features that attract attention. Not long since we paid an interesting visit to a certain locality—now a Garden City—where there previously existed a six square mile area of pastoral country, sparsely wooded for the most part, excepting for two or three choice spots, prominent among them being a delightful common of seventy-eight acres, covered with Privet, Buckthorn, Blackthorn, Whitethorn, Elder, Wild Rose, and other trees, shrubs, and herbaceous plants. Now as the city develops the streets are being planted with many kinds of trees; the common and its wild beauty is being rigorously preserved; the fostering of a natural inclination for gardening, hedgerows, trees, everything that is not an eyesore, is encouraged. It is, so far as has been possible in the short time at command, a Garden City in the truest sense of the word, and although we of to-day may not appreciate it as we should do, nor live to see its complete accomplishment, there are generations as yet unborn who will, we venture to predict, be thankful a thousand times

INTRODUCTION

that there was created for them a place of quiet beauty and restfulness, a city with pure air, blue sky, green grass, soaring larks, verdant trees, where they might find solace, comfort, and recreation far from the busy turmoil of the great City and the rush of the work-a-day world.

STUDY OF WINTER BUDS

The study of winter buds is a subject of great interest, and they are so definite and constant in their character that trees can be easily identified by this means. The twigs usually bear a terminal bud at the end, and others, known as axillary buds, arranged along the sides in a definite order. In the Ash, Horse Chestnut, and Sycamore they are in opposite pairs at right angles to each other up the stem.

Then again in the Beech, Elm, and Plane we find them arranged more or less alternately, and we have a spiral arrangement in the Poplar and Oak. In the latter we also find a terminal cluster of five or six buds instead of the large solitary bud usually seen in that position.

The young leaves within the bud are usually protected by bud scales, varying in number from a few to very many, as in the Oak, where we find twenty or more pairs of scales before a leaf is seen. The outer scales are often leathery, and may be either covered with hairs, or with a resinous secretion, so familiar in the buds of the Horse Chestnut. These are all means for keeping out damp and moisture, and for moderating the changes of temperature within, where any sudden freezing or thawing might rupture the delicate tissues. When the bud-scales die they leave rings of scars, and the distance between each set of rings represents a year's growth, so that it is easy to tell the age of a twig by counting these intervals. The fallen leaves also give characteristic scars, differing very much according to the species, but this is well seen in the Horse Chestnut, where they have the likeness of a horse-shoe, the resemblance to the nails being conspicuous in the ends of the fibro-vascular bundles of the leaf.

The bud-scales vary much in colour, reds, browns, and greens being most

INTRODUCTION

common, whilst in the Ash they are of so dark a shade of olive-green as to appear almost black in the distance.

INSECT PESTS

The timber of trees in the living state is subject to attack from insect larvæ, two of the most common being those of the Goat Moth (*Cossus ligniperda*) and the Wood Leopard Moth (*Zeuzera æsculi*). The former is most frequently associated with Willows, but is also partial to Oak, Lime, and fruit trees, especially Apple, Pear, and Plum. The latter attacks Ash, Beech, Birch, Elm, Walnut, and the before-mentioned fruit trees.

The larvæ of Wood Wasps, especially the Giant Sirex (*Sirex gigas*), often bore into the Fir trees, and those of many beetles work havoc in the wood of other trees.

FUNGOID PESTS

Among fungoid diseases which affect decay in timber, two of the best known are the Canker Fungus (*Nectria ditissima*), which is common in Apple trees, but also attacks Pear, Plum, Oak, Beech, Ash, &c., and the Larch disease or Larch Canker, which probably owes its origin to the spores of *Peziza Wilkommii*.

AGE OF TREES

In spite of their many enemies trees often attain great age, and though it is impossible to accept the estimates that have been made by the older naturalists, there is little doubt that individuals have remained in a flourishing condition for over a thousand years.

Tradition places the age of some of the Cedars of Lebanon at about 3000 years, and probably the Yew has attained as great an age. The specimens at Fountains Abbey are believed to have been flourishing twelve cen-

INTRODUCTION

turies ago, and Lime trees near Friburg have existed as long. Oaks, too, are long-lived, and several in England have probably stood for 800 to 1500 years. Space will not permit us to pursue the subject further, but among others of the longest-lived may be mentioned the Cypress, Larch, and Elm, whilst the Wellingtonias and other giants of Western America carry us back in imagination beyond the dawn of history.

NATURE'S LABORATORY AND COAL

We have spoken of the uses to which we put trees in the present age of high civilisation. But what shall we say of those vast primeval forests which in the course of bygone ages were annihilated, and in the hidden recesses of Nature's laboratory transmuted into what we now know as coal? We can scarcely imagine what would be the industrial conditions of to-day without our seemingly inexhaustible supplies of this universal commodity, and the innumerable by-products which man in his ingenuity extracts from it. Yet what do we know of its origin? Truly little indeed, and even that little only through the patient toiling of the geologist and botanist, who have combined to probe Nature's secrets and build up for us a feeble picture of the luxuriant vegetation which clothed these antediluvian wilds in those days which we call the Carboniferous Period. By patient research these workers have pieced together the story, and they tell us that among the largest forms which composed those forests were certain Lycopodiums or Club-mosses known as *Sigillariæ* and *Lepidodendra*.

The *Sigillariæ* attained a height of 60 to 70 ft., the unbranched stem having a number of longitudinal rows of diamond-shaped leaf-scars, and being somewhat hollow, so that where the trees have fallen and been subjected to great compression, the fossil remains are simply the thickness of the double bark, that is, the two opposite sides of the envelope which covered the trunk when living.

The *Lepidodendra* had much-branched stems, 100 ft. or more in length, also beautifully marked with scars, whilst the branches bore at their ex-



SHAPES OF LEAVES

(For description of Plate see page XXVIII)

INTRODUCTION

tremities cylindrical sporangia filled with minute spores. The bituminous coal in many instances is made up almost entirely of these spores and spore-cases.

Another important group of trees which reached their maximum in the Carboniferous Period were the Conifers, represented to-day by our Firs and Pines. Those found in the coal-beds were closely related to the Araucarias, and in many districts their fossil fruits have been found in great quantities.

There were also at this time lofty trees or bushes with multipinnate leaves several feet in length, in the shade of which other smaller species grew and flourished.

Through the eons life and death marched hand in hand, and the accumulations of vegetable material, caused by the steady yearly shedding of leaves, fronds, and spores, and the decay of fallen giants, continued to grow, being subjected to an ever-increasing pressure, and gradually being covered by sedimentary deposits, beneath which they might remain till the genius of man should extract them from the depths of the earth to serve the wants of industry and his own dwelling.

LEAF STRUCTURE, FORM, AND FUNCTIONS

We have referred to the more æsthetic beauty of trees as exemplified in their general outline and ramification, but it is probably the foliage, with its ever-varying form and colours, and its niceties of light and shade, which will appeal most to the casual observer.

We cannot here enter into a systematic description of the various forms of leaves, but it is a matter of vital importance in the identification of species, and, owing to the fact that the life of the flowers is at most a short one, it is often our chief guide.

Not only do leaves vary greatly in their arrangement on the stem and in their outline, but they exhibit many minute differences in colour and texture, each with its own appellation, and for the meaning of these the student must be referred to the Glossary. This infinite variety of leaf form and structure is intimately connected with the environment of the plant. The deep incisions and clefts which give such beauty to the outline of

INTRODUCTION

compound leaves, and the disposition of the leaves on the stem, and of the leaflets on the petiole, are definitely related with the admission of light, without which the activity of the green tissues would be much impaired, if not altogether arrested. The texture of leaves is associated with the prevention of excessive exhalation and the consequent danger from heat, and among the devices adopted to shield the epidermis from the direct rays of the sun, and reduce transpiration, may be mentioned the coriaceous membranes with which many leaves are provided, the woolly or siliceous hair-like structures which are especially prevalent on their under-surfaces, and the revolute margins of many which grow in exposed situations.

Among the contrivances adopted as a protection against animate nature may be mentioned the various forms of stinging hairs, spines, and prickles to be found on the leaves, petioles, stems, and branches of various plants. In the struggle for existence, and in the face of the incessant depredations of animal visitors, these modifications of plant structures have undoubtedly been the salvation of the race. In the case of the lower forms of animal life, more especially as regards the insect world, the signs of warfare are many and numerous, whole colonies of trees and shrubs sometimes being denuded of foliage by insect larvæ, and volumes have been devoted to the description of the various galls which owe their origin to insect agency. Many of these attack the leaves, and attention is drawn to a few in the descriptive pages. The foliage also is especially susceptible to fungoid diseases, and an interesting study may be made of these at all seasons of the year. The life-history of many is at present but imperfectly known, and a wide field of research here lies open to the earnest worker.

AUTUMNAL BEAUTY OF HEDGEROW, WOOD, AND GARDEN

Before leaving this part of our subject we will for a moment direct attention to the autumnal beauty of our hedges, woods, and gardens. Few dwellers in the country can have failed to notice the infinite variety of colour which attaches to the dying foliage, and even those in towns must

INTRODUCTION

be familiar with the exquisite colouration of the Horse-Chestnut leaves in the early stages of decay, and the many beautiful gradations through which the leaves of the Elms pass in their change from the sombre green of summer to the golden yellow at their fall.

In an Oak wood we may see every variety of green and every variety of brown, while among the Beeches we have a long range from modest brown to glowing orange. In the Hedge Maple we find every shade of green, brown, and orange suffused with gold, and among the Brambles and on the Hawthorn we get every possible variation in green, orange, yellow, red, and brown.

Space will not permit of our going through the list of all our common trees, but we must pause to mention a few of our cultivated trees and shrubs which may be depended on in most years to put on their autumnal livery of crimson, scarlet, and gold. The various species of Maple provide us with examples of red, orange, yellow, and scarlet, and all the species of *Æsculus* turn yellow. Many of the Thorns (*Cratægus*) take on brilliant shades of red, bronze, orange, and scarlet, and among the many fine examples of yellows may be placed the Poplars, Sycamore, Tulip Tree, Honey Locust, and Maidenhair Tree. Among shrubs some of the most striking are the Sumachs (*Rhus*), most of which turn red, while the Barberries furnish us with red, purple, and scarlet. The exact nature of the subtle chemical changes which take place in the cell-contents of the leaf and produce this autumn colouration is not clearly understood, nor is the reason clear as to why it varies so much in different seasons, but, as a rule, it seems to be best when a warm, moist summer is followed by a dry, sunny autumn, and many species colour best when growing in a soil which is not over-rich.

FLORAL STRUCTURE AND POLLINATION

Let us for a moment turn our attention to the flowers. We are not here concerned with their structure, for that is dealt with fully in the detailed descriptions, but we should like to direct the student to the many interest-

INTRODUCTION

ing problems connected with the question of their pollination and fertilisation. Nearly all the species dealt with in this work belong to one or other of two great classes of Flowering Plants, the Dicotyledons and Gymnosperms, the Monocotyledons being represented by a very few species. The Gymnosperms, or plants with naked ovules, have flowers which are unisexual and destitute of calyx and corolla, and are entirely wind-fertilised. There is a general broad resemblance of structure in the various genera and species, and the fertilised ovules take from one to three years to become ripe seeds. In the Dicotyledons we have a marvellous diversity of floral structure, and there is no doubt that each peculiarity has its own significance.

Generally speaking, self-fertilisation is not advantageous to the plant, and the structural differences are usually a means of preventing this, and at the same time an aid to cross-pollination. Our catkin-bearing trees are conspicuous examples of this, for their flowers are nearly all anemophilous, the females having well-developed and usually projecting stigmas, and the male flowers being easily shaken in the wind, while, as an aid to the better dispersal of their pollen by the wind, they almost universally blossom before the leaves are fully developed. Irregular and conspicuously coloured flowers are nearly always pollinated by insects, and our trees and shrubs provide us with many examples, the greater number perhaps belonging to the Order Leguminosæ. The latter are for the most part pollinated by bees, but among entomophilous flowers we have many which for the perpetuation of the species are dependent on the visits of butterflies or moths, wasps, flies, or beetles. We cannot stay to discuss the many questions connected with colour, perfume, nectaries, &c., but will direct the reader to the very admirable chapters on the subject to be found in various well-known botanical works.

COMMERCIAL PRODUCTS OF FLOWERS OF TREES AND SHRUBS

As commercial products the flowers of trees and shrubs are of not much value, but in two instances the unopened flower-buds are used commercially, viz., in the case of Capers, which are produced on a small shrub (*Capparis*



TYPES OF INFLORESCENCE
 (For description of Plate see page XXVIII)



INTRODUCTION

spinosa) grown in South Europe, and with Cloves, which are the product of an East Indian tree (*Caryophyllus aromaticus*) belonging to the Order Myrtaceæ, which includes other such useful products as Allspice, Pomegranate, and the many species of Eucalyptus. Another most interesting example is provided in the Fig, popularly regarded as a fruit, and used as such in dessert, but which is in reality an inflorescence or collection of flowers.

FRUIT AND SEED

In our review of the tree we now come to the most essential point, the fulfilment of the Creator's command, "Let the earth bring forth grass, the herb yielding seed, and the fruit tree yielding fruit after his kind, whose seed is in itself upon the earth." Since the dawn of creation Dame Nature has been working out this scheme, and the results of her handiwork are around us in the endless variety of shape and form evolved by the fruit and seed, and the innumerable mechanical contrivances adopted for their dispersal.

Time and space will not permit of our entering into details of the Classification of Fruits, but we shall find that the majority of those dealt with may be placed under the headings of pomes, drupes, berries, capsules, samaras or cones. The first three are fleshy fruits containing seeds, and in their dissemination birds and other animals take an active part. The succulent portion of such fruits is greedily devoured, but the seeds usually resist digestion, and are sometimes transported to great distances where, under favourable conditions of soil, moisture, and temperature, they may continue the race.

The true capsules liberate their seeds through toothed openings or pores, or by forcibly bursting open in well-defined directions. The pod or legume, which is often described as a capsule, also bursts to disperse its seeds, and sometimes propels them a considerable distance. In the samaras or winged fruits, and in the winged seeds of the cones, we have aids for their dispersal by the wind, and many other interesting forms of fruit and seeds of less frequent occurrence may be met with.

INTRODUCTION

Among the useful products of trees may be mentioned the orange, lemon, citron, lime, banana, and date; nuts include almonds, Brazil nuts, chestnuts, and walnuts; and useful beverages are obtained from cocoa and coffee.

Many fruits and seeds are subject to attack from insect larvæ, especially of beetles, many of which are known as weevils. Many trees and shrubs lend beauty to the autumn through the charming effects produced by their conspicuous and brightly coloured fruits, and to the student of Nature they have the additional merit of encouraging bird-life, for the delicacies displayed in such profusion are eagerly devoured by our feathered visitors.

FINE-FRUITING TREES AND SHRUBS FOR DECORATIVE EFFECT

Of all the natural orders into which our plants are grouped none is so prolific of fine fruits as the Rosaceæ, and many familiar examples are to be found among the Roses, Pyruses, Thorns, and Cotoneasters. Many of the Rose fruits are extremely beautiful, the most conspicuous being the bright red orange-shaped hip of *Rosa rugosa*, measuring 1 inch or more across, and surrounded by leaf-like persistent sepals $1\frac{1}{2}$ inches long. The Dog Rose, so familiar in our hedges, is also worthy of note, being deserving of a place in the garden, its fruit being, like many others of the genus, a beautiful red.

Varying shades of red, orange, and yellow are provided by the genus *Pyrus*, which includes the Crabs, White Bean, and Mountain Ash. Many of the Thorns are very effective, and rarely fail to carry a good crop of brightly coloured fruit. Among the best examples we may place the Cockspur, Fiery Evergreen, and Washington Thorns. The Cotoneasters may supply us with specimens for the lawn, shrubbery, wall, or rockery, differing so widely in habit that one or more can be found for almost any position seldom failing to provide an autumn show of handsome berries.

Of the many other showy species we need only mention the inflated



SOME TYPICAL FRUITS

(For description of Plate see page XXVIII)

INTRODUCTION

Pods of the Bladder Nuts and Bladder Sennas, the conspicuous white fruits of the Snow-berry, those of the Arbutus resembling ripe strawberries, the bright orange berries of the Sea Buckthorn, and the Spindle trees with their open red fruits revealing the orange-coloured seeds within. The list could be extended almost indefinitely, but we have said enough to prove that to those who will look for them there are beauties in our trees and shrubs at all seasons of the year.

PENDULOUS TREES AND SHRUBS

As a last word on the subject of beauty we will call attention to the many varieties of pendulous trees and shrubs which we may find in cultivation. Very few of these are species coming true from seed, but have mostly originated as sports, and are propagated by grafting, cuttings, or layers. Some of the best known and most frequently met with are the weeping varieties of the Ash, Birch, Elm, Poplar, and Willow. The genus *Prunus* gives us several forms of Cherry, and there are pendulous varieties of Alder, Hazel, Hornbeam, and Oak. The weeping forms of Holly are the best of all evergreen trees with a pendulous habit, and among Conifers we have pendulous varieties of Cedar, Cypress, Juniper, Larch, Yew, and others to choose from. All such trees and shrubs are seen to the best advantage when growing on an open lawn or on the margin of a lake or stream.

THE SCENT OF TREES: THE BEAUTY OF THE LIME

The scent given off by some kinds of trees and shrubby plants—and the latter especially—is one of the many features of the countryside and the garden.

Whilst comparatively few of our commoner British trees are aromatic, exception must be made in the case of the Lime. When laden with its light yellowish tassels of bloom during the wealth of summer, when the honey bees are taking toll from the nectar and so energetically pursuing their

INTRODUCTION

sweet pillage amongst the flowers, then it is that few scents in the country are more beautiful or enticing. Perchance the lovely breath from the sweet violet wafted on the breeze from some sun-kissed bank, or the delicious perfume from the meadow-sweet along some secluded streamside, or the fresh, invigorating air after a shower of rain, or the scent from the hayfields, may vie with the Lime in luxury of aroma, but the latter surely eclipses all. Of an evening, when the heat and dust of the day have departed, and twilight replaces the dawn, when the little pipistrelle bat is commencing its nocturnal exploitations, and the bees have gone home to slumber after the day's pillaging among the flowers, then it is the Lime is at its best. We really do not know of any other British tree which gives to the country such a delightful scent, nor—with the exception of the male Sallow blossoms in the early spring, the Brambles in the summer, and the Ivy in the autumn and winter—one that attracts such an abundance of insect visitors.

It is astonishing to notice, however, how few people appear to hear the pleasing monotone, or stop to inhale the sweet aroma. Yet most of us seem to love trees, and nearly every one is passionately fond of flowers. Many of our more unfortunate fellows, penned up in town or city, who for a few brief hours pass a week end with us in the country, crave for a sight of, and a meander through, some tangled and untrammelled piece of wild England, some lonely copse, some secluded greenwood where the squirrel loves to gambol in the tree tops playing hide-and-seek, and the jay and the woodpecker delight in sounding their loud clarion cry.

COMPANIONSHIP OF TREES

There is companionship in trees. Shakespeare has written of sermons in stones. Verily, if there be sermons in stones, there are sermons and music and congregation combined in trees.

Have you ever wandered alone through some favourite belt of woodland listening to the feathered choir, stooping to caress some vegetable treasure at your feet, watching the rabbits scuttle away at your approach, or a crafty weasel creeping snake-like through the undergrowth? You

INTRODUCTION

inhale the pure air, gain inspiration from Nature's inexhaustible storehouse at every step you take into her sacred fastnesses; the wood is in itself a rich museum, a fairy forest, full of wonders untold, secrets as yet unravelled, pathways as yet untrod, and the trees seem so very near that you know not solitude during your interviews and association with them.

"At the gates of the forest," says Emerson, "the surprised man of the world is forced to leave his city estimates of great and small, wise and foolish. The knapsack of custom falls off his back with the first step he makes into these precincts. . . . Here is sanctity which shames our religions, and reality which discredits our heroes. . . . The tempered light of the woods is like a perpetual morning, and is stimulating and heroic. Here no history, or church, or state is interpolated on the divine sky and the immortal year!" Yet, while the birds and other animals interest and amuse you with their winning ways, and you note the smaller plants, the crafty woodbine and the twining bryony, that by force of youthful sap thrust themselves over and around their fellows, it is the larger trees which look down upon you and seem to preach a living sermon, seem to proclaim a real message. The wind gently rustles the leaves so that they shimmer in the sunlight and thus produce a kind of woodland lullaby, a whisper of welcome, a message of friendliness, a spirit of companionship, a symphony of love.

Never need one be dull or morose when in the neighbourhood of trees, and if people generally realised what we owe to them for the purposes of fuel, food, medicine, raiment, and timber, they would undoubtedly be much more highly regarded than they are to-day. They are happy sanctuaries for birds, squirrels, bats, a vast array of insects, and other animals; they improve the landscape, temper the winds, consolidate the soil, give off an abundance of life-giving oxygen and breathe in the bad gases that we breathe out, and generally add a complete charm to the town or countryside such as no other branch of Dame Nature's fruitful family can ever hope to do.

Surely our natural love is for trees, for the little copse, the wild woodland, or the virgin forest. From the latter we have, as it were, not long since emerged; our woodcraft in some remote districts has lost none of its cunning.

INTRODUCTION

Far back in distant ages we learn of tree-worship, of the mysterious influence surrounding the grove. "Trees," says Pliny, "were the first temples," and although we have lost some of the poetic fancy connected with trees we have learned much of their life histories. The mystery, however, is still there, and to probe into the secrets affords an abundance of wonder and delight.

OUR WOODLANDS OF TO-DAY

To-day, when the woodman uses his axe so largely and so often, our great forests and woods are denuded of the monarchs among which the deer, the wild boar, the bear, the wolf, and other animals once roamed, and we see in many instances the wood of our youth converted into the homeliness of the spinney or the copse. And what a remarkable change takes place in the living garment when light and air are let into the woodland. Presto! was ever anything more magical or remarkable? Have you never witnessed such a transformation? If not, then your experience has been very dissimilar to our own. Fresh plants have sprung up with amazing rapidity and carpeted the ground with their virgin growth; a new young wood has been silently ushered into the world, and between the few remaining trees of an older growth that stood sentinel-like, the earth was literally festooned with a profusion of herbage.

The whole panorama requires to be actually seen to be appreciated, and as the various wild tenants inhabit the copse, and plants appear, disappear, and re-appear, there is a whole succession of interesting phenomena displayed to view which cannot fail to fill one full of gratitude and wonder.

A GOOD STORY BY DEAN HOLE

"'Tis a beautiful tree," our neighbours say, and that is mostly the only comment they have to make. That is the Alpha and Omega of it all! This reminds us of a story told by the late Dean Hole in his charming

INTRODUCTION

book, "Our Gardens." It is worth retelling here. The Dean is writing in his own inimitable way of the various persons he approached as to their opinion of what a garden was for, and he says that "the unkindest cut of all, so common that it makes one callous, comes from those visitors who 'would be so delighted to see our garden!' and they come and see, and forget to be delighted. They admire the old city walls that surround it, they like to hear the cawing of the rooks, they are pleased with the sun-dial and the garden chairs, but as for horticulture they might as well be in Piccadilly! They would be more attracted by the fruit in Solomon's shop than by all the flowers in the border. I heard a lady speaking to her companion of 'the most perfect gem she had ever seen,' and when, supposing that reference was made to some exquisite novelty in plants, I inquired the name and habitation, I was informed that the subject under discussion was 'Isabel's new baby.' 'Ladies,' I remarked, with a courteous but scathing satire, 'I have been a baby myself, and am now a proprietor, but I am constrained to inform you that this is a private, and not a nursery, garden.'"

THE MISSION OF THE TREES

It is an undisputed fact that few people stop to admire a tree's symmetry, its bark, its chaste and delicate filigree and lacework during winter, or to study the functions of the leaves, the flowers, the roots, the branches, the fruit, its uses; just its beauty, that is all.

Why do trees unfold themselves with such lavish and remarkable splendour? Why are so many so comely, so attractive, so inspiring, so friendly, so companionable, so neighbourly (often more so than their human prototypes)? No flower "is born to blush unseen, and waste its sweetness on the desert air," for, although many please and satisfy us, it is not for us alone that they have, through the countless ages, evolved into the wonderful floral treasures we see before us to-day.

No tree or shrub, nor herbaceous plant, wastes its sweetness on the desert

INTRODUCTION

air. Each in its way has a mission to fulfil, business to carry out, a message to deliver, a duty to perform.

Their beauty is not meant for sentiment nor display, but, as the late Hugh Macmillan has so truly said, "for use in the economy of the plants that produce it, so that they could not be spread over the earth, over those desert places themselves, without that beauty."

AN ENGLISH WOOD IN SPRINGTIME

To be in an English wood in the early springtime, to observe the Hazel catkins swinging like so many fairy bells on the leafless branches, is one of the greatest delights which could come to any one interested in outdoor life. The noting down systematically, season after season, of the first leafing of the green canopy above, and the date of flowering, fruiting, and fall; the arrival of some favourite bird among the pliant branches; the appearance of the first brimstone or tortoiseshell butterfly; the songs of newly awakened birds; the peeping from its woodland and leaf-strewn bed of the pale primrose; the hum of insects; the frolics of wild folks, and generally the resurrection of everything that lives out of doors and likes the sun,—all these tend to make an April morning in the wild greenwood the very essence of quiet and unobtrusive enjoyment, and result in a rich harvest to those possessing the seeing eye.

Here one may note and appreciate to the full the music of the feathered choir, the murmur of the wind, the ripple of the leaves, the distant lullaby of the sheep-bell, and receive with reverence the message of the trees.

There is no doubt, as Richard Jefferies has said, that "if you wish your children to think deep things, to know the holiest emotions, take them to wood and hills, and give them the freedom of the meadows. Under the green spray, among the Hazel boughs, where the nightingale sings, they shall find a secret, a feeling, a sense that fills the heart with an emotion never to be forgotten."

INTRODUCTION

MORE WOODLAND PICTURES

There is a peculiar fascination in being in a wood at any time, but especially so in the early morning when the sun is just flashing its rays across the dew-spattered meadows and through the fast-leaving woodland of the first days of spring.

Towards the gloaming hour, too, when the chorus of thrushes and blackbirds is such a feature of our English springtime, there is some indescribable charm in wandering silently through a wood, and again, in the very heart of summer, it is cool and refreshing to dive into the greenwood's welcome shade. The birds have by then mostly ceased their minstrelsy; perchance a startled rabbit skips away as you tread on a piece of dead wood which goes off with a loud report; an inquiring robin and a few tits are busy on the moss-strewn tree trunk yonder, but even the industrious insects seem to be taking life very quietly and soberly.

How still everything is! Not a leaf stirs. The trees bear the full complement of their summer dresses; they are simply wreathed in foliage, and many are already in fruit. You rest awhile near the old spot you know and love so well. A turtle-dove slips silently off her nest, and you would not have noticed her at all only your eye chanced to wander towards the spot from whence she rose.

What pictures come to mind as you sit there soliloquising. You think first of those cheerless winter days when it was cold and blustering in the open, but mild and inviting among the trees. Then later comes the remembrance of the first little tuft of red upon the Hazel, the bursting of the Sallow into a blaze of splendour, the feathery tufts upon the Larch, the green carpet afforded by the Dog's Mercury, the gradual robing of the woodland, the mating of birds, the hum of insects, and finally the full glow of spring.

These thoughts have often occurred to us as we have sought refuge in the wood from the rush and bustle of everyday life. We have tested it at all times and at all seasons, and it has never disappointed us. When within

INTRODUCTION

it we are happy; we are on familiar terms with every tree almost; we feel somehow that we are part and parcel of the green canopy above and the soft verdure beneath, but when we leave it behind and step out into the wide and often unthinking world, we feel we have lost a friend. Yet we are contented to know that we may, and shall, return to seek companionship and fellowship with the trees and flowers again, and thank Heaven that we have imbued within us a sense of the beautiful in Nature's wonders.

The quietude of summer in the woodland is so entirely different from the full gush of spring, when the re-leaving of the trees, the thrusting above earth's surface of the first flowers, and the fussy courtships of birds engage and occupy one's attention.

To our mind one of the greatest experiences is to commune with Nature in solitude during the full glow of summer in some sylvan retreat, some lonely copse, some secluded woodland glen.

HOW TO READ THE STORY OF THE YEAR

To know and appreciate a wood properly, and to be on intimate terms of acquaintance with trees, birds, and flowers, it is essential to walk lovingly and trustfully with them at all seasons of the year.

It has been our pleasant and profitable enjoyment to ramble through woodlands far from the madding crowd for many years past, and throughout the whole year. It is only by this means that one can appreciate the rich charm of Nature, and be able to piece together in a humble way the great story of the year.

As a result one indelibly associates the environment of a bird, an insect, a flower, or other inhabitant of the fairyland of living things, with the particular object one has in mind. When we think of the wood wren we at once associate it with a Beechwood, among the stately temples and avenues of which this bird delights to pass the summer hours.

When we think of squirrels and jays, of golden-crested wrens and

INTRODUCTION

doves, the groves of sombre, thickly-matted Firs and Pines at once come into view. The Oakwood reminds us of the nuthatch, the woodpecker, the wryneck, the tree creeper, and insects far too numerous to mention.

The tall Elms are indivisibly connected with the sable rooks; the ivy-clad ruins and the hollow trees with their near relative the starling. The mossy nest of the chaffinch is inseparably associated with the milk-white bloom of a hedgerow, the nightingale brings to mind the thick retreat of a blossoming thorn.

It is a good thing to be cognisant of the environment of an animal or plant, for it is only by this means that a full measure of enjoyment can be obtained. Without a knowledge of the habitat of any of Nature's children one half the interest and the beauty vanishes, and whilst we are the first to recognise the educational advantages of Museums and Gardens, Pestalozzi was right when he said: "Lead your child out into Nature; teach him on the hill-top and in the valleys. There he will listen better and the sense of freedom will give him more strength to overcome difficulties. But in these hours of freedom let him be taught by Nature rather than by you. Should a bird sing or an insect hum on a leaf, at once stop your talking; bird and insect are teaching him; you may be silent."

If in any measure this work helps to create an interest in, and a love for, trees and shrubs, we shall feel amply repaid for the great amount of labour expended in its compilation, and it is our earnest hope that not only will these trees and shrubs be regarded from the standpoint of beauty, form, colour, design, usefulness, ornament, or service, but that those who honour us by a perusal of these pages will be able to enter fully into the spirit of the lines:—

"Ye bright mosaics that with storied beauty
The floor of Nature's temple tessellate,
What numerous emblems of instructive duty
Your forms create!"

TREES AND SHRUBS

Description of Plate I

SHAPES OF LEAVES

- | | |
|------------------------------------------------------------------|--------------------------------------------------|
| A. ACEROSE, or ACICULAR (Scotch Pine). | H. OVATE (Lilac). |
| B. LINEAR (Sea Buckthorn). | I. CORDATE (Mulberry). |
| C ¹ . SUBULATE (Furze); C ² . Single leaf. | J. CUNEATE (Leaflet of Horse-Chestnut). |
| D. LANCEOLATE (Willow). | K. TERNATE, or TRIFOLIATE (Laburnum). |
| E. OVAL, or ELLIPTICAL (Gean). | L. IMPARIPINNATE (Robinia). |
| F. OBLONG (Common Laurel). | M. BIPINNATE (<i>Gleditschia triacanthos</i>). |
| G. ORBICULAR (Hazel). | |

Description of Plate II

TYPES OF INFLORESCENCE

- | | | |
|----------------------------------------|----------------------------------------|------------------------------------------|
| A. RACEME (Bird Cherry). | F. CAPITULUM or HEAD (<i>Olearia</i> | P ¹ . SINGLE FEMALE FLOWER. |
| B. PANICLE (Traveller's Joy). | <i>Haastii</i>). | P ² . SINGLE MALE FLOWER. |
| C. CORYMB (<i>Pyrus sorbus</i>). | F ¹ . STAMENS AND PISTIL OF | J. VERTICILLASTER (Jerusalem |
| D ¹ . CATKIN (Hazel). | INNER FLORETS | Sage). |
| D ² . SINGLE MALE FLOWER OF | F ² . A SINGLE RAY FLORET. | J ¹ . LONGITUDINAL SECTION OF |
| HAZEL CATKIN. | G. THYRSUS (Lilac). | SAME. |
| E. UMBEL (Dwarf Cherry). | H. DICHASIUM (<i>Euonymus</i>). | K. GLOMERULE (Box). |
| | I. HYPANTHODIUM (Fig). | |

Description of Plate III

SOME TYPICAL FRUITS

- | | |
|-----------------------------------------------------------------------|-----------------------------------------------------------------|
| 1. CYPSELA—Head of <i>Olearia Haastii</i> in seed. | 18. CARCERULUS—Fruit of <i>Phlomis fruticosa</i> , with part of |
| 2. " Single parachute seed of same. | calyx-tube. |
| 3. GLANS, or NUT—Sweet Chestnut, cupule open, showing the three nuts. | 19. " Fruit of <i>Phlomis fruticosa</i> , splitting into |
| 4. " Longitudinal section of nut of | four nuts or achenes. |
| 5. " A single nut of same. | 20. DRUPE—Cherry. |
| 6. " Section of young fruit. | 21. " Section of same, showing stone. |
| 7. CAPSULE of <i>Euonymus Europæus</i> . | 22. " Complete section of same, showing kernel within |
| 8. " of same, open and empty. | stone. |
| 9. " of same, open, with seeds in position. | 23. POME—Crab-apple. |
| 10. SAMARA—Single samara of Elm. | 24. " Transverse section of same. |
| 11. " Single samara of Ash. | 25. " Longitudinal section of same. |
| 12. " Double samara of Sycamore. | 26. ETÆRIO of Follicles— <i>Magnolia conspicua</i> . |
| 13. " Section of half of same, showing enclosed | 27. " " Vertical section of same. |
| cotyledonous leaves. | 28. ETÆRIO of Drupes—Blackberry. |
| 14. LEGUME—Pod of Broom, closed. | 29. " " Vertical section of same. |
| 15. " Pod of Broom, open. | 30. CYNARRHODIUM—Dog-rose. |
| 16. BERRY—Wild Gooseberry. | 31. " Vertical section of same. |
| 17. " Section of same (<i>Transverse</i>). | 32. STROBILUS—Spruce Fir, closed cone. |
| | 33. " " winged seeds of same, within |
| | scale. |
| | 34. " Weymouth Pine, open cone. |

CHAPTER I

INJURIOUS INSECTS

THE number of insects injurious to plants is very large, and their rapid increase is often alarming, as in only comparatively few cases are effectual remedies available. It is our intention to take a hasty glance at the more important of those insects which cause material injury to Trees and Shrubs. With the space at our disposal the descriptions must necessarily be brief.

Among the Coleoptera or Beetles there are many which may be classed as Pests.

The Cockchafer or "May-bug" (*Melolantha vulgaris*) is a large heavy-looking reddish-brown insect about 1 in. long. The head and thorax are black, the abdomen being of the same colour, with stripes of white hairs on the underside. The pointed tip of the abdomen projects beyond the elytra. The larvæ or "White-grubs" devour the roots of Roses and seedling trees, young Oaks and Fir-trees often suffering severely. The adult insects live on the foliage of fruit-trees, Roses, and such forest-trees as the Oak, Chestnut, and Beech, the needles of Larch and Spruce, and the male cones of Scots Pine. The beetles fly in the evening, so must be collected and killed during the day. The larvæ, which live in the ground for three years, may be trapped in pieces of turf laid with the grass downwards.

The Summer Chafer (*Rhizotrogus solstitialis*) appears in June and July. It somewhat resembles the larger Cockchafer, but is only about $\frac{2}{3}$ in. long. The larvæ live about two years in the ground, and the adult beetles live partly on the foliage of Rose-trees. They must be collected in the daytime.

The Garden Chafer or Bracken-clock (*Phyllopertha horticola*) is known in Wales as the Coch-y-bonddu, and appears in May and June. It is about $\frac{1}{2}$ in. long, the front part of the body being of a metallic greenish colour, and the elytra or wing cases of a reddish-brown hue, the male being

TREES AND SHRUBS

very hairy. The larva lives about a year, and the beetle feeds largely on the foliage of fruit-trees and Roses. Being a day-flier, and very active in the sunshine, it must be attacked late in the day or when the weather is dull.

The Rose Chafer (*Cetonia aurata*) is a handsome beetle about $\frac{3}{4}$ in. long, with golden green wing-cases marked with transverse creamy spots, and the body coppery beneath. The larvæ live underground for two or three years, eating the rootlets of Rose-trees, and gnawing off the skin of the larger roots. The adult beetles feed largely on the anthers and petals of Roses. They are most easily collected on dewy mornings, when they are sluggish, or at night.

The Pine Beetle (*Hylesinus (Hylurgus) piniperda*) is one of the most destructive of forest insects. The mature beetle is about $\frac{1}{5}$ in. long, of a dark brown to glossy black colour, thinly covered with brown hairs springing from little tubercles, which, on the elytra, are disposed in rows between lines of punctures. Eggs are laid in March and April in the thick rough bark of recently felled trees, especially Scots Pine and Black Austrian Pine. The female lays about 100 eggs, which produce larvæ in about a fortnight. The larvæ feed on the bast or inner bark. The young beetles appear in June and July, and then usually bore into the young shoots of Pines about 2 ins. beneath the terminal bud, and, tunnelling upwards, cause the death of the shoots. The best method of prevention consists of leaving autumn or winter felled trees in or near the wood, in order to attract the beetles in the breeding season, and then removing the bark during May, when the larvæ may be destroyed by exposure.

The Spruce-bark Beetle (*Bostrychus (Tomiscus) typographus*) and others of the genus destroy Fir-trees by tunnelling just below the bark. As a rule they attack sickly trees, but may extend their depredations to healthy specimens also. Prevention consists of the timely removal of sickly or uprooted trees, and in stripping the bark from logs left lying in the woods over summer.

The Elm-destroying Beetle (*Scolytus destructor*), a small creature less

INSECTS INJURIOUS TO TREES AND SHRUBS

1. Lackey Moth (*MALACOSOMA NEUSTRIA*). 1A. Larva. 1B. Eggs, in ring round stem.
2. Mottled Umber Moth (*HYBERNIA DEFOLIARIA*). 2A. Wingless Female. 2B. Larva.
3. March Moth (*ANISOPTERYX ÆSCULARIA*). 4A. Female. 3B. Larva.
4. Brown Tail Moth (*EUPROCTIS CHRYSORRHŒA*). 4B. Larva.
5. Magpie Moth (*ABRAXAS GROSSULARIATA*). 5A. Larva.
6. Winter Moth (*CHEIMATOBIA BRUMATA*). 3A. Female. 6A. Larva.
7. Wood Leopard Moth (*ZEUZERA PYRINA*). 7A. Larva.
8. Goat Moth (*COSSUS LIGNIPERDA*). 8A. Larvæ, in Willow.
9. Green Oak Moth (*TORTRIX VIRIDANA*). 9A. Larva, descending from rolled leaf.
10. Codlin Moth (*CARPOCAPSA POMONELLA*). 10A. Larva, on Apple.
11. Cockchafer Beetle (*MELOLONTHA VULGARIS*).
12. Rose Chafer Beetle (*CETONIA AURATA*).
13. Pine Beetle (*HYLESINUS PINIPERDA*)—enlarged.
14. Garden Chafer, or June Bug (*PHYLLOPERTHA HORTICOLA*).
15. Gooseberry Saw-fly (*NEMATUS RIBESII*). 15A. Larvæ.

FOOD PLANTS

A. Blackthorn. B. Oak. C. Gooseberry. D. Hawthorn.

INSECTS INJURIOUS TO TREES AND SHRUBS

1. Lackey Moth (*MALACOSOMA AUSTRIACA*). 1A. Larva. 1B. Eggs in ring round stem.
2. Mottled Umber Moth (*HYPERIA DEPOLARIA*). 2A. Wingless Female. 2B. Larva.
3. Match Moth (*ANISOPLEURYX ASCULARIA*). 4. Female. 3A. Larva.
4. Brown Tail Moth (*EUPROCTIS CHRYSORHINCHUS*). 4A. Larva.
5. Maple Moth (*ABRAXAS GROSSELLIATA*). 5A. Larva.
6. Winter Moth (*CHEIMALOPHA BRUNATA*). 3A. Female. 6A. Larva.
7. Wood Leopard Moth (*ZEBCERA PYRINA*). 7A. Larva.
8. Goat Moth (*GOSYUS LIGNIBERDUS*). 8A. Larva, in Willow.
9. Green Oak Moth (*TORTRIX VIRIDANA*). 9A. Larva, descending from rolled leaf.
10. Codlin Moth (*CARPONOSA POMONELLA*). 10A. Larva, on Apple.
11. Cockchafer Beetle (*MELOLONTIA VILGARIA*).
12. Rose Chafer Beetle (*CETONIA AURATA*).
13. Pine Beetle (*HYPHENUS PINIBERDUS*)—enlarged.
14. Garden Chafer, or June Bug (*PHYLLOPERETHA HORTICOLA*).
15. Gooseberry Saw-fly (*NEMATIS RIBESII*). 15A. Larva.

FOOD PLANTS

- A. Blackberry. B. Oak. C. Gooseberry. D. Hawthorn.



INSECT PESTS

INJURIOUS INSECTS

than $\frac{1}{4}$ in. long, makes up in numbers what it lacks in size, for it is stated that as many as 80,000 have been found in one tree. The female beetle excavates the bark, making a tunnel about 2 ins. in length, and laying 20–50 eggs as she advances. These are hatched in about two months, and the larvæ eat out galleries on either side of the main tunnel. They pupate and emerge as perfect insects at the end of May in the second year. Brushing the tree with coal-tar is said to have the effect of driving away the perfect insects, but if the larvæ are allowed to commence their ravages there is but little hope of saving the tree. Other members of the genus attack the Oak.

The Fruit-tree Beetle (*Scolytus regulosus*) is a species which frequently attacks Apple-trees, and in a less degree the Pear, Plum, Cherry, and Peach. The insect seems to have a decided preference for sickly trees and parts of branches where there is the least flow of sap. It is barely $\frac{1}{10}$ in. long, and black in colour, except the ends of the wing-cases, legs, and antennæ, which are of a russet tinge. The eggs are laid in April in a gallery about $\frac{1}{2}$ in. long, and hatch in a few days. There are at least two generations during the year, and the winter is passed in the larval state. Not much can be done in the way of prevention except to cut out and burn all infested branches during June and remove all sickly trees.

The Pine Weevil (*Hylobius abietis*) is a beetle very harmful to the Scots Pine, Norway Spruce Fir, and other Conifers, as it feeds in the perfect state on the bark of the young shoots. It is dull black in colour, with scattered tufts of yellow hairs, and appears in the summer months (May to July). It gnaws the buds and bark of the twigs, thus interfering with the development of the tree. The evil is difficult to deal with, but the weevils are sometimes trapped in small pieces of bark laid at regular intervals, and kept in place by a stone being put over each. In sandy soils trenches are sometimes dug surrounding new plantations, and into these the weevils fall, and may be gathered and killed.

Other Pine-weevils are *Pissodes notatus* and *P. Pini*, both of which destroy the branches of Conifers by boring small holes in them and sucking the sap.

TREES AND SHRUBS

The Apple Blossom Weevil (*Anthonomus pomorum*) is a small brown beetle, about $\frac{1}{8}$ in. long. At the beginning of spring, the female lays 15-20 eggs, placing one in each flower bud. The larva hatches in 5-9 days, and proceeds to feed on the essential parts of the blossom. In about 8-10 days the larva changes to pupa, and at the end of another 10 days the perfect weevil appears and escapes by boring a hole through the petals. Through the summer it lives among the leaves of fruit-trees and hibernates under moss or bark, or beneath stones and rubbish around the trees. The best preventative is clean culture, all lichens, moss and rough bark being removed from trees. On dull days the beetles may be shaken from the branches into cloths, and as many as 1000 weevils have been shaken from a tree at one time.

The Clay-coloured or Raspberry Weevil (*Otiorrhynchus picipes*) is about $\frac{1}{4}$ in. in length, and has the somewhat brown elytra thickly covered with light-coloured scales, giving it the colour of clay. Eggs are laid in the summer in the ground, and the larvæ feed on roots of raspberries, strawberries, and other plants throughout the autumn until the spring. The pupal stage lasts about a fortnight, and the perfect weevils then appear, starting on a life of depredation, feeding on the leaves and young shoots of raspberries and fruit-trees. The weevils may be caught by holding tarred boards near the ground at night, and tapping the stakes so that the insects fall into the tar.

The Red-legged, or Plum Weevil (*Otiorrhynchus tenebricosus*) is $\frac{1}{2}$ $\frac{2}{5}$ in. long, black and shiny, with dull red legs. The eggs, laid underground, hatch in August and September, and the larvæ feed upon strawberry and other roots till the following March or April. The perfect beetle is particularly partial to the foliage of Plum-trees, but is also destructive to the Raspberry, Cherry, Peach, Apricot, and Nectarine. Being nocturnal in its habits, it is best caught at night.

The Nut-Weevil (*Balaninus nucum*) is $\frac{1}{4}$ in. long, dark brown or black, with a long, reddish-brown beak supporting elbowed antennæ at about the middle of its length. In June one egg is laid in each nut. The larva feeds

INJURIOUS INSECTS

upon the seed, or kernel, and when full grown emerges from the shell, leaving behind a mass of dark, powdery excrement. The pupa lives in the ground till the following May, when the beetle comes forth and feeds on the young buds of the Hazel. The wild plant should not be allowed to grow near cultivated Hazels or Filberts. All fallen nuts should be collected and burned. The weevils may be shaken from the trees into cloths or on to tarred boards.

The Order Hymenoptera includes the Bees, Wasps, Ants, Gall-flies, Saw-flies, and Ichneumons. Many of these may be considered as injurious insects, some in relation to our present subject.

The Rose Leaf-cutting Bee (*Megachile centuncularis*) causes much annoyance to Rose growers by cutting out semicircular pieces from the foliage. The pieces are used for lining a circular tube formed either in decaying wood or in brick walls, or sometimes in the ground. At the bottom of the tube, which is often some inches in length, the female bee lays an egg, and, having provided a store of food consisting of pollen and honey, closes up the cell with more circular leaf-sections, and continues the process until six or more cells have been formed. Complete metamorphosis takes place in the cell, and the leaf-cutting bee emerges in the next season.

The Common Wasp (*Vespa vulgaris*) does great injury to ripe fruits. The nest is commenced by a single female, which has survived the winter, and is afterwards enlarged by the exertions of her progeny, the work continuing till the cells may number many thousands. Prevention is best secured by encouraging the capture of the females or Queens in the spring. Nests in holes and trees may be destroyed in various ways, and the insects may be caught in simple traps made of bell-glasses inverted one over another, or even a bottle containing a sweet fluid.

The so-called Wood-wasps include two well-known injurious insects, the larvæ of which feed in the wood of Conifers, boring tunnels about $\frac{1}{3}$ inch in diameter.

The Giant Sirex (*Sirex gigas*) is the first of these. The female is yellow, with two black bands, and a stout ovipositor, the body measuring from

TREES AND SHRUBS

1¼ in. to 1½ in., and the ovipositor being about half as long as the body. By means of the "saw" contained in the ovipositor the insect bores into the bark of Spruce and Silver Firs, and occasionally Larch, depositing 1 egg in each hole made. The length of the larval stage is not easily ascertainable, but the perfect insects emerge from July to September.

The Steel-blue Sirex (*Sirex juvencus*) is slightly smaller than the first species, and is usually of a dark steel-blue colour, with red-brown feet; in the males several segments of the abdomen are rusty-red. The wings in both sexes are yellowish. This species prefers the Scots Pine.

It is impossible to destroy the larvæ in infested trees. All that can be done is to cut down such trees, and remove all sickly trees and fallen branches and trunks. The timber is of little value, save as firewood.

The next section of the Hymenoptera contains a large number of boring insects known as Saw-flies, the boring instrument being modified into a pair of toothed saws, which are used for cutting incisions in leaves, or in the tender bark of twigs, in which to deposit the eggs. The larvæ much resemble caterpillars in appearance and habits, and the pupæ are enclosed in cocoons.

The Pine Saw-fly (*Lophyrus pini*) bores into the needles of Scots Pine, and deposits a large number of eggs. The female is pale yellowish-white, with black head and breast, the wings expanding $\frac{3}{4}$ in. The male is black, and the wings measure $\frac{1}{2}$ in. across. The light greenish-yellow larvæ are gregarious, and do much damage by gnawing and totally destroying the needles. There may be two generations in the year. In gardens and young plantations hand-picking may be found an effectual remedy, but in older woods it is impossible to cope with the pest.

There are several species of *Lophyrus* which attack Conifers, and also some species of *Lyda*. The latter are semi-social, spinning a common web, but each also spinning an inner tube for itself. Various species attack fruit-trees, Alders, Birches, and Willows.

The Gooseberry and Currant Saw-fly (*Nematus ribesii*) is very troublesome in plantations and gardens in some seasons, and is probably the most

INJURIOUS INSECTS

familiar. When once established it is most difficult to eradicate, and the larvæ will often completely strip the bushes of their leaves, together with the young fruit. The fly appears in April, the female being about $\frac{1}{3}$ in. long, with a wing expanse of over $\frac{1}{2}$ in. Eggs are laid on the underside of the leaves, and hatch in about eight days. After the first change of skin the larvæ are green, with numerous black spots. Having fed for about twenty days, they spin cocoons upon, or just beneath, the surface of the earth, and may produce a summer brood after another twenty days. They may, however, burrow more deeply in the ground, and remain there till the next spring. Hand-picking and spraying may be resorted to in the earliest stages, or lime may be dusted over the bushes when wet. The ground under infested bushes should be dressed with quick-lime in the autumn, being dug deeply to destroy the cocoons, and the ground is sometimes beaten down in spring to prevent the flies coming up from the cocoons.

The Pear and Cherry Saw-fly (*Eriocampa limacina*) and others of its genus are known in the larval stage as Slugworms, a name made very appropriate by reason of the dark, green, slimy exudation which covers the body in the early period of its growth. At this time the larva resembles a malformed slug or tadpole, and it spends the time in eating away all the soft tissues from the upper surface of the leaf. It attains a length of nearly $\frac{1}{2}$ in. at the end of a month, and after losing its slug-like character, pupates in the ground in a cocoon of silk and earth. The pupal stage lasts two weeks in the summer, and there may be two or more broods. The late brood pass the winter in the larval stage beneath the earth, and pupate in the spring. The larvæ infest fruit-trees, especially Pear and Cherry, and are occasionally seen on some species of Thorns, as well as Oak, Birch, and other forest-trees. Paris Green, Hellebore wash, or arsenate of lead are sometimes used before the fruit is ripe. The ground round infested trees should be well dug and prong-hoed in early spring, and quick-lime hoed in, after which the earth may be beaten down to prevent the flies coming up.

The Rose Slugworm (*Eriocampa rosæ*) works in much the same way as the previous species. The larva is pale yellowish-green, with a darker line

TREES AND SHRUBS

down the back. Eggs are laid in May in the midribs of the leaves, and the larvæ are busily feeding in June. After two or three weeks they pupate in the ground, emerging soon afterwards to give rise to a second brood of larvæ in August or September. The larvæ may be killed by spraying the Rose bushes with Hellebore wash or Paris Green. The surface soil may be removed in winter, and either deeply buried or burnt, fresh mould being put over the roots.

The Leaf-rolling Saw-fly (*Blennocampa pusilla*) attacks both wild and cultivated Roses. The short, stumpy, green larvæ fold down the sides of the leaflets and live in the retreats. This folding over prevents the leaf performing its proper functions, and causes it to shrivel and die, after which the larva removes to another leaf. The larvæ enter the soil in August, pupate in the early spring, and the flies emerge in May and June. The best treatment is to pick off the folded leaves when first seen, and destroy them.

The Rose Emphytus (*Emphytus cinctus*) is another common and hurtful species. The larvæ are green, and covered with small white spots. They eat the leaves entirely away, holding on by their front feet to the edge, and curling the rest of the body in all manner of shapes. When at rest they lie curled up in a ball on the underside of the leaves. The full-fed larvæ bore into the branches and pupate in the following spring.

Many other Saw-flies belonging to the Genera *Emphytus*, *Cladius*, *Hylo-toma*, *Poecilosoma*, and *Lyda* are injurious to Roses. The chief remedies are (1) hand-picking, (2) spraying with Hellebore wash or arsenate of lead, (3) removal of surface soil to a depth of a few inches in autumn, and (4) the burning of all dead wood and loose dead leaves, &c.

The Order Lepidoptera—Butterflies and Moths—includes a very large number of injurious insects. We can call attention to only a few.

The Goat Moth (*Cossus ligniperda* or *Trypanus cossus*) is one of the largest and most destructive of British Moths. The perfect insect measures 3 ins. across the fore-wings, which are ashy brown clouded with grey, the hind-wings being brownish-grey. The larva is smooth, with short scattered hairs; the sides and under surface are a dirty yellowish or flesh-colour; the back is dark

INJURIOUS INSECTS

red, and the head black. When fully grown the caterpillar measures 4 ins. in length, and is as thick as a man's finger. It lives in the wood of Willows, Poplars, Ash, Oaks, Birch, and fruit-trees. After two or three years it makes a cocoon of chips of wood in which to pass the pupal stage, and emerges as a perfect insect in June or July. Infested trees are of little use but for firewood.

The Wood Leopard Moth (*Zeuzera aesculi* or *Zeuzera pyrina*) is white, with numerous blue-black spots on the wings and thorax. The female measures $2\frac{1}{4}$ – $2\frac{3}{4}$ ins. across the wings, and the male about half the size. The larva is nearly 2 ins. long, yellow, with black spots. It lives in the wood of various trees, principally Pear, Apple, Elm, Willow, and Plum. The moth is seen from June to August. Flying somewhat heavily in the evening, and resting in the daytime on the trunks of trees, it becomes an easy prey to many birds. Titmice and other small birds eat the eggs, and the green woodpecker is serviceable in taking the caterpillars from infested trees. Little can be done to prevent the attack or to check its progress.

The Pine-shoot Tortrix (*Retinia buoliana*) is a small moth with reddish-orange fore-wings measuring nearly 1 in. across. In July the eggs are laid singly on the terminal buds of young trees of Scots Pine. The small dirty brown larva spends the winter in the bud, and in the spring hollows out the leading shoot and most of the lateral buds, causing the stem to take an objectionable twist.

The Pine Looper or Bordered White Moth (*Bupalus piniarius* or *Fidonia piniaria*) abounds in Fir-woods in May and June. The male is whitish or yellowish-white and the female yellowish-brown. The green larva feeds on the needles of Scots Pine from August to October. The humus matter should be searched for pupæ in autumn, and if many are present the leaf litter should be burned.

The Pine Beauty (*Panolis (Trachea) piniperda*) is found in Fir-woods in March and April. The patches of pale orange on the reddish-brown fore-wings make it impossible to mistake this moth, which is often seen on Sallows. The larva is green, with five white longitudinal stripes, and feeds on the

TREES AND SHRUBS

needles of Scots Pine in July and August, and may completely defoliate the trees. The pupal stage is passed in the leaf litter on the surface of the soil.

The Pale Tussock Moth (*Dasychira pudibunda*) has pale-grey wings measuring $1\frac{1}{2}$ - $2\frac{1}{2}$ ins. across in the female, and somewhat smaller in the male. It is found in May and June. The beautiful larva is known as the Hop-dog from being found in hop-gardens. It is greenish-yellow, with velvety black incisions and four yellow tufts of hair on the back, and a single dull-red tuft on the last segment. It feeds from August to October on the foliage of Lime, Oak, Beech, Birch, Hazel, Willows, Poplars, Walnut, Fruit-trees, and Roses. Infested trees may be banded with tar at about 9 ft. from the ground, before the eggs are hatched. Rose-bushes may be sprayed with arsenate of lead.

The Black Arches or Nun Moth (*Psilura (Lymantria) monacha*) is somewhat local in England, but on the Continent it is one of the worst of forest pests. The wings are $1-2\frac{1}{2}$ ins. across, white, with numerous irregular, transverse black markings, and the terminal half of the body is pinkish. The female is provided with a long ovipositor, used for laying the eggs in deep crevices of the bark. The moth appears in July and August. The larva is brownish-green, grey or black, with tubercles bearing blue and red hairs. It feeds from May to July on the needles of Spruce and Scots Fir, and on the leaves of Oak, Beech, Birch, and Apple. In the pine forests the caterpillars waste as much as they devour, biting the pine-needles through at the middle, and eating only the short stump. Rings of tar will prevent the larvæ from reaching the tree-tops, both when newly hatched, and after letting themselves down by long silken threads. The sticky band intercepts their progress up the trunk, and they die in thousands for want of food. It is said that on the Continent this treatment has saved many forests.

The Oak-leaf Roller or Green Oak Moth (*Tortrix viridana*) abounds at the end of June and in July. The fore-wings are bright light green with sulphur-coloured fringes, and expand $\frac{3}{4}$ in. The hind-wings and abdomen are grey. The larva is light green, ornamented with small black dots, and feeds on Oak, Hornbeam, and Sallow, living in such quantities on the first-

INJURIOUS INSECTS

named as to become a pest. The leaves are at first slightly bitten, then rolled into a tube and more thoroughly devoured. This continues through May and June, and about midsummer a cocoon is formed on the bark or amongst the twigs and remnants of leaves, the winged insect appearing in about three weeks.

The Larch Mining Moth (*Coleophora laricella*) is a small narrow-winged moth measuring about $\frac{1}{3}$ in. across the fore-wings, which are greyish fuscous: The eggs are laid in the needles in May and June. The small larva lives in a case formed from a hollowed-out Larch needle. In this it hibernates through the winter, and on again becoming active, it doubles its accommodation by attaching a second empty needle to the side of the first, and then passes through the pupal stage, the moth appearing at the end of June or in July. The workings of this pest are said to be a predisposing influence to the attack of Larch Canker. Prevention seems to consist in planting Larch upon suitable situations where the soil is good and naturally well-drained, with free circulation of air about the crowns.

The Lackey Moth or Tree Lackey (*Clisiocampa (Malacosoma) neustria*) and the next species to be described are often called "Tent Caterpillars" on account of the larvæ forming tent-like nets of silk on the trees, in which to live during their early existence. The Lackey is very variable in size and colouring, measuring 1-1 $\frac{1}{2}$ in. across the wings, which are rusty reddish-brown, yellowish-brown, ochreous, or brick-dust red, the hind-wings being often paler. It is common in the south, west, and middle of England, not occurring beyond York, and is on the wing in July and August. The eggs are deposited in a kind of bracelet around the smaller shoots of several trees, and hatch in the following April or May, the larvæ living till June under a common web. Almost black at first, they afterwards become brilliantly coloured, being bluish-grey with orange-red stripes and a white dorsal line; the head also is bluish-grey, with two black dots. Having reached 1 $\frac{1}{2}$ in. in length, the larva spins a cocoon of silk, colouring it with yellow crystals of oxalate of lime, and attaching it to leaves or bark, or on wall, fences, &c., indeed almost anywhere above ground. The pupal stage lasts 2-3 weeks.

TREES AND SHRUBS

The larvæ do considerable damage to Apple, Pear, and Plum, and are also frequently found on Hawthorn and Blackthorn, and less often on Oak, Elm, and Hazel. As preventatives, all egg-bands should be collected and burnt in winter; tents should be collected and burnt in summer on a dull day or in the evening, boards or a cloth being held underneath to catch the larvæ which fall. Spraying with arsenate of lead has the advantage of killing the larvæ without damaging the foliage; Paris Green or London Purple may also be used for spraying.

The Brown-tail Moth (*Porthesia (Euproctis) chrysorrhæa*) has white wings and body, and a tuft of brown hairs at the end of the abdomen. The moth appears towards the end of July and in August, and the female lays a patch of golden-coloured eggs on the under surface of the leaves, covering over the patch with hairs from her tail. The eggs hatch in August, and the larvæ live at first in a common web. They are afterwards greyish-black, with reddish hairs; two reddish-brown lines run down the back, beneath which is a row of whitish streaks; a tuft of hair proceeds from a fleshy protuberance on each side of the head. The larvæ feed on the same trees as the Lackey, and the preventive treatment is the same.

The Small Ermine Moth (*Hyponomeuta padella*) is a tiny moth with a wing stretch of about $\frac{4}{5}$ in. The fore-wings are white with a greyish tinge, traversed longitudinally by three rows of black dots, about thirty in number; the hind-wings are brownish-grey, with light fringes. The moth appears in July and August. The larvæ are grey, with black spots. They appear in May, and live gregariously in a veil-like web on Apple, Plum, Hawthorn, Sloe, Mountain Ash, and other trees, often doing considerable damage. Other species feed on Spindle. The webs should be destroyed in the early stages, being pulled down and burned. The trees may be syringed with various solutions, one of the best being made with paraffin and soft soap.

The Winter Moth (*Cheimatobia brumata*) is abundant in October and November, and later in mild seasons. The male measures slightly over 1 in. in expanse, the fore-wings being greyish-brown, with several indistinct wavy

INJURIOUS INSECTS

lines. The female has only rudimentary wings, and crawls up the stems of fruit-trees and others to lay groups of eggs in the chinks of the bark, as many as 200 eggs being laid by one moth. Roses growing in kitchen gardens or near orchards are sometimes badly damaged. The pale green or yellowish "looper" caterpillars are busy in May, and few larvæ do greater damage. "Grease-banding" is the most effective method of preventing the passage of the wingless females up the trees in autumn and winter. Spraying with quassia chips or paraffin solution will make the foliage unpleasant and distasteful to the caterpillars, so that they die of starvation or fall from the trees.

The Mottled Umber or Great Winter Moth (*Hybernia defoliaria*) is well deserving of its specific name, for sometimes the trees which it attacks are left as bare as in winter. The fore-wings of the male are dull yellow, sprinkled with rusty brown, expanding about $1\frac{3}{4}$ in.; the hind-wings are yellowish-white, with a small central dot. The apterous female has a stout ochre-yellow body, with two longitudinal rows of black spots. As many as 400 eggs may be laid by one female. The larva is reddish-brown, with a broad sulphur-yellow stripe on the sides. It feeds on fruit-trees, as well as Lime, Oak, Beech, Birch, Elm, Blackthorn, Whitethorn, Hazel, and Hornbeam. It is prevalent in May and June, and the moth is seen in October and November. The treatment is the same as for the Winter Moth.

The March Moth (*Anisopteryx ascularia*) resembles the previous two species in the apterous condition of the female, and the eggs are laid round twigs, somewhat similarly to those of the Lackey. The male moth is found in March and April, being often seen on gas lamps. The fore-wings are of a grey-brown tint, with a darker central transverse band, edged on either side with a pale wavy line. The green larva is abundant everywhere in May, feeding on Hawthorn, Blackthorn, Oak, Elm, and Lime.

The Vapourer (*Orgyia antiqua*) is common not only in the country, but may be seen flying about the crowded thoroughfares of large cities. The male varies from $\frac{3}{4}$ in. to $1\frac{1}{2}$ in. across the fore-wings, which are of various shades of rich chestnut brown, with a white spot near the hinder angle;

TREES AND SHRUBS

the hind-wings are rust coloured. It flies from July to October. The female is wingless, and merely crawls from the inside of the cocoon to the outside, there depositing the eggs, often completely covering the silken case. The larvæ appear at intervals lasting over several weeks or even months. They range from $1\frac{1}{2}$ in. to 2 ins. in length, being dark grey, spotted with small red tubercles; there are four tufts of ochreous hairs standing up from the back of the 5th to 8th segments, two long blackish tufts on the 2nd segment pointing forwards, a slender lateral tuft on each side of the 5th and 6th segments, and one long one on the 12th segment pointing backwards. When mature the caterpillar spins a cocoon amongst the leaves and shoots, or on the trunk of a tree, or often on a fence. It feeds on most trees and shrubs, even including the Cherry Laurel: it is specially fond of fruit-trees, Oaks and Roses. All cocoons seen in winter should be burned; spraying with arsenate of lead is useful; caterpillars may be picked by hand, or swept into a cloth and destroyed.

The Codlin Moth (*Carpocapsa pomonella*) is a small species, but its larvæ are exceedingly destructive to the apple crop. The moth appears in June and July. The fore-wings are grey, with wavy lines of a brown hue, and at the extremities there are oval patches of a golden colour; the hind-wings have a coppery lustre. The female lays from 50 to 100 eggs, putting one on each apple or pear. The pinkish larva bores into the fruit, usually entering at the "eye" or calyx, and following the core down to the pips, upon which it feeds for some three or four weeks. When full grown, it bores a hole to the outside, and, seeking a place of shelter in the cracks and crevices of the bark, or other suitable spots, it rests during the winter and pupates in the spring. All "windfalls" should be cleared away as soon as possible, and if not fit for sale should be given to pigs; strips of cloth or sacking should be tied round the trees near the base, and will serve as traps for the larvæ; spraying with London Purple or Paris Green will kill the larvæ before they bore into the fruit.

The Magpie Moth (*Abraxas grossulariata*) appears in July and August, and is common everywhere in gardens. It varies in colouring, but the

INJURIOUS INSECTS

fore-wings are white, with generally several rows of black spots; there is a yellow blotch at the base, and an orange band beyond the middle; the hind-wings are white, with black spots. The larva resembles the parent in being white, with black spots. Emerging from the egg in September, it feeds for a short time, then hibernates amongst the leaves and rubbish, and reappears in the spring. During May and early June it feeds principally on Currant and Gooseberry foliage, but also on Raspberry and Blackthorn. The pupa is black, ornamented with three orange rings, and is often suspended upon the bushes. If the larvæ appear in the autumn, powdered quicklime should be dug in during early winter; in the early spring the ground should be well hoed, and lime and soot applied; spraying with Paris Green in September will kill the young larvæ.

“Rose Maggots” are the larvæ of several small moths belonging to the Family *Tortricidæ*, of which there are considerably over 300 British species, the best-known being the Green Oak Tortrix. Spraying with arsenate of lead will kill the larvæ in the early stage, but the more general method is to employ the tedious process of picking out or pinching the grubs in the leaves, often after much damage has been done.

The Frog-hopper, Frog-spit, or Cuckoo-spit Insect (*Philaenus (Aphrophora) spumaria*) is the most common of the seven British “Frog-flies.” It attacks the tender parts of plants, including the young shoots, leaves, and flower-buds, sucking the juices, and thereby weakening the whole plant. Roses are often badly attacked, especially when growing against a wall or fence. The perfect insect is found from July to October. It is about $\frac{1}{4}$ in. long; the fore-wings are of a stout consistency and uniform in colour, and the hind-wings transparent. It can jump a considerable distance. The larva lives under a mass of spittle-like froth. Roses attacked should be well syringed with plain water to remove the spittle, and then sprayed with strong tobacco wash and soft-soap. For more hardy plants dilute paraffin emulsion may be syringed.

The Apple Sucker (*Psylla mali*) somewhat resembles some of the Frog-hoppers in appearance and habits. It is a minute insect, but sometimes

TREES AND SHRUBS

does considerable injury to the apple-crop by sucking away the juices from the stalks of blossoms and blossom-buds. Eggs are laid usually on the young shoots from September to early November. The larvæ emerge in early spring, and at once enter the flower buds, there to suck the juices and prevent the formation of fruit. The perfect insect appears from the middle of May to the middle of June. Early spraying with quassia wash has proved the most effectual remedy.

The Apple Mussel Scale (*Mytilaspis pomorum*) belongs to one of the most destructive families among insects—the Coccidæ or Bark-lice. The mussel-shaped scale is about $\frac{1}{6}$ in. long, pale brown or grey, and in neglected orchards or gardens may be seen almost covering the trunk and branches. The wingless female lives under the scale, and lays a number of eggs, which hatch towards the end of May or the beginning of June. The larva becomes stationary after a few days, inserting its beak in the bark and sucking the juices. The scale gradually forms over it, and by the middle of August the female louse has laid a mass of eggs, there to remain till the spring under the dead body of the parent. The bark of trunk and branches should be scraped in winter, and then washed or sprayed with caustic alkali wash.

Several other injurious insects will be dealt with under the heading of "Galls."

CHAPTER II

USEFUL INSECTS

IT is well to remember that insects are not all harmful. On the contrary many plants have become dependent on insect agency for the perpetuation of the species, and this useful work is especially carried on by Bees, Butterflies, and Moths. But besides this, there are many insects which are indirectly beneficial by reason of their carnivorous habits, being either predatory or parasitic species living upon injurious forms. Were it not for their presence in the enemy's camp certain insect scourges would often get beyond human control. We will endeavour to point out a few of the more important useful species in the hope that it may induce cultivators to pause before they contract the habit of killing every creature that creeps, crawls, runs or flies.

The Order Coleoptera furnishes several examples of useful insects.

The Green Tiger Beetle (*Cicindela campestris*) is a voracious creature both in the larval stage and when it becomes a perfect insect. It inhabits bare banks and sandy heaths, preying indiscriminately on other insects, often mounting upon the wing with the rapidity of a blue-bottle fly. It measures $\frac{1}{2}$ in. or more in length, and is of a fine green colour, glossed with coppery red, and having five yellowish-white spots on the margin of each elytron, and another towards the middle. It is one of the most beautiful of British beetles. The larva lives in a cylindrical hole in the sandy soil, lying in ambush at the entrance with jaws expanded ready to seize its prey. The excavation is nearly perpendicular at the mouth, and the grub anchors itself to the side by means of two strong fleshy tubercles rising from a hump on its back near the tail. When about to pupate the grub seals the entrance and retires to the bottom of the hole.

The Bombardier or Artillery Beetle (*Brachinus expulso*) has the head

TREES AND SHRUBS

and thorax dull red, and the elytra blue. It is about $\frac{1}{3}$ in. long, and is found under stones in the vicinity of river-banks or the seashore. If alarmed or molested it discharges a slightly acid fluid, which immediately volatilises into smoke, each discharge being accompanied by a slight explosion. Like the first species it is carnivorous in its habits.

The Violet Ground Beetle (*Carabus violaceus*) is one of the commonest and largest of its genus, and is frequently found in gardens, hiding under stones or clods of earth. It sometimes exceeds an inch in length, and is deep violet in colour, with the margins of the elytra and thorax a rich burnished golden-violet. In common with the rest of its genus it has only rudimentary wings, the elytra being soldered together, and not used for flying. It runs swiftly over the ground, preying on other insects, and is a voracious creature both as a larva and a perfect beetle. When handled it emits from its mouth a blackish fluid which stains the fingers, and has a disagreeable odour.

The Devil's Coach-horse, or Fetid Rove Beetle (*Ocypus olens*) belongs to the group of beetles known as Cocktails, so named from their habit of bending their bodies upwards when alarmed. This species is dull, dead black in colour, with very small elytra, and a long abdomen; two yellow tubercles at the end of the tail exude a secretion with a very objectionable odour. The beetle is an inch or more in length and very ferocious in aspect. It is common in gardens, and sometimes finds its way into houses. It will feed on carrion if procurable, but will attack and kill any insect which may come in its way, thus doing much good in gardens, and for this reason should never be destroyed. It is predacious both in the larval and perfect stages. Its eggs are $\frac{1}{10}$ in. in length, being larger than those of any other British insect. It may be found throughout the year, except in May, when it pupates, but is most common in autumn. It flies with great rapidity, and runs swiftly over the ground; hence its generic name (Gr. *okus*, swift, *pous*, a foot); its specific name referring to its evil-smelling secretion (L. *olens*, stinking).

The Glow-worm (*Lampyris noctiluca*) belongs to the group of Soft-skinned

USEFUL INSECTS

Beetles, the body being soft and flexible, and covered with a yellowish-grey down. The female has neither wings nor elytra, and has the power of emitting a strong phosphorescent light from the underside of the last three segments of the body. The male has well-developed wings and elytra, and emits only two tiny spots of light. The larva greatly resembles the perfect female, and does great service for the agriculturalist in attacking and devouring snails. During April or May the larva pupates, and the perfect insect appears in a fortnight or a little more.

The Seven-spot Lady-bird (*Coccinella septempunctata*) is a great friend of the horticulturalist and agriculturalist, waging incessant war on the aphides, preserving for the use of man much which would otherwise be lost. The perfect insect has a black head and thorax, and red elytra usually bearing seven black spots, three on each elytron, and one near the base of the suture. The larvæ are slaty and yellow, with black spots and hairy tubercles down the back, mixed with orange spots. They are popularly known as "niggers," and are exceedingly voracious, soon clearing a plant of aphides, literally by the thousand. So serviceable are they that they should never be disturbed. When full-fed they attach themselves to a twig or leaf by the end of the tail, and hang downwards, and the pupæ remain in the larval skin till changing into the perfect form. The disagreeable odour attached to the Lady-birds is connected with a yellowish liquid secreted from the joints of the limbs.

The Two-spot Ladybird (*Coccinella bipunctata*) is another common species. The wing-cases are usually scarlet, bearing a black spot on each, but the colouring varies considerably from red and black to entirely black.

The Sun Beetles (*Pterostichus*) number more than twenty species. They are very varied in colour, generally green, bronze, or bluish-black, the elytra being marked with regular striæ. They are very voracious, feeding on a large number of insects, darting swiftly over the ground when in quest of food.

The Lacewing Fly (*Chrysopa vulgaris*) is one of man's best friends in the garden and orchard. The fly is a delicate and beautiful insect, not

TREES AND SHRUBS

easily mistaken for any other species. Its body, head, and thorax are leaf-green; its eyes golden-green, large and conspicuous; and its wings wide, thin, gauzy, and glossed with changing hues of green and pink. It flies chiefly at night, and in the daytime may be seen at rest, with the wings pressed against the sides of the body. It possesses an evil odour, which attaches itself strongly to the finger that crushes it. The larva is extremely predacious, feeding voraciously on the aphides, covering itself with the emptied bodies of its victims as a protection. It pupates in a cocoon of extremely tough silk. The eggs are deposited on leaves, each being fixed to the end of a slender stalk about $\frac{1}{2}$ in. long. They are pure white, and bear a resemblance to the capsules of certain mosses.

The Ichneumon Flies, of which there are probably over 2000 species in England, are of inestimable benefit to man, their chief function in the economy of nature being the maintenance of a balance amongst the various insect tribes. They are parasitic insects, belonging to the Order Hymenoptera, being provided with four wings, and the female being furnished with a sharp ovipositor. Many of them puncture the bodies of caterpillars, depositing an egg in each wound. The larvæ, when hatched, devour the caterpillar alive, feeding on the soft but less vital parts of the host, and when full-grown quit the body of their victim, frequently forming their cocoons around it. Almost every species of caterpillar, grub, aphis, or other form of insect life, has one or more parasites which keep it in check. One of the species most frequently seen at work is *Microgaster glomeratus*, which lays from thirty to sixty eggs in a single caterpillar of the Large Cabbage White Butterfly. When about to pupate, the larvæ gnaw their way out, and each spins a yellow silken cocoon, generally beside the empty skin of the caterpillar or upon its surface.

The Chalcididæ are a family of Ichneumons, for the most part exceedingly small, and many being parasitic upon other parasites. Some deposit their eggs in various galls, where they feed upon the rightful inhabitants. Others work havoc among the aphides.

The Proctotrupidæ, a family of minute Ichneumons, comprise some of

USEFUL INSECTS

the smallest known Hymenoptera. They deposit their eggs in the eggs of other insects, particularly those of moths and butterflies, and are so minute that a single butterfly's egg will suffice for the support of several ichneumon larvæ. By this means many eggs of the Lepidoptera must be destroyed, and our gardens and crops are thus protected by insects scarcely visible to the naked eye.

The Hover Flies or Hawk Flies (*Syrphidæ*), belong to the Diptera, insects possessing only two wings. They have a peculiar habit of hovering in the air, darting away like an arrow when disturbed, and hovering again at the end of their flight. They are common from spring to autumn, but more especially numerous from July to September. In appearance many resemble bees or wasps, but may be known by the manner of their flight and the number of the wings.

The female fly deposits a single white egg in a colony of aphides, and the leech-like larva feeds ravenously upon them, sucking the juices and rejecting the empty skins. It is said that a hungry larva will devour a hundred aphides in an hour. When full-fed the maggot fixes itself to a leaf, stem, or other object by the tail, making the attachment by means of a sticky excretion. The pupa is developed within the larval skin, and in a few days the perfect fly emerges.

Syrphus (Scæva) pyrastris is a fine species of Hawk-fly, whose larva may be found feeding on the aphides infesting Rose-trees. The insect is blackish-blue, with a whitish-grey down; usually there are on each side of the abdomen three short bands varying from white to golden yellow.

Another typical species is *Syrphus lucorum*. It is a pretty insect, somewhat variable in colour and the extent of its markings, but its general colour is black, the thorax being covered with brown hairs, and the base of the abdomen with golden down.

Many of the genus *Volucella* are hairy species, strikingly like wasps and bees. Their larvæ are short maggots with pointed tubercles on the segments, living in the nests of wasps and bees, where they act as scavengers or feed on the larvæ of their hosts.

TREES AND SHRUBS

In the great family of *Muscidæ*, to which the House-fly and Blow-fly belong, we have a genus which consists of flies in some respects resembling the Ichneumons. Nearly two hundred British species have been described.

One of the best known is *Tachina ferox*. This species has the head tinged with grey; and the abdomen is yellowish, shining like horn, and black along the middle. The female lays her eggs upon the bodies of various caterpillars, and the young larvæ penetrate into the body of the caterpillar, and feed upon the fatty tissues. Not only are the caterpillars of Butterflies and Moths attacked, but various species are known to infest the larvæ of some Coleoptera, Hymenoptera, and even the bodies of spiders.

The species *Tachina grossa* is so large and hairy that it might be easily mistaken for a black humble-bee. Its body measures $\frac{3}{4}$ in. in length, and the wings have an expanse of $1\frac{1}{2}$ in.

We will conclude this brief review of some of the gardener's friends with a mere reference to one which he would scarcely care to encourage, but which, nevertheless, does him good service in keeping down the number of his enemies. It is the Hornet (*Vespa crabro*), the largest and most formidable of British wasps. The queen may measure $1\frac{1}{2}$ in. in length, and the wings may expand over 2 ins., but many of the workers are no bigger than the common wasp. The nest is usually built in outhouses or the hollows of trees. The food of the Hornet consists of other insects, and is largely composed of wasps.

CHAPTER III

GALLS

THE study of galls and gall-producers is a fascinating one, and may be pursued at all seasons of the year. The British galls number nearly 300, and occur on all parts of plants. They are in most cases the result of insect agency, but some are due to the presence of nematoid worms within the tissues of the plants, and yet others are the result of attacks by fungi. No plants are more susceptible to galls than are the various species of Oak, and of the many kinds of oak-galls which have been described the greater number are produced by gall-wasps, insects belonging to the Cynipidæ, a family of the Hymenoptera. A wonderful feature connected with the life-history of these gall-producers is the phenomenon of alternating generations, in which we have an insect producing an offspring, which at no time resembles its parent, but which, on the other hand, itself brings forth a progeny, which returns in its form and nature to the parent insect, so that the latter does not meet with its resemblance in its own brood, but in another generation. The two generations produce galls of very different character. One generation consists of females only, the other includes both males and females. We will now call attention to a few of the more common and interesting oak-galls, and give examples of this strange relationship.

The Cherry Gall (*Dryophanta scutellaris*) is found on the under-surface of the leaf, attached to the midrib and its offshoots. As its name implies, it resembles a cherry in size, form, and colour, having a diameter of about $\frac{3}{4}$ in., and being yellow, yellowish-green, pale-green or rose-coloured. It is found from July to October, and the imago emerges during the autumn and winter. It is the largest and most brightly coloured of the leaf-galls. The alternate sexual generation is found in the next species.

TREES AND SHRUBS

The Purple Velvet-Bud Gall (*Spathogaster Taschenbergi*). This is a dainty little violet or purple gall found in dormant adventitious buds of the bark and small twigs. It may be sought for in April or May, and best on sunny days, but is not common. The imago emerges in May or June.

The Cupped Spangle Gall (*Neuroterus fumipennis*) is found on the under-surface of the leaf, and much resembles the Common Spangle, but is slightly smaller, being $\frac{1}{8}$ in. in diameter. The prevailing colour is rose-madder, this being due to the presence of numerous microscopic stellate hairs. Nearly 500 of these galls have been counted on a single leaf. They may be found from July to September, and the imago emerges in the following May. The alternate sexual generation is seen in

The Hairy Pea Gall (*Spathogaster tricolor*). This forms a conglomerated mass of 15–20 pea-like excrescences on the underside of the leaf, being most frequently found on scrub-oak bushes, and stunted, and hedge-trimmed growth along road-side banks. It is white, pale green, or yellow in colour. It may be seen during the summer (May to August), and the imago emerges in July.

The Common Spangle Gall (*Neuroterus lenticularis*) is the largest and most abundant of the lenticular galls. It is found from July to October, scattered all over the under-surface of the leaf. It is greenish-yellow, covered with crimson or reddish hairs, and measures about $\frac{1}{5}$ in. in diameter. The imago emerges during March and April. The alternate sexual generation is

The Currant Gall (*Spathogaster baccarum*), which is found on the staminate catkins, and on leaves. It consists of a sappy and soft cellular tissue containing an abundance of a whitish, tasteless fluid, and when growing on a catkin peduncle the aggregation much resembles a “string” of red currants, the galls being generally suffused with pink, or spotted or striped with red. It is the most common of the globular galls, and may be found in June. The imago emerges during June, the entire metamorphosis occupying less than two weeks.

The Silk-Button Spangle Gall (*Neuroterus numismatis*) is perhaps the

GALLS

most beautiful of the lenticular galls, and one of the most abundant, nearly 700 having been counted on a single leaf, covering practically the whole of the under-surface. It appears as a small flat disc, about $\frac{1}{8}$ in. in diameter, the prevailing colours being golden yellow, bright ochre, and golden brown. It is common from August to October, and the imago emerges during March or April, earlier than those of any other leaf gall. The alternate sexual generation is seen in

The Blister Gall (*Spathogaster vesicatrix*). This, as its name implies, takes the form of a small blister in the blade of the leaf. It may be found from May to October, but is not easy to detect.

The Oak Apple (*Teras terminalis*) is, on the other hand, familiar to every country school-boy, and is largely in evidence on the 29th of May, the day of all others most closely associated with "King Charles's Apple." It is usually developed from a terminal bud, but those from axillary buds are also of very frequent occurrence. It is yellowish-white, suffused with pink and red, and measures 1-2 ins. in diameter. Growth is complete by the end of June, but the "apple" may be found throughout the year. The imagines emerge during June and July. The alternate asexual generation is found in

The Root Gall (*Biorhiza aptera*). This usually takes the form of a conglomerated cluster on the roots and rootlets, and may measure $1\frac{1}{2}$ in. in diameter. It may be pink, red, or of varying shades of brown. Growth is complete by the end of October, and the imago emerges during the winter or spring. The females are mostly wingless. After leaving the gall the female creeps up the bole of the tree, along a limb, and selecting a terminal bud, bores holes with her ovipositor, the ova being pushed down the holes till they form a mass at the base of the bud. The resulting gall is the Oak Apple.

The Marble Gall, or Oak Marble, is the work of *Cynips Kollari*. It is one of the most familiar galls, and is often erroneously spoken of as the oak-apple. It is usually noticed when the hedgerows are leafless, and then has much the appearance of marble, being spherical, and brown in colour.

TREES AND SHRUBS

They may be found growing either singly, in groups of 3-6, each being perfect in shape, or in conglomerate clusters consisting of several galls more or less fused together. They are not usually borne by fully developed trees. The ova are deposited in a leaf-bud towards the end of September or early in October. A small swelling is formed on the twig, but does not increase much in size till the following April or May. Growth then continues, and by the end of September the gall has become firm and hard, and is of a yellowish-brown or reddish-brown hue. It may remain attached to the twig for several years. The question of an alternate sexual generation is still an open one, but it has been considered likely that it will be found in the Turkey Oak Bud Gall (*Andricus circulans*).

The species of galls above mentioned are some of the easiest to find, but there are many more of extreme interest, and the reader who wishes to pursue the study may be referred to Connold's "British Oak Galls," a work to which we are indebted for much recent information.

The Robin's Pincushion, Rose Bedeguar or Moss-gall, is the work of *Rhodites rosæ*, an insect belonging to the Cynipidæ. The greenish, pink, or crimson gall is formed by ova being deposited in a leaf-bud, each egg becoming surrounded with layers of sap, and ultimately making a mass of 30-45 cells concealed beneath a covering of many-branched fibres. The globular conglomeration of cells may reach nearly 2 ins. in diam. The larvæ pupate in the gall, and the imagines emerge during June.

Rhodites eglanteriæ forms small, smooth, globular galls on the leaves and petioles of Dog Rose and Sweet Briar. They are attached by a delicate pedicel, and are unilocular and unilarval. They may be found from July till October. The larva pupates in the gall, and the imago emerges during the following spring.

Horse-bean Galls, so familiar on the edges, and on either side of the midrib of willows, is caused by a Saw-fly (*Nematus gallicola*). The gall is equal in proportion on both surfaces of the leaf, and is green, suffused with red, pink, or purple. The larvæ, when full fed, generally burrow into the soil, and there pupate. The imagines, which emerge in August and Sep-

GALLS

tember, lay eggs in early autumn, and the larvæ pass the winter within the gall, the resulting brood appearing in April or May.

Of the many thousands of Lepidoptera (Butterflies and Moths) whose larvæ feed in or on plants, only about half-a-dozen are known to produce galls, and of these two only need be mentioned here.

Hedya aceriana is a dull cream-coloured moth with the fore-wings expanding $\frac{7}{12}$ of an inch, and appears in July or August. The dirty-brown larva eats its way into the young shoots of poplars, and the irritation causes an unsightly swelling. The gall may be found from June to August.

The Resin-gall Moth (*Retinia resinella*) belongs to a group of the Tortricidæ which inflict damage on Scots Pine and other Conifers. The egg is laid among the buds at the extremity of a young shoot, and the larva feeds upon, and bores into the stem, causing an exudation of resin not unlike a half walnut in form, and somewhere near the size. The larva pupates in the gall of resin, and the imago emerges in March. The fore-wings measure $\frac{9}{12}$ — $1\frac{1}{2}$ in. and are dark blackish-grey with silvery streaks. The moth is mostly confined to Scotland and the north of England. All shoots showing signs of attack should be removed and burned.

The Aphides or Plant-lice belong to the Homoptera, in which the fore-wings are uniform in structure from base to apex. They are minute in size, soft-bodied, and generally long-legged; the mouth is provided with a curious beak or rostrum for sucking the juices of plants, and nearly every plant has its own peculiar Aphis. Many kinds secrete "honey-dew" from two cornicles or honey-tubes at the end of the abdomen, and this, falling on the leaves, prevents respiration. Their rate of increase is marvellous, and reproduction is carried on in two ways. In the spring the wingless females produce living young, which soon mature and produce other wingless females, the process continuing with great rapidity till the plant may become completely covered. At the end of the season males and females both are produced, and sexual reproduction takes place, the eggs being laid upon the plant, and lying dormant through the winter. In the spring the eggs hatch out, and the cycle is again begun. The irritation set up in the plant by the action

TREES AND SHRUBS

of the aphides often causes abnormal growths, and it is some of these with which we are concerned in this chapter.

The Woolly Aphis or Apple Root Louse, often called American Blight (*Schizoneura lanigera*), causes large warty excrescences on every part of the trunk and limbs of Apple-trees. These swellings are the result of the continuous punctures of the rostra of the aphides, the sap accumulating into soft pulpy masses which harden in winter, cracking in all directions on the surface, and producing scabby hypertrophies or "canker-like" growths which often attain large dimensions. The presence of the aphides in summer is readily apparent from the presence of a white cottony substance formed as an excretion in the back of both young and mature females. The wool sometimes hangs in festoons from the trees, and, being blown about by the wind, acts as a means of dispersal of the pest, but the infection is most frequently spread by means of nursery stock. This species is not provided with cornicles, and does not produce honey-dew. The wingless females are purplish-brown, and the lice or larvæ are dull yellowish to reddish in colour. The best preventative of the pest is clean cultivation, the trunks and boughs being kept free from lichens and moss, and no rank grass being allowed to grow beneath. In winter the trees may be cleansed of the vegetal encumbrances with a caustic alkali wash, and the trunks may be lime-washed after the removal of all rough bark.

The Currant Blister Aphis (I.) (*Rhopalosiphum ribis*) causes convex or concave blisters on the foliage of Currants, red, black, and white, but especially the first. The leaves attacked shrivel away, and the fruit often falls, owing to loss of sap, long before the leaves die. The wingless viviparous female, or "Mother Queen," is shiny green, mottled with darker green, and the cornicles are green. The lice turn to pupæ, from which arise winged, viviparous females, yellowish-green in colour, with black head. Later on the egg-laying female deposits eggs on the twigs, and these hatch in the following spring. This aphis also attacks the Gooseberry, and has been found on the Guelder Rose.

The Currant Blister Aphis (II.) (*Myzus ribis*) is distinguished from the former by differences in colour in the various stages. The wingless female

GALLS

is shiny yellowish-green, with dark green mottlings; and the cornicles are pale green. The winged viviparous females are bright green, with pale olive head. This species often causes the leaves at the apex of the shoots to curl and twist up. It attacks Gooseberries as well as Currants. Early spraying with paraffin emulsion is the best treatment, but little can be done when once the lice have got a hold.

The Elm Aphis (*Schizoneura ulmi*), frequently rolls, blisters, and distorts the foliage of Elms. The galled leaves may be found from June to October. Usually only one half of the leaf is attacked, curling downwards and under, forming a roll within which the life stages are passed, as in the case of the Currant Aphis. The unaffected part of the leaf does not appear to suffer much from the attack, but the galled portion is gradually denuded of all sap, and turns to a yellowish-green, and finally to a pale ashy grey.

Pemphigus bursarius, or *Aphis bursaria*, forms an attractive gall on the petioles of Black Poplar, and sometimes the Lombardy Poplar. The gall consists of a pear-shaped or oval purse-like swelling, green in colour, suffused with pink. It is usually $\frac{3}{5}$ in. long and about $1\frac{1}{4}$ in. in girth. It is very plentiful from July to September, and on badly infected trees some branches may have 25 per cent. of their leaves attacked. The queen aphid punctures the petiole of the leaf, and the sap exuding, gradually surrounds, and finally encloses her, and the work of reproduction goes on. The winged aphides make their exit through a small opening at the apex of the gall.

The Pine-apple Gall, so common on young trees of Norway Spruce Fir, is the work of an Aphis (*Adelges (Chermes) abietis*). The queen emerges in June, hibernates through the winter, and in the following spring punctures the shoot at the axils of the young leaves, causing their bases to thicken by an accumulation of sap. The thickened bases form a kind of false cone in which innumerable eggs are laid, the resulting colony numbering perhaps 1800–2000 insects. The dry galls may remain on the trees for several years before final disintegration, the infected shoots being often distorted and sometimes killed.

The order of Diptera includes over a hundred gall-making insects, usually

TREES AND SHRUBS

called Gall-gnats and Gall-midges, and the greater number of these belong to the sub-genus *Cecidomyia*.

Cecidomyia crataegi causes a cluster or rosette of 8-40 deformed leaves at the extremity of a shoot on the Hawthorn. The leaflets in the centre are stunted in growth, curl inwards, and provide shelter and food for numerous larvæ during the summer months. The larvæ pupate in the ground, and the gall-flies emerge in the spring.

Rosette Galls are to be found on several kinds of Willows, and are the work of *Cecidomyia rosaria*. The single larva feeds upon the end of the shoot, preventing its further growth, and a rosette is formed, consisting of 30-60 leaves in all stages of development, the outer ones occasionally being woody. The larva pupates in the gall, and the fly emerges in the spring.

Cecidomyia marginem-torquens causes the margins of the leaves of Osiers to roll along the under-surface towards the mid-rib. The margins become variously coloured, yellow, red, purple, and chocolate-brown being the prevailing tints. The larvæ feed in the gall from June to October, pupate in the ground during the winter, and the flies emerge in spring.

Cecidomyia salicis forms peculiar lemon-shaped swellings on the twigs of Grey Sallow (*Salix cinerea*), and sometimes the Round-eared Sallow (*Salix aurita*). The galls are nearly an inch long, and about $\frac{1}{2}$ in. in diam. The larvæ, from three to thirty in number, pupate in the gall, and the imagines emerge in May, leaving about half of the puparium projecting from the hole, after the manner of the Goat Moth when emerging from its cocoon.

The Gall-mites belonging to the Order Acarina are microscopic creatures which live on plants, by preference in the bud, and produce galls of various descriptions.

The Black-Currant Mite (*Eriophyes (Phytoptus) ribis*) causes the buds to swell unnaturally, so that they produce neither leaves nor fruit. From some infested buds a few stunted leaves may come forth, but they fall in the early summer, and no blossoms are formed. The mite is indistinguishable with the naked eye, but can be seen with a good pocket lens. The body is

GALLS

cylindrical, and consists of about 70 rings. Eggs are found in the buds nearly all the year round. The mites stray about the shoots when the buds shrivel up, and later find their way into the embryonic buds. In January the buds contain adults and eggs, in February the eggs are in abundance, by March there are hundreds of young mites and several adults, and by April there are mites in all stages. In June they may travel from the old buds to the new, and by July there are eggs, young and adults in the young buds, thus continuing the infestation for the next season, and making remedial measures of little avail. Infested bushes should be pruned very hard, and all cuttings burned. The best plan to adopt is to cultivate from clean stock, carefully examining all new bushes, and rejecting any which show any indication of unnaturally swollen buds.

“Witch-knots,” “Witches’ Brooms,” and “Rooks’ Nests” are names given to large bunches of distorted twigs often to be seen on the Birch. They vary in size from a few inches to many feet in circumference. They are caused by a gall-mite (*Eriophyes rudis*), which lives in the buds, absorbing nourishment, and preventing proper development. The growth of the twig is arrested, and as the new buds appear, they are attacked by the mites and rendered abortive. The mites increase in numbers very rapidly, and when the work of thousands is concentrated at one spot it causes the many twigs to grow outwards in all directions, while the common centre becomes a hard, solid, and woody core. In cases where the mites are distributed along the branches a dense bushy tangle of long and slender twigs is formed. Apparently the presence of these galls does little or no harm to the general growth and development of the tree. Similar growths are caused by a Fungus.

Eriophyes (Phytoptus) levis causes variously-coloured pimple-like galls on the upper surface of the leaves of Alder. They are green, yellow, red, purple, or brown, and may number as many as 400 on a leaf. When numerous they cause the leaf to curl and fold up in a very distorted manner.

“Nail-galls” on the foliage of Limes are the work of *Eriophyes tiliae (typicus)*, They are of varying shades of greenish-yellow, red, crimson, purple, and brown, and have the appearance of tacks projecting through the upper surface of

TREES AND SHRUBS

the leaf. They are hollow, the interior containing a quantity of long hairs, giving shelter to innumerable mites. A single leaf may support as many as 150 of these galls.

The leaves of the Common Maple are often literally covered with smooth, semi-globular pimples, the work of a gall-mite (*Eriophyes macrorhyncus*). At first greenish-yellow, the galls pass through shades of yellow, orange-yellow, red, crimson, and purple, and finally become brown. Many leaves will support 400–500 galls; some may even bear as many as 800, and a somewhat large leaf has been crowded with nearly 1400.

The Maple foliage is also attacked by a somewhat similar, but larger gall, made by the mite *Eriophyes macrochelus*. A leaf may have 50–200 of these globular galls, which vary considerably in shape and appearance, being usually green, orange-yellow, red, or brown in colour. Occasionally they may be seen on the underside of the leaf, but are most often situated on the upper surface.

CHAPTER IV

FUNGOID PESTS

INTRODUCTION. In the treatment of fungoid pests it is essential to know that parasitic fungi may be placed in two groups, each with a different mode of development, and each necessitating a different method for their prevention or cure. The first, or epiphytal group, includes those fungi which establish themselves on the surface of leaves, stems, or other green parts of living plants, their whole career being external and superficial. Many of these can be held in check or destroyed by powdering or spraying. The Hop Mildew and Rose Mildew are familiar examples of this class, the first being kept in check by the application of sulphur, and the second by spraying with potassium sulphide solution. In the early stages of attack the mildews present themselves as patches of white mould consisting of a stratum of delicate interwoven threads, forming a mycelium, from which arise fertile threads producing myriads of spores to carry on the infection. Later in the season other spores are formed which will rest during the winter, and germinate in the following spring.

The second group of parasites are endophytal, originating in the tissues of the host-plants, and manifesting themselves externally only when the damage is beyond control. In these cases all efforts must be directed towards destroying the spores, and preventing the future infection of healthy plants. The "rot moulds" belong to this group, and are among the most devastating of fungoid pests. The mature mould, when it appears on the surface, produces a profusion of spores, or conidia. From these there issue minute zoospores provided with delicate cilia enabling them to swim in any thin film of moisture. If this be on a leaf, the zoospore may enter one of the stomata, and give rise to a mycelium within the tissues. From this there issue fertile threads, reaching the surface through the stomata, to carry on

TREES AND SHRUBS

the work of reproduction through conidia as before. Resting spores are produced within the tissues, and carry on the attack anew in the spring.

A large and important group of endophytes is that known as the Uredines, in which there are three distinct stages of development, each of which may be considered as a fungoid disease.

The first stage is known as the "cluster cups," or *æcidium* form, and consists of clusters of little cups, partly imbedded in the substance of the leaf or twig of the host-plant. The margin is usually white and fringed, and the interior filled with orange subglobose spores, termed *æcidiospores*. A species, exceedingly common in spring, may be found on the under-surface of the leaves of the Lesser Celandine or Figwort (*Ranunculus ficaria*). Less frequently it occurs on other species of *Ranunculus*, and is known as the Crowfoot Cluster-cups. The "cluster cups" form of parasitic fungus is found on many trees and shrubs.

The second stage is reached in the summer, when on the same leaves, or others, there are developed small brownish pustules, which at length split irregularly, exposing a mass of minute brownish spores, each borne on a short thread. These powdery spores, known as *uredospores*, constitute the "rusts" which attack many plants.

The third stage consists of *teleutospores*. These are produced in pustules similar to those of the second stage, and may sometimes be found mixed with them. They are more or less elongated, being supported on hyaline threads, and divided across the middle into two cells. Each of these cells may give rise to a germ tube or promycelium, and the apical cell may also produce secondary spores by cell-division. These last are eligible for the production of mycelium which on entering a new host plant will commence the cycle again. *Æcidiospores*, *uredospores*, and *teleutospores* may or may not be all produced on the same plant, but there are many variations, and the cycle is not always complete. Mycologists are divided in opinion, and there is still much to be learned before many of these life-histories are fully understood.

Having given this brief sketch of their various phases, we will turn our

FUNGOID PESTS

attention to some of the more common of these Fungoid Pests, and will group them under four heads, viz.—1. Roses; 2. Orchard and Fruit Garden; 3. Ornamental Shrubs; 4. Forest Trees.

I. DISEASES OF ROSES.

Rose Mildew, *Sphaerotheca pannosa*, is undoubtedly the most prevalent and destructive of all Rose pests. Its dirty-white felted mycelium of interwoven threads clothes the leaves, shoots and flower-stalks of all kinds of Roses. The mycelium sends up short branches, which produce conidia attached to each other in a chain. They are produced in rapid succession during the summer months, and, unless kept in check by frequent spraying or the use of sulphur, will soon give rise to an epidemic beyond all control. No fungoid disease can be cured by spraying, but it may be prevented from extending, by killing the spores which alight on the leaves.

As the season advances winter spores are produced. They consist of small dark brown globose receptacles scattered about upon the whitish mycelium. When mature each receptacle encloses a single globose transparent sac, or ascus, containing numerous spores which will germinate in the following spring. This winter fruit is found in the mycelium growing on the young wood, or rarely on the fruit, but not on the leaves. It is essential that every patch of mycelium should be carefully scraped off and burned, doing this early in the season, before the spores have a chance of falling to the ground.

Rose Rust, *Uredo Rosæ*, occurs during the summer on the leaves, petioles, and stems of wild and cultivated Roses, bursting through the cuticle as an orange-coloured powder. The patches on the underside of the leaves are small, or may coalesce to form a larger patch, while on the stems they may extend to an inch in length. When the rust disappears wounds or canker spots remain, which favour the growth of other fungi.

The rust patches on the wood may be treated with a solution of equal parts of methylated spirit and water, rubbing in with a piece of sponge.

TREES AND SHRUBS

Plants which have been attacked the previous season should be sprayed with a solution of potassium sulphide, or copper sulphate just before the leaves expand.

Rose Brand, *Phragmidium subcorticium*, is the advanced stage of the Rose Rust. It forms minute blackish projecting tufts on the under surface of the leaves, taking the place of the gradually disappearing Rust in autumn. Each point is a long and cylindrical teleutospore, of a very dark brown colour, divided transversely into 3-7 cells. In the spring they produce secondary spores which again give rise to the orange summer form.

Preventive measures consist of collecting and burning all infected leaves, not only those that are dead and fallen, but any that remain on bushes that have been infected.

Rose-leaf Black Blotch, *Actinonema Rosæ*, is a common fungus, appearing as somewhat rounded spots on the foliage, being at first purplish, and then black. Radiating from the black spots are flexuous threads of a delicate mycelium, and scattered among them are small black conceptacles containing sporules. The mycelium permeates the leaf tissues, causing premature defoliation.

Badly diseased leaves should be removed from the bushes and burned, together with all diseased leaves lying on the ground. Spraying with potassium sulphide, early in the season, and continued at intervals has been recommended, but does not seem to have much effect when the disease has once gained a foothold. Dilute copper sulphate, and Eau Céleste or Blue Water are also used for spraying.

Rose Leaf-spot or Leaf-scorch, *Septoria Rosarum*, not only disfigures the leaves, but seriously weakens the plant through premature defoliation, badly diseased plants being often quite leafless by the end of July. The fungus appears as rounded spots on the upper surface of the leaf, yellowish-green at first, becoming pale brown later, and bordered by a dark purple ring. The brown patches usually fall out, leaving holes in the leaf, but they may remain fixed, and will sometimes be studded with minute black points, the perithecia or reproductive bodies of the fungus, containing thread-

FUNGOID PESTS

like sporules consisting of a chain of six cells. The disease is very prevalent on wild Roses and Brambles, and is difficult to eradicate.

All diseased leaves should be collected and burned. Where the disease has existed the sulphate of copper solution may be used to drench the bushes and the surrounding ground. Spraying with "liver of sulphur" (potassium sulphide) should be done when the leaves are half grown, and repeated at intervals.

II. DISEASES OF ORCHARD AND FRUIT GARDEN.

We will next mention a few of the more common Fungoid Pests to be found in the Orchard and Fruit Garden, and for convenience of reference will place them in alphabetical order, without regard to any scientific classification.

Apple-leaf Spot, *Septoria pyricola*, occurs on the upper surface of the leaves of Apple and Pear. The substance of the leaf within the spot is killed by the mycelium and bleached, and the surface is dotted with minute black points. Each point is a tiny receptacle with a minute pore at the apex, out of which the fungus spores issue and spread themselves over the leaf.

Apple-tree White Mould, *Oidium farinosum*, covers the young twigs and leaves of Apple trees with a mealy coating, causing the leaves to curl, and distorting the tender twigs, at the same time giving them the appearance of having been dusted with flour or powdered chalk. Fertile branches arise from the profuse mycelium, and give a continuous crop of conidia, causing the disease to rapidly spread. Dusting with "flowers of sulphur" is the most effectual treatment.

Apple-tree Canker, *Nectria ditissima*, is the most frequent and destructive form of canker attacking Apple trees in this country. The fungus gains admission to the living tissues through a wound, and then spreads rapidly in the living bark, which becomes eaten away in patches, leaving the wood exposed, and in very young branches even the wood itself may be destroyed.

TREES AND SHRUBS

Where the bark is destroyed all round the branch, the portion above the wound is at once killed. On older parts of the tree the fungus will often gain an entrance through a crack in the fork of a branch, and after becoming well established will travel up the branch and cause its destruction by bursting through the bark at different points along its course. If the cracks containing the fungus be examined in spring there will be seen minute red dots growing in clusters on a white mycelium. These smooth spherical dots are the perithecia or conceptacles, and contain a pulpy nucleus consisting of a great number of long cylindrical tubes, or asci, each enclosing a row of eight spores. On germinating these spores give rise to the summer stage of the fungus, which may be seen as minute white specks nestling in the crevices of the rugged bark surrounding the wounds.

The white stage of the fungus can be killed by applying with a brush a solution of sulphate of iron—1 lb. to a gallon of water. Young branches that are attacked should be cut off. In older branches the diseased parts should be cut away, and the cut surface carefully anointed with gas tar.

The canker fungus is said also to attack Pear, Plum, Oak, Beech, Ash, Hazel, Alder, Maple, and Lime.

Apricot Brown Rot, *Monilia fructigena*, attacks the fruit of Apple and Pear in England, and of Apricot, Peach, and Cherry in the United States of America. The disease appears as a discoloured brownish spot, soon followed by the growth of dull grey tufts arranged in irregular concentric rings. The tufts are composed of dense masses of spores arranged in long branched chains. Although most conspicuous on the fruit, the fungus usually attacks the leaves, forming thin, velvety, olive-green patches, and from these the spores are carried to the blossoms or young fruit. If allowed to follow its course undisturbed for some years, the fungus may attack and kill the young shoots. The infected fruit becomes dry and mummified, like a large mouldy Plum, and in the spring produces a copious supply of spores to carry on the disease. The second or ascigerous stage of the disease has been found in the United States growing abundantly on old half-buried peaches.

All dead twigs and shrivelled fruit should be collected and burned during

FUNGOID PESTS

the winter, and the ground thoroughly drenched with a solution of sulphate of iron. The solution may also be used for spraying in January or early February, before the buds begin to swell. When the buds are expanding the trees may be sprayed with very weak Bordeaux mixture.

Fruit-tree Pustule, *Eutypella prunastri*, is a fungoid disease which attacks young fruit-trees and nursery stock, Plum and Apple suffering most severely, and Peach, Apricot and Cherry to a less extent. It is often abundant on Wild Plum, Bullace, Blackthorn, &c. In the orchard it probably enters the tree through wounds made by pruning. In the first stage there is a drying up, browning, and shrivelling of the bark, and threads bearing conidia ooze out through minute elongated cracks. These are followed in the second season by larger transverse cracks or perithecia from which asci are produced, each containing eight sporidia. These are ripe in late spring or early summer, and carry on the infection. The fungus growing in the bark and cambium must ultimately kill the young tree. All diseased plants should be burned, and wounds on the stem should be coated with gas tar.

Gooseberry Mildew, *Microsphaera Grossulariæ*, forms white patches on both sides of the leaves, giving them the appearance of having been sprinkled with flour. The powder consists of myriads of spores or conidia, which, unless destroyed, will rapidly spread the infection. When the disease is severe the leaves die and fall early, hindering the development of the tree. Later in the season minute black points are seen among the mycelium. These are the globose receptacles, each furnished with 10–15 colourless radiating fibres, and containing 4–8 sacs, or asci, each enclosing four or five sporidia.

Being an epiphyte, the disease may be checked by the application of sulphur, but the most effective treatment is spraying with a solution of potassium sulphide. All dead fallen leaves should be burned in winter, and the ground around the bushes should be well dug to bury stray spores.

American Gooseberry Mildew, *Sphaerotheca Mors-uvæ*, usually makes its appearance on the expanding leaf-buds, extending later on to the young wood and fruit. It has a cobwebby appearance, becoming white and powdery, and may be readily peeled off. In this country the fungus appears to be

TREES AND SHRUBS

mostly confined to the tips of the shoots, causing them to become brown and shrivelled. The life-history resembles that of the previous species. To combat the attack spray with potassium sulphide, one ounce to two gallons of water, repeating every ten days till the fruit is nearly mature.

Peach-leaf Blister or "Curl," *Exoascus deformans*, causes the leaves to become blistered and contorted in various ways, presenting an appearance as though suffering from an attack of aphid. Such a case of distortion might well have been placed in the chapter on Galls, especially as the curling of the leaves is often accompanied by an abnormal swelling of the young shoots, but owing to the serious nature of the disease we have preferred to describe this and some few others as true Fungoid Pests. The fungus in this instance causes the under surface of the leaves, in the hollows of the blisters, to assume a hoary or frosted appearance, the interior being closely packed with cylindrical cells, or asci, containing sporidia, the whole being covered with a transparent membrane.

Diseased or fallen leaves should be burned. The mycelium is perennial in the branches, following the young growth, producing the disease in the leaves each year, and preventing the ripening of the wood. Branches bearing diseased leaves should be pruned back beyond the point of infection.

Pear-leaf Cluster-cups, *Ræstelia cancellata*, is a parasite which thickens Pear leaves at the infected spots by the internal growth of the mycelium, and the "cups" are flask-shaped brown bodies containing æcidiospores. The cups, or *peridia*, split into numerous thread-like filaments, which for some time are united at the apex. The diseased leaves fall early in the autumn, resulting in a lack of reserve food for the following season, and if the attack occurs two or three years in succession, the tree will probably perish. All diseased leaves should be burned. By some authorities the Puccinia generation of this disease is said to be found in the Savin Jelly-rust.

Pear-leaf Blister, *Exoascus bullatus*, or *Taphrina bullata*, distorts the foliage in a similar manner to the "curl" on Peach leaves, but in this case the leaves remain flat. All blistered leaves should be burned, to check re-

FUNGOID PESTS

production. In the case of young trees frequent spraying with dilute Bordeaux mixture may be a preventive.

Plum-tree Mildew, *Podosphaera tridactyla*, attacks the foliage of Plum and Cherry trees, and resembles the Gooseberry Mildew in appearance. The receptacles in the case of the Plum have usually six or seven radiating arms, while those of the Cherry have from eighteen to twenty of these appendages. The disease may be checked by the application of sulphur.

Plum Pockets, *Exoascus Pruni*, is a disease easily recognised by reason of the familiar "Bladder Plums" which are the result of the attack. These galled and swollen fruits, as well as Witches' Brooms, are frequently found on the Bullace, the fungus being known as *Exoascus insititiae*. In the case of this tree the diseased fruits may attain dimensions three or four times larger than that of a normal-sized fruit. The mycelium is perennial in the twigs, and from these travels to the ovaries of the flowers, taking possession of the young fruit, diverting and absorbing the supplies of nutriment, preventing the formation of seed, and causing considerable malformation of the fruit. Growing from the mycelium are closely-packed cylindrical asci, each containing eight sporidia, which, escaping from the infected fruit, may carry on the disease. The diseased fruits, after going through various changes of colour, become shrivelled, and fall to the ground. All "pockets" should be collected and burned, and the branches may with advantage be cut back beyond the point of infection.

Witches' Broom of Cherry is caused by the fungus *Exoascus Cerasi*. The disease shows itself in the production of dense tufts of branches, growing apparently from a central point, very similar to those already described in the chapter on Galls, under the title of "Witch Knots." In the present case the fungus appears as a hoary bloom on the branches. The slender, club-shaped asci enclose nearly globose sporidia. The only known remedy is to cut out the disease tufts and burn them, so as to prevent propagation by spores.

TREES AND SHRUBS

III. PESTS OF THE ORNAMENTAL SHRUBBERY.

Barberry Cluster-cups, *Æcidium Berberidis*, is a disease which attacks the Common Barberry. The cluster-cups are to be seen during the summer on the leaves, peduncles and fruit. They are rather elongated and packed closely side by side in sub-rotund or oval patches. The margin of the cups is white and toothed, and the interior is filled with chains of globose orange-coloured spores. Some authorities consider this pest as one stage in the life-history of the Wheat mildew.

Barberry Leaf Mildew, *Microsphaeria Berberidis*, is a common pest of *Berberis vulgaris*, and resembles the Gooseberry Mildew in appearance. The globose receptacles are surrounded by a circle of about ten appendages, each beautifully forked in a dichotomous manner. Each receptacle encloses about six asci, and each ascus contains 6-8 sporidia. The mildew may be checked by the application of sulphur.

Ivy leaves are attacked by at least three species of Spot. Dotted about in the discoloured patches are small receptacles enclosing thread-like sporules.

Leaf Sooty Mould, *Capnodium Footii*, is a very common black mould forming thin sooty spots on the leaves of many plants, and often to be seen on Holly, Ivy and Cherry Laurel. The creeping mycelium consists of colourless or brownish threads, each divided into a chain of cells. The perithecia or receptacles are erect and bristle-like, and fringed at the mouth. All sooty leaves should be picked off and burned.

Phillyrea Rust, *Uredo Phillyreae*, is sometimes found on the leaves of Mock Privet, and takes the form of round, yellow pustules filled with orange-coloured uredospores, each with a thick hyaline outer coating.

Rhododendron Galls are often to be seen on the leaves of *Rhododendron ferrugineum*, and similar gall-like swellings are produced on Bay-Laurel. They are caused by a fungus, *Exobasidium Rhododendri*. They vary in size from $\frac{3}{8}$ in. to about $\frac{3}{4}$ in., and are at first yellowish-green, becoming reddish later, and covered with a delicate bloom. The mycelium traverses the interior of the gall, and the "bloom" consists of the fungus fruit. The naked spores

FUNGOID PESTS

are borne at the apices of stout erect spore-bearers called basidia, there being usually four basidiospores to each of the basidia. Diseased leaves should be burnt as soon as seen, in order to prevent the production of spores.

Savin Jelly-rust, *Gymnosporangium Sabinae*, causes gouty swellings in the branches of the Savin (*Juniperus Sabina*). These swellings burst through as an orange-coloured gelatinous mass consisting of teleutospores. These are two-celled, and each cell may give rise to a thread-like promycelium which divides at the extremity into three or four cells, each producing a secondary spore. Some mycologists consider this disease to be a stage in the life of the Pear Cluster-cups, and strongly deprecate the growing of Savin bushes in the neighbourhood of Pear trees.

IV. FUNGOID PESTS OF FOREST TREES.

Ash-leaf Spot, *Septoria Fraxini*, affects almost every leaf if once it attacks a tree. It takes the form of irregular discoloured patches, sometimes covering the entire leaflet. The minute conceptacles are immersed in the substance of the leaf, and contain numerous cylindrical sporules.

The Beech-tuft, *Armillaria mucida*, is a handsome Toadstool which is often seen growing in clusters on the trunks and branches of old Beech trees. It is greyish-white in colour, with a slender stem 3-5 ins. long, and a hemispherical, flattened cap, 1-4 ins. in diameter. It is of a slimy character, but delicious when properly cooked. It is said to be a wound parasite, capable of attacking a healthy branch, causing death and decay. All wounds and cut branches should be protected with a coating of tar. The Agarics should be eaten or destroyed.

Birch-leaf Rust, *Melampsora betulina*, is common from May to November. The pustules are of two kinds. Those which contain uredospores are pale orange, the spores being orange-yellow, and ovate. The teleutospores are pale yellow-brown, cylindrical, slightly wedge-shaped, and closely packed side by side, the pustules changing from yellow to brown, and finally becoming black.

TREES AND SHRUBS

Birch-leaf Blotch, *Dothidella betulina*, appears as small blotches containing white cavities or cells in which the fruit of the fungus is developed after the leaves have fallen to the ground. The asci enclose eight sporidia.

Birch Polypore, *Polyporus betulinus*, is a hoof-shaped fungus often found on dead Birch-trees, and sometimes attacking and destroying living trees. It measures 3–8 ins. across, and is soft and whitish when young, becoming firmer and brown with age. The mycelium is probably perennial, so there is no hope of saving a tree when once attacked. To prevent the dispersion of spores, all specimens of the fungus should be destroyed.

Crack Willow Rust, *Melampsora epitea*, is found on the foliage of several species of *Salix*, in the form of minute orange powdery pustules. The globose uredospores are pale yellow, and the cylindrical teleutospores are at first brown, then nearly black. Both are present on the underside of the leaf.

Conifer Root Rot, *Trametes radiciperda*, is the most dangerous of all the parasites met with in coniferous woods. It attacks Scots Fir, Weymouth Pine, Norway Spruce Fir, Silver Fir, and other conifers, causing the worst form of red-rot. The mycelium forms a felted mass between the bark-scales of the roots, scarcely as thick as the finest tissue-paper, and the sporophores appear as small cushion-like structures, coalescing to form a thin white cake, usually 1–2 ins. in diameter, but sometimes measuring as much as 16 ins. across. The spores may possibly be disseminated by mice or other burrowing animals, but usually the disease spreads by means of the mycelium travelling from a diseased root to any sound root which may be in contact. Having gained an entrance between the bark-scales of the root, the mycelium finds its way into the wood and travels up the stem, causing decomposition of the tissues, and the ultimate death of the tree. All diseased trees should be removed, great care being exercised to take from the ground every portion of the old stump and diseased roots.

Elm-leaf Phlœospore, *Phleospora Ulmi*, is one of the commonest parasites on Elm leaves, sometimes attacking nearly every leaf on a tree. The small brownish spots are dotted with pustules from which there exude whitish threads

FUNGOID PESTS

of conidia, each divided into five cells. This is supposed to be the first stage of the Elm-leaf Blotch.

Elm-leaf Scab (*Piggotia astroidea*) is thought to be the second stage. It occurs as small blackish scabs on the upper surface of the leaves. The scabs are composed of minute tubercles, from which conidia exude.

Elm-leaf Blotch (*Phyllachora Ulmi*) is not unusual on Elm-trees, taking the appearance of rounded, convex, nearly black blotches on the upper surface of the leaves. The fungus matures after the fall of the leaves, the cavities containing numerous cylindrical sacs or asci, each enclosing eight sporidia.

Hawthorn Powdery Mildew (*Podosphaera Oxyacanthæ*) frequently whitens the leaves of Hawthorn, powdering them with the fallen conidia. The minute receptacles have 8-10 shortly branched appendages, about equal in length to the diameter of the receptacles. Each of the latter contains only one ascus, enclosing eight sporidia.

Hawthorn Cluster-cups (*Ræstelia lacerata*) is a species of fungus found on the leaves, petioles, and fruits, taking the form of tufts seated on orange spots. The flask-shaped or cylindrical peridia are much lacerated and fringed at the margins, and ultimately split nearly to the base in reflexed thread-like filaments of attached cells marked with wavy lines. The yellowish æcidiospores are nearly spherical and warted. These cluster-cups are believed to be the first stage in the life of the Juniper Jelly-rust (*Gymnosporangium clavariiforme*), and are often now called by this Latin name.

Hornbeam-leaf Blotch (*Gnomoniella fimbriata*) attacks the living foliage in the form of black convex blotches containing receptacles, each terminating in a spine-like neck, and enclosing oblong asci with eight sporidia. The conidial stage is believed to be the *Gleosporium Carpini*, a form of anthracnose in which the cylindrical conidia are expelled in whitish tendrils.

Laburnum Leaf-spot (*Phyllosticta Cytisi*) takes the form of brownish, circular spots, over which are scattered the dot-like receptacles containing curved sporules.

Larch Canker (*Dasyscypha calycina* or *Peziza Willkommii*). The Larch disease is thought to be caused by this *Peziza*, which is found on the twigs and

TREES AND SHRUBS

branches, especially when the Larches are growing in low, damp situations. The fungus is a wound parasite, its spores entering by wounds caused by insects, hailstones, or the fracture of a branch through excessive weight of snow. It consists of tiny white cups of a waxy consistency, having an orange-yellow disk formed of closely packed asci, or spore cases, each containing eight sporidia. Mixed with the cylindrical asci are erect sterile filaments known as paraphyses. The bark is destroyed above the area occupied by the mycelium of the fungus, and when the diseased spots spread so far as to girdle the trunk or branches, the part beyond will die. In damp localities the mycelium appears to spread rapidly through the entire plant, and the cups, or ascosphores, may be developed over every part of the tree.

As a preventative plantations of Larches should not be made in damp, lowland localities. To check the disease all canker spots should be removed on their first appearance, and the wound dressed immediately with a wash of corrosive sublimate in methylated spirit, or with a strong solution of sulphate of iron, and then painted over with tar.

Maple-leaf Blotch (*Rhytisma punctatum*) occurs as yellow spots nearly 1 in. in diameter, and dotted with disconnected portions of a black scab or crust. The final stage is passed on the fallen leaves, and consists of clavate asci containing eight needle-shaped sporidia.

Maple Mildew (*Uncinula Aceris*) sometimes covers the foliage of Hedge Maple so completely as to give it the appearance of having been drenched with a thin coating of whitewash. The appendages of the receptacles are hooked at the apex. The receptacles enclose eight asci, each containing eight sporidia. The pest may be kept in check by the application of sulphur and lime.

Mountain Ash Cluster-cups (*Ræstelia cornuta*). The peridia occur in tufts on rusty orange-coloured spots on the under surface of the leaves. They are long, cylindrical, horn-like, curved tubes, serrated at the margin, but do not split into threads. They are whitish at first, and then become yellowish-brown or reddish, and contain brownish-yellow æcidiospores. The teleutospore stage is said to be the Juniper Jelly-mass (*Gymnosporangium juniperinum*), and the fungus is sometimes described under this name.

FUNGOID PESTS

Pine Cluster-cups (*Peridermium Pini*). The cluster-cups, which appear in May or June, usually on the Scots Pine, and sometimes on the Weymouth Pine, are of two forms, those found on the leaves being cylindrical or laterally compressed, and having an irregularly torn margin; others, found growing in crevices of the bark on the young twigs, are larger and inflated, and have the mouth spreading and much torn. The powdery æcidiospores are orange coloured. The mycelium is perennial in the bark, bast, and wood. The cells attacked by the haustoria or minute suckers of the mycelium lose their contents, and afterwards secrete turpentine in considerable quantity, which escapes through cracks in the bark. When the disease encroaches on the wood, and checks the flow of sap, the branches die. The uredo and teleutospore stages are thought by some authorities to be the Senecio Rust, (*Coleosporium Senecionis*), and this name is sometimes applied to the cluster-cups.

Black Poplar Rust (*Melampsora populina*) occurs on the leaves of the Black, Balsam, and Lombardy Poplars. The brown pustules of the uredo are roundish, and contain orange-yellow spores, mixed with capitate paraphyses. The flat pustules of the teleutospores are generally crowded and often confluent, reddish-brown at first, and afterwards forming blackened crusts. The cylindrical pale brown teleutospores are closely packed side by side, becoming angular by compression.

Sulphury Wood-rot (*Polyporus sulfereus*) is a large and showy poisonous fungus found as a parasite on the trunk of various trees, such as Oak, Alder, Willow, Poplar, Pear, Apple, and Larch. In the young state it is a round fleshy knob, but soon grows into an irregularly flattened body, crisped and waved on the margin, often with several overlapping portions or pilei, one above the other. A well-grown specimen may measure a foot in expanse, and weigh several pounds. The fungus is a bright sulphur-yellow, becoming paler on the smooth upper surface when old. It is brittle, with a soft whitish flesh and a disagreeable smell. Beside the usual reproduction by basidiospores, there are also conidia produced in abundance from the mycelium growing in cavities of the wood, or sometimes in the flesh of the polypore. The fungus is an annual, growing rapidly, and decaying in the autumn.

TREES AND SHRUBS

The spores gain access through a wound, such as a broken branch or an unprotected surface exposed by pruning. The mycelium attacks the heart-wood, changing its colour to a clear reddish-brown, and causing it to crack and decay.

Parts exposed by pruning, and the ends of broken branches, should be protected by the use of a fungicide. All specimens of the polypore should be removed and burned, and the surrounding wood cut away to the depth of an inch, the cut surface being washed with a saturated solution of corrosive sublimate in methylated spirit, and afterwards painted over with tar.

The Spruce Nectria (*Nectria cucurbitula*) attacks the Norway Spruce, and sometimes the Silver Fir and Scots Pine. It is a wound parasite, gaining entrance by means of cracked branches, bruises caused by hail, and on the Continent through wounds made by the larvæ of a Tortrix moth (*Grapholitha pactolina*). The fungus chiefly affects the cortex, but when this is killed the wood may also dry up and wither, and in this way the top of a tree often becomes yellow, withers and dies. The mycelium is most active in the soft bast; and when the dead bark is almost constantly damp, numerous small cushion-shaped or mushroom-like bodies called stroma burst through to the surface. These at first bear numerous conidia, followed at a later period by red perithecia, which produce colourless sporidia contained in asci. To prevent the spread of the disease it is considered advisable to cut off and burn the tops of dead trees.

Sycamore-leaf Blotch (*Rhytisma acerinum*) is common on the upper surface of the leaves of Sycamore, as well as at least three other species of *Acer*, viz. the Common, Norway, and Red Maples. On their first appearance in June or July the blotches are yellow, but soon change to pitch-black, the surface becoming wrinkled or corrugated and scab-like. Within the scab-like covering or stroma are cavities from which there ooze out minute curved spores or spermatia. During the winter an ascigerous form of fruit is produced on the fallen leaves, the sporidia being needle-shaped and colourless. All diseased leaves should be collected and burned before the ascospores are liberated in the spring.

FUNGOID PESTS

The Vegetable Beef-steak or Oak Tongue (*Fistulina hepatica*) is found on living Oaks, not infrequently in the same position, year after year. It first appears as a reddish knob, rather like a strawberry, but soon enlarges, becoming darker in colour, sticking out horizontally from the tree, and much resembling the tongue of an animal in shape and appearance. As it ripens it becomes more succulent, being soft and easily cut, internally mottled somewhat after the manner of beetroot, and though it perhaps more closely resembles a piece of bullock's liver, it is not difficult to account for its common name of Vegetable Beef-steak. It usually weighs from three to four pounds, but specimens have been found weighing as much as thirty pounds. Though bitter and astringent when young, it is said to be quite nice if stewed with butter when thoroughly mature. The under surface is perforated with innumerable minute holes—the mouths of the closely packed tubes—which bear the salmon-coloured spores on their inner sides. Being always found on the dead parts, it is doubtful to what extent the fungus is a cause of injury to the tree.

Willow-leaf Blotch (*Rhytisma salicinum*) is found on the Goat Willow and several other species of *Salix*. The blotches are large, circular, or irregular, rather shining and pitchy-black, the internal stroma being white. The ascigerous stage is found on the fallen leaves which have passed the winter on the ground. The clavate asci contain eight needle-shaped, curved sporidia. Diseased leaves should be collected and burned.

Willow Mealy Mildew or Blight (*Uncinula adunca*) attacks the foliage of Willows, Poplars, and sometimes Birch. The mycelium is rather thin and white, and the falling conidia increase the mealy appearance of the leaves. The minute, dot-like receptacles are surrounded by a rather dense circle of unbranched, hooked appendages. Each receptacle contains 8-12 asci furnished with four spores.

Witches' Broom of Birch (*Exoascus turgidus*). This is a somewhat similar growth to the "Witch Knots" already described in the chapter on Galls, but in this case the abnormal growth is the result of a fungus belonging to the great group of Ascomycetes. In the genus *Exoascus* the asci, or spore

TREES AND SHRUBS

sacs, are quite exposed, instead of being enclosed in a perithecium. The asci are developed in spring and summer on the under surface of the leaves, which curl up, lose their fresh green colour, becoming sickly in appearance, and covered with a velvety, greyish-white hoariness. The contained sporidia are globose.

Witches' Broom of Hornbeam is produced by *Exoascus Carpini*.

Witches' Broom of Pines (*Peridermium* (*Æcidium*) *elatinum*). This fungus is parasitic on the Stone Pine and various species of Silver Firs. The mycelium causes fusiform swellings or canker knobs, from which often arise the deformed shoots, bearing pale green swollen needles. It is perennial in the cortical and bast tissues of the stem, and even penetrates the cambium and wood; in the latter case giving rise to canker-swellings, with or without the witches' broom. The leaves of the latter remain yellowish, and towards autumn they bear two rows of whitish æcidia or "cluster-cups" on their underside. After the discharge of the æcidiospores, the leaves die and fall off. Each year the mycelium advances into the new shoots, and the witches' broom increases in size, its growth continuing for perhaps twenty years. In young woods all trees that show cankerous swellings should be removed.

CHAPTER V

FUNGICIDES AND INSECTICIDES

THE following Formulæ have been compiled from many sources, several of the most common being derived from the leaflets issued by the Board of Agriculture and Fisheries. By the kind permission of the editor several others have been taken from volume xxxiv. part iii. of the *Journal of the Royal Horticultural Society*; these are marked with an asterisk (*). Many of the variations of Formulæ are the results of years of patient experiment, and experts are agreed that we have yet much to learn in the matter of spraying for the eradication of pests. In the meantime there is great truth in the remarks of two of our well-known experts when they say, "The grower must know what to spray for, what to spray with, and when to do it." It is hoped that this chapter will give a few useful hints to those who may be on the look-out for simple remedies. Those more especially interested in the question of spraying of fruit-trees may be referred to the above-mentioned Journal, which contains a full account of the admirable papers read at the Conference held in October 1908.

Ammoniacal Carbonate of Copper. Useful in epiphytic diseases, such as Rose Mildew.

I. Dissolve 5 ozs. carbonate of copper in $1\frac{1}{2}$ pint water; slowly add 3 pints strong aqua ammonia; dilute with water to 45 gallons.

II. Mix 1 oz. carbonate of copper and 5 ozs. carbonate of ammonium, and dissolve in 1 quart hot water; add 16 gallons cold water.

III. Mix 3 ozs. sulphate of copper and 3 ozs. carbonate of soda with 1 quart concentrated ammonia; when all action ceases dilute with 22-28 gallons water.

Arsenate of Lead. Destruction of caterpillars.

I. Roses. Arsenate of lead (98 per cent.), $2\frac{3}{4}$ ozs.; arsenate of soda

TREES AND SHRUBS

(98 per cent.), 1 oz.; water, 10 gallons; place chemicals in some of water and stir till dissolved; add rest of water; use as fine spray.

II. Tent caterpillars on fruit-trees. Dissolve 1 oz. arsenate of soda in warm water; add to 16 gallons soft water; dissolve 3 ozs. acetate of lead in water; pour into the 16 gallons; add 2 lbs. treacle, or mix with paraffin emulsion; use as fine spray.

III. Saw-fly larvæ, Magpie Moth, &c. Dissolve 4 ozs. arsenate of soda (40–50 per cent.) in little water; dissolve 12 ozs. white commercial acetate of lead in water; add dissolved arsenate of soda to 100 gallons soft water; mix well and add dissolved acetate of lead, and stir; add 2 lbs. treacle. Do not use on ripe or ripening fruit for four weeks previous to gathering.

Bisulphide of Carbon. Useful in subterranean attacks of Woolly Aphis or Apple Root Louse.

One fluid ounce of bisulphide is sufficient for a good-sized tree. Inject into soil in four places 2 ft. away from trunk of tree.

Bordeaux Mixture. The cheapest and best all-round fungicide.

I. Dissolve 6 lbs. sulphate of copper in 25 gallons water in a barrel; in another vessel dissolve 4 lbs. unslaked lime, adding water slowly, and making up to 25 gallons; when cold mix the solutions, and stir well during spraying. Never use air-slaked lime, as it injures the foliage.

* II. Woburn Recipe. Copper sulphate, 10 ozs.; lime-water, $8\frac{1}{2}$ gallons; water to make 10 gallons. Dissolve the copper sulphate in $\frac{1}{2}$ gallon of water; run in $8\frac{1}{2}$ gallons clear lime-water; add water to make 10 gallons. To make lime-water gradually slake $\frac{1}{2}$ lb. quicklime, add 12–15 gallons water, stir once or twice, and allow to settle. The mixture is not fit for use until addition of a few drops of potassium ferrocyanide produces no red colour; if necessary add lime-water until red colouration ceases on testing.

Caustic Alkali Wash. I. Beneficial where fruit-trees are infested with moss and lichens, or with Woolly Aphis. Use as spray in February.

Dissolve 1 lb. commercial caustic soda in water; dissolve 1 lb. crude potash (pearl-ash) in water; mix solutions, and add $\frac{3}{4}$ lb. soft soap or agricultural treacle; stir well and dilute to 10 gallons.

FUNGICIDES AND INSECTICIDES

* II. Destruction of Apple Sucker. 3 lbs. caustic soda (98 per cent.), 3 lbs. caustic potash, 2 lbs. soft soap, 1 gallon petroleum, 30 gallons water.

Hellebore Wash. Destruction of Saw-fly larvæ. 1 oz. fresh ground hellebore, 2 ozs. flour, 3 gallons water. Mix hellebore and flour with a little water, then add rest of 3 gallons. Constantly stir while using as fine spray. For fruit-trees it must not be used on ripe or ripening fruit for four weeks before gathering.

Iron Sulphate. Destruction of resting spores of fungi. Spray before leaf-buds begin to swell. In a barrel pour 1 pint sulphuric acid upon 25 lbs. sulphate of iron; add 50 gallons water by degrees.

Lime Wash. Useful for "painting" fruit-trees. Make a whitewash of 8 lbs. lime, 1 lb. soft soap, a small quantity of size, 4 gallons water.

* *Lime and Salt Wash.* For cleaning trees of moss and lichens, and prevention of hatching of eggs of Apple-Sucker, Plum-Aphis, and Mussel-Scale. Spray from end of February to beginning of April, ceasing as soon as buds open.

I. Lime, 1-1½ cwt.; salt, 30-40 lbs.; water, 100 gallons.

II. Lime, 1-1½ cwt.; salt, 30-40 lbs.; water-glass, 5 lbs.; water, 100 gallons.

III. Lime, 1-1½ cwt.; salt, 30 lbs.; washing-soda, 3 lbs.; water, 100 gallons.

Gradually slake best fresh lime; mix with water in which salt has been dissolved; strain through sieve or sacking. If using water-glass or soda, previously dissolve in water and add to strained wash. Water-glass is said to make wash hold better on trees.

* *Oregon Wash, or Lime-Sulphur-Soda Wash.* Destroys Pear-leaf Blister Mite. Spray on dormant wood; in pear spraying cease as soon as bud-scales are fully opened.

Lime, 3 lbs.; sulphur, 3 lbs.; salt, 3 lbs.; caustic soda, 1 lb.; water, 10 gallons. Mix soda and lime, and slake with hot water in which sulphur has been incorporated; stir and add salt; boil and then add rest of water.

Paraffin Emulsion. I. Destruction of Aphides on Roses. Boil ½ lb. soft soap in water; remove from fire, and while still boiling add ½ pint paraffin; dilute to 10 gallons.

TREES AND SHRUBS

II. For Gooseberry Saw-fly and Apple Sucker. 6 lbs. soft soap, 4-6 gallons paraffin, 100 gallons water. Prepare as in No. I., thoroughly churning in order to incorporate the soap and oil.

III. For Ermine Moth Caterpillars. 7 lbs. soft soap, $\frac{1}{2}$ gallon paraffin, dilute to 25 gallons. Prepare as before.

* IV. For Winter use. Destroys Mussel-Scale ova, Oyster-shell Bark Louse, and Brown Currant Scale. Paraffin (Tea Rose), 10 gallons; soft soap, 15 lbs.; water, 100 gallons.

* V. For Summer use on fruit-trees. Paraffin, 3 gallons; soft soap, 12 lbs.; water, 100 gallons.

* *Paraffin Metal Emulsion.* For Summer use. A fungicide and insecticide; kills Aphides, Leaf-hoppers, and Thrips, and perhaps Caterpillars. Apply as a fine spray when buds are bursting, and again when blossom has fallen.

Copper sulphate, 10 ozs.; lime-water, 8 gallons 3 pints; paraffin (Solar distillate), 24 ozs. Dissolve copper sulphate in water, add lime-water or lime, churn in oil, add water to make 10 gallons. Arsenate of lead may be added.

Paris Green. Destruction of Caterpillars and Saw-fly larvæ. Use as spray.

Add 1 lb. Paris green to 200 gallons water, and stir in 2 lbs. lime. Paris green in the form of Blundell's paste is more easily mixed with water than the fine powder.

Potassium Sulphide. Popularly known as "liver of sulphur." Useful for checking fungoid disease. Dissolve $\frac{1}{2}$ lb. potassium sulphide in 2 gallons hot water; dilute to 20 gallons.

* *Self-boiled Lime-Sulphur Spray.* Useful for checking fungus diseases, including Apple Scab and Apple Leaf-spot. "Flowers of sulphur," 10 lbs.; quicklime, 15 lbs.; water, 50 gallons. Place lime in wooden barrel, pour in 2-3 gallons boiling water; add sulphur and 3 gallons hot water; cover barrel with cloth, and let action continue for 20 minutes, occasionally stirring; when boiling ceases add water to make 50 gallons.

Soft Soap and Quassia. I. Spray for Currant Aphides. Boil for two

FUNGICIDES AND INSECTICIDES

hours 5–10 lbs. quassia chips in just sufficient water to maintain the extract as a liquid; dissolve 6–8 lbs. soft soap in water; add to quassia extract, well mix, and dilute to 100 gallons.

II. For Gooseberry Saw-fly and Apple Sucker. 6–8 lbs. quassia, 6 lbs. soft soap, 100 gallons water.

III. For Winter Moth Caterpillars. 6 lbs. quassia, 7–8 lbs. soft soap, 100 gallons water.

IV. For Winter Moth Caterpillars. 4 lbs. quassia, 6 lbs. soft soap, 5 pints paraffin, 100 gallons water.

V. For Winter Moth Caterpillars. 4 lbs. quassia, 6 lbs. soft soap, 4 pints Calvert's No. 5 Carbolic acid, 100 gallons water.

VI. For Aphis or Scale on Roses. 1 lb. quassia, $\frac{1}{2}$ lb. soft soap, 10 gallons water.

Soft Soap and Sulphur. For Woolly Aphis. 1 lb. soft soap, $\frac{1}{2}$ lb. "flowers of sulphur," 7 gallons water.

Sulphate of Copper. Spray for Fungi. Dissolve 1 lb. sulphate of copper in 25 gallons water.

Sulphur. Use as a dry powder in form of "flowers of sulphur"; sometimes mixed with fine-powdered quicklime. Very effective in arresting Mildews.

Tobacco and Soft Soap. I. For Aphis on Fruit-trees. Pour 4–6 gallons boiling water on 1 lb. tobacco; when cool, add $\frac{1}{4}$ –1 lb. soft soap. Syringe with force.

II. For Thrips, Leaf-hoppers, and Cuckoo-spit on Roses. $\frac{1}{2}$ lb. tobacco, 1 lb. soft soap, 12 gallons water.

* III. Destruction of Aphis, Psylla, Cuckoo-spit, Leaf-hoppers, and Thrips. Tobacco powder, 3 lbs.; soft soap, $\frac{1}{2}$ lb.; water, 10 gallons. Infuse tobacco powder in water for about six hours, strain off, press tobacco and infuse again; add the extract to dissolved soap and water.

* *Woburn Winter Wash.* A caustic alkali wash for cleansing trees of moss, lichens, and Mussel-Scale.

I. Non-fungicidal. Soft soap, $\frac{1}{2}$ lb.; paraffin, 5 pints; caustic soda, 2 lbs. ;

TREES AND SHRUBS

water, $9\frac{1}{2}$ gallons. Dissolve soap in warm water, churn paraffin into it, shake in caustic soda.

II. Non-fungicidal. Will destroy ova of Mussel-Scale and Oyster-shell Bark Louse. Use November to February.

Iron sulphate, $\frac{1}{2}$ lb.; lime, $\frac{1}{4}$ lb.; caustic soda, 2 lbs.; paraffin, 5 pints; water, 10 gallons. Dissolve iron sulphate in 9 gallons water; slake lime in little water, and add more to make milk of lime; run milk of lime into dissolved iron sulphate through a fine sieve; churn paraffin in the mixture, and add caustic soda.

III. Fungicidal. Removes moss and lichens; destroys Mussel-Scale ova and Oyster-shell Bark Louse, and is valuable where Apple-scab occurs on the wood.

Copper sulphate, $1\frac{1}{2}$ lb.; quicklime, $\frac{1}{2}$ lb.; paraffin, 5 pints; caustic soda, 2 lbs.; water, 10 gallons. Dissolve copper sulphate in 8-9 gallons water, slake lime in water, add to dissolved copper sulphate, running through fine sieve; add paraffin and churn, add caustic soda and water to make 10 gallons.

TREES AND SHRUBS

CLASS I.	<i>Dicotyledons</i>
DIVISION I.	<i>Thalamifloræ</i>
NATURAL ORDER.	<i>Ranunculaceæ</i>

HERBS or climbing shrubs, with an acrid juice; *Leaves* radical or alternate, rarely opposite, generally sheathing at base; *Sepals* usually 5, deciduous, often petaloid; *Petals* usually 5, sometimes wanting, often deformed and serving as nectaries; *Stamens* indefinite, hypogynous, anthers basifixed; *Carpels* numerous, 1-celled; *Fruit* an etærio of achenes or follicles, or rarely a berry.

Distinguished from Rosaceæ by the hypogynous stamens and deciduous calyx.

The Crowfoot or Buttercup Family comprises many hundreds of species arranged in thirty genera, most of them being herbaceous plants, distributed throughout cool and temperate climates. The shrubby plants in cultivation consist of about thirty-five species of Clematis (mostly woody climbers), two Tree Pæonies, and the American Shrubby Yellow Root. Some members of the Order are extremely poisonous, and the juices of most are acrid.

The name Ranunculus (*L. rana*, a frog) is said to have been applied by Pliny to the chief genus, from the fact that some of the aquatic species grow where frogs abound.

TRAVELLER'S JOY, *Clematis Vitalba*.

A native of Britain, especially favouring dry, chalky soils, climbing over our hedgerows, and in woods and thickets. Being a quick-growing climber, it is suitable for covering unsightly objects, and its small greenish-white

TREES AND SHRUBS

flowers are followed by the 1-seeded fruits, from which hang long whitish feathery, hair-like tufts, very attractive in winter, and making its popular name of Old Man's Beard most appropriate. June—August.

The genus *Clematis* consists chiefly of deciduous shrubs, many of which are planted in the garden for the variety, size, and brilliancy of their gorgeous flowers, the rapidity of growth, and the ease with which they may be trained to trellises or walls, or made to climb up stumps of old trees or over rockeries. Their height may range from 1 to 30 ft.; and their white, blue, purple, or yellow flowers are in evidence from April to October. They thrive best in a rich loamy soil with a fair share of leaf-mould and decayed manure, with an addition of road grit to keep the whole open and allow the free ramification of the roots. The genus has been greatly improved by hybridisation, and the number of varieties is ever increasing. Many do well on chalky soils.

The species and varieties are mainly propagated by grafting small scions on pieces of roots of old plants in spring. Cuttings also are taken in spring, and shoots may be layered at all periods. Seeds are sown in light sandy soil in gentle heat in March, and the seedlings transplanted outdoors in June or July.

Flowers 1 in. diam.; honeyless, with sweet almond scent; borne in a *panicle* at ends of short axillary or terminal branches; pedicels shorter than leaves; *Sepals* 4-5, petaloid, valvate, pubescent; *Petals* 0; *Stamens* indefinite, hypogynous; *Carpels* numerous, 1-celled; *Fruit* an *etærio* of 1-seeded achenes, with the persistent styles transformed into long feathery awns.

Leaves opposite, pinnate or ternate, leaflets 3-9, usually 3-5, ovate-cordate, entire, toothed or lobed, downy beneath, veins prominent, petioles persistent when twining.

A deciduous *shrub*, climbing by its twisted petioles; *Stem* woody, young stems 6-angled, dark olive-green, downy.

Generic name derived from Gr. *klema*, a twig or tendril; specific "Vitalba," in a contraction of *vitis alba*, meaning "white vine," both names referring to its trailing habit. Juice of leaves said to be employed by beggars to



TRAVELLER'S JOY (*Clematis vitalba*)

A. Flowering shoot. B. Section of flower.

RANUNCULACEÆ

produce artificial sores; dried leaves used as fodder for cattle, the acrid juice disappearing after drying.

VIRGIN'S BOWER, *Clematis Flammula*.

Gardens. Very ornamental and useful for covering arbours, trellises, or walls; generally grown from seed. July—October.

Flowers creamy-white, fragrant, small, solitary or paniced; *Fruit* an etærio of achenes.

Leaves imparipinnate, leaflets very variable, entire or 3-lobed, glabrous, acute, dark green.

A deciduous climbing *shrub*, 15 ft.; *Roots* answer well for grafting.

Introduced from S. Europe, 1596. Specific name from L. *Flammula*, a little flame—*flamma*, blaze, flame; also called Sweet-scented Clematis.

MOUNTAIN CLEMATIS, *Clematis montana*.

Walls, roofs, trellises. This is the best of the hardy early flowering species. May, June.

Flowers white, tinged with pink, fragrant, 2-3 ins. diam.; on wood of previous year; peduncles usually one-flowered, in *axillary fascicles*; pedicels longer than leaves; *Sepals* petaloid, oblong and narrow; *Fruit* an etærio of achenes.

Leaves trifoliate, fascicled on arrested branches, leaflets ovate or ovate-lanceolate, acuminate, coarsely toothed at base, glabrous, $1\frac{1}{2}$ - $2\frac{1}{2}$ ins.

A deciduous climbing *shrub*, 20 ft.

Native of Nepaul; brought from India by Lady Amherst, 1831.

VINE BOWER, *Clematis Viticella*.

Gardens, arbours. It is the parent of many garden varieties. June—September.

TREES AND SHRUBS

Flowers blue, purple, or rose, large, drooping; solitary on the young wood; peduncles longer than leaves; *Sepals* petaloid, obovate, spreading; *Fruit* an etærio of achenes.

Leaves simple or ternate, entire, acute or obtuse.

A deciduous climbing *shrub*.

Introduced from S. Europe; cultivated in 1569 by Hugh Morgan, apothecary to Queen Elizabeth.

CLASS I.	<i>Dicotyledons</i>
DIVISION I.	<i>Thalamifloræ</i>
NATURAL ORDER	<i>Magnoliaceæ</i>

Trees or shrubs, with alternate, simple leaves, often coriaceous; leaf buds enclosed in convolute membranous stipules; *Sepals* 3, usually petaloid, deciduous; *Petals* 6 or more, 3 in a whorl, imbricate; *Stamens* indefinite, hypogynous; *Carpels* numerous, free, or cohering at base; *Fruit* an etærio of follicles or achenes; *seeds* with an aril-like testa.

The Order much resembles Ranunculaceæ, but the members are always trees or shrubs. The name was given in honour of Pierre Magnol (1638–1715), Professor of Medicine and Prefect of Montpellier Botanic Gardens.

CUCUMBER TREE, *Magnolia acuminata*.

Gardens, shrubberies. Makes a handsome tree when planted singly in the park or pleasure ground. May—July.

The Magnolias or Water-lily Trees comprise about a dozen distinct species of ornamental hardy deciduous trees or shrubs, besides which there are some half-dozen others of garden origin. They thrive best in a rich, deep sandy loam, of free and open texture, and when in a sheltered position or against a south or south-west wall. They are somewhat impatient of root disturbance. They are propagated by layering in summer or autumn, grafting in heat in July or August, and by seeds sown in sandy soil in spring or autumn. Seeds should be sown as soon as ripe.



YULAN
(Magnolia conspurcua)

MAGNOLIACEÆ

Flowers green, tinged with yellow, solitary, terminal, only slightly scented, 2 ins. high, 3-4 ins. diam.; *Sepals* acute, spreading, soon reflexed, deciduous, 1-1½ ins. long; *Petals* 6-9, obovate or oblong; *Fruit* an etærio of follicles, ovate or oblong, 3 ins. long, 1 in. diam.; in young stage somewhat resembling a small cucumber, rose-coloured when ripe, aromatic, fragrant; *seeds* ovate, acute, ½ in. long.

Leaves oblong, petiolate, entire, acute or acuminate, thin, upper surface shining, dark green, underside pubescent; 6-9 ins. long, 3-4 ins. broad. Autumn tint bright brown.

A deciduous *tree*, 30-60 ft.; *Branches* spreading; growth rapid; *Buds* silky pubescent; *Bark* furrowed, dark brown; *Wood* dark brown or mahogany colour, soft, close-grained, durable, not strong.

The hardiest species; discovered by Bartram in Pennsylvania, and introduced from N. America by Collinson in 1763; there reaches 80-120 ft.

YULAN, *Magnolia conspicua*.

Whether growing in the open as a standard, or under the protection of a wall, this handsome species may be generally considered as the earliest and most beautiful of flowering trees. In mild seasons it may be laden with blossoms as early as February, its waxy-white flowers making it appear as if a heavy fall of snow had settled on its spreading branches. It likes a warm, open, and rich soil with abundant moisture, and requires protection north of London. February—May.

Flowers waxy-white, sometimes suffused with purple, tulip-shaped, solitary and terminal, opening before leaves expand, very fragrant; *Petals* 6-9; *Fruit* an etærio of follicles.

Leaves alternate, obovate, entire or slightly sinuate, abruptly acuminate, petiolate, young leaves pubescent.

A deciduous *tree*, 20-50 ft.; bluntly conical.

Introduced from China by Sir Joseph Banks, 1789; name "Yulan" from *yu*, purple, and *lan*, lily, probably given to a purple variety. *M. Soulangeana*

TREES AND SHRUBS

is believed to be a chance hybrid between this species and *M. obovata*, first appearing in the garden of Mons. Soulange-Bodin at Fremont, near Paris.

LONG-LEAVED CUCUMBER TREE, *Magnolia Fraseri*.

Gardens. Needs shelter from strong winds. Makes a very striking specimen when in full leaf. May—July.

Flowers creamy-white, 6–8 ins. diam., very sweet-scented, solitary and terminal, peduncles stout, glabrous; *Sepals* 9, obovate, narrow, rounded at apex, 4–5 ins. long, early deciduous; *Petals* 6 or 9, obovate, acuminate, membranaceous, spreading; *Fruit* an etærio of follicles, oblong, 4–5 ins. long, 1½–2 ins. wide, rose-red, glabrous; *Carpels* with subulate tips; *seeds* $\frac{5}{8}$ in. long.

Leaves alternate, obovate-spathulate, cordate and auricled at base, acute or obtuse, glabrous, bright green above, slightly glaucous beneath, 10–12 ins. long 6–7 ins. wide; petioles slender, 3–4 ins. long.

A deciduous tree, 30–50 ft.; *Branches* erect, spreading, contorted; *Twigs* stout, brittle, shining, red-brown; *Buds* terminal, glabrous, purple, axillary, minute; *Bark* dark brown, smooth, small excrescences; *Wood* light, soft, spongy, not strong, light brown.

Introduced from N. America, 1786; discovered by Bartram 1776, and introduced into France by Michaux. Syn. *M. auriculata*.

Specific name in honour of John Fraser, a collector who sent home many plants from America between 1780 and 1810.

LAUREL MAGNOLIA, *Magnolia glauca*.

Gardens, lawns. Thrives in a moist peaty soil. June—August.

Flowers creamy-white, fragrant, 3 ins. diam., solitary, terminal, peduncles glabrous; *Sepals* membranaceous, obtuse, concave; *Petals* 9–12, ovate, concave; *Fruit* an etærio of follicles, oval, dark red, glabrous, 2 ins. long, $\frac{1}{2}$ in. broad; *seeds* suspended, $\frac{1}{4}$ in. long.

Leaves variable, broadly oval or oblong, or lanceolate; obtuse, entire,

MAGNOLIACEÆ

under surface glaucous or nearly white, upper side light green, glabrous, aromatic, 4–6 ins. long, $\frac{1}{2}$ – $2\frac{1}{2}$ ins. wide; petioles slender.

A deciduous *shrub* or small *tree*, nearly evergreen in mild seasons, 15 ft.; *Branches* erect, spreading; *Twigs* hoary pubescent when young, afterwards glabrous, red-brown; *Buds* silky; *Wood* aromatic.

Native of N. America; there reaches 70 ft.; in swampy places used by beavers in construction of dams—hence names of Swamp Magnolia and Beaver-wood; introduced 1688.

GREAT LAUREL MAGNOLIA, *Magnolia grandifolia*.

This handsome species is usually treated as a wall plant, but in the south of England it grows and flowers well in the open. It is the largest leaved and noblest of our hardy evergreen trees. May—October.

Flowers white, lemon scented, 6–9 ins. diam., solitary, terminal, erect; *Petals* 9–12; *Fruit* an etærio of follicles cohering in a kind of cone; *seeds* with an aril-like scarlet testa, suspended by slender threads.

Leaves alternate, oval-oblong, petiolate, exstipulate, entire, coriaceous, glabrous, upper surface bright green and shining, reddish-brown beneath, 6–12 ins. long, 4 ins. broad.

An evergreen *shrub* or small *tree*, 20–30 ft.; freely branching and forming a pyramidal head; *Branchlets* green to brown; *Bark* rough; *Wood* soft and white.

Known also as Evergreen Magnolia and Bull Bay; in forests of North Carolina and adjacent States grows to height of 100 ft.; introduced 1737.

GREAT-LEAVED MAGNOLIA, *Magnolia macrophylla*.

Gardens. A handsome tree, possessing the largest flowers and largest leaves of any tree brought from America. Here it is somewhat tender. May, June.

Flowers white, fragrant, 8–10 ins. diam., solitary; *Petals* 6–9, ovate-

TREES AND SHRUBS

oblong, obtuse, three times as long as sepals, purple blotch at base; *Fruit* an etærio of follicles, cone ovoid-cylindrical, 4–6 ins. long, bright rose at maturity.

Leaves alternate, obovate-oblong, cordate at base, obtuse, glabrous and green above, hairy and white beneath, $2\frac{1}{2}$ – $3\frac{1}{2}$ ft. long, 8–10 ins. wide; petiole stout, 2–4 ins. long.

A deciduous *tree*, 30–40 ft.; *Bark* smooth, white or grayish; *Buds* pubescent; *heart-wood* brown, satiny, hard; *sap-wood* light yellow.

Discovered by Michaux in Carolina in 1789; introduced 1800.

PURPLE-FLOWERED MAGNOLIA, *Magnolia obovata*.

Gardens, walls. This is a dwarf species except when grown on a wall. April, May.

Flowers purple outside, white within, large, fragrant, tulip-like, solitary; *Petals* 6; *Fruit* an etærio of follicles.

Leaves alternate, obovate, acute, wavy, dark green, small.

A deciduous *shrub*, 5–8 ft.; forming dense bush 8–10 ft. through, or tree 20–30 ft.; *Shoots* having odour of camphor.

Native of China and cultivated in Japan; introduced 1790. Syn. *M. purpurea*, *M. discolor*, &c.

SMALL-LEAVED MAGNOLIA, *Magnolia parviflora*.

Gardens. April—July.

Flowers white, 3 ins. diam., almost globular, solitary; *Sepals* 3, drooping; *Petals* 6–7, 2 ins. long, rosy-tinted externally; *Anthers* red; *Fruit* an etærio of follicles.

Leaves alternate, ovate, cuspidate, wavy, 5 ins. long, 4 ins. wide, principal veins and petioles pubescent, reddish hairs $\frac{1}{2}$ in. long.

A deciduous *shrub*.

Native of Japan; introduced about 1893.

MAGNOLIACEÆ

STARRY MAGNOLIA, *Magnolia stellata*.

Gardens. The glistening star-shaped flowers, borne in great profusion, make this a very desirable subject for a specimen bed. March—May.

Flowers white, star-shaped, fragrant, 4 ins. diam., appearing early, before leaves develop, solitary and terminal; *Sepals* shorter than petals, oblong, hairy outside; *Petals* 12–15, narrow, linear-oblong, obtuse, reflexed, external stripe of pink, 10–12 ins. long; *Stamens* bright yellow, shorter than pistil; *Carpels* green; *Fruit* an etærio of follicles.

Leaves alternate, obovate, obtuse to elliptical, acuminate, membranaceous, 2–5 ins. long.

A deciduous *shrub*, 4–8 ft.; much branched.

Native of Japan; introduced 1862. Syn. *M. Halleana*; this name given in compliment to Mr. Hall, who introduced the species to the United States.

UMBRELLA TREE, *Magnolia tripetala*.

Gardens. Best in sheltered spot. April—July.

Flowers creamy-white, having disagreeable odour, 7–8 ins. long, 4–6 ins. diam., solitary, terminal, at extremities of previous year's shoots; peduncles slender, glabrous, glaucous, 2–2½ ins. long; *Sepals* broad, reflexed, early deciduous, 5–6 ins. long; *Petals* 9–12, exterior ones pendent, 4–5 ins. long, 2 ins. wide, coriaceous, ovate; *Stamens* with bright purple filaments; *Fruit* an etærio of follicles; cone 4–6 ins. long; rose, ovate, glabrous; *seeds* ½ in. long.

Leaves clustered near ends of branches, oblong or obovate lanceolate, narrowed at base, acute, spreading, young ones pubescent beneath, old ones smooth, 1–2 ft. or more long, 7–8 ins. broad; petioles stout.

A deciduous *tree*, 15–30 ft., straggling growth; *Buds* glabrous, glaucous, terminal bud purple; *Wood* dark brown or mahogany colour, soft.

Introduced from N. America, 1752; attains 40 ft. in native habitat. Name *tripetala* is in allusion to three petaloid sepals.

TREES AND SHRUBS

TULIP TREE, *Liriodendron tulipifera*.

Gardens. June, July. This elegant, hardy, deciduous tree, with fragrant, tulip-like flowers, somewhat resembles a Plane in growth. It thrives best in a deep loamy soil and a sheltered, sunny position. Seeds are sown in a rather moist sandy soil in a shady spot in autumn; layering may be done in October or November.

Flowers greenish-yellow, spotted with various colours, tulip-like, very fragrant, 2 ins. high, solitary, terminal, with two deciduous bracts; *Sepals* 3, petaloid, reflexed; *Petals* 6, in two series; *Stamens* indefinite, hypogynous; *Anthers* linear, extrorse; *Carpels* in an oblong spike, 2-seeded; *Fruit* a cone-like etærio of achenes, samaroid, indehiscent, never ripening in England.

Leaves alternate, simple, saddle-shaped, 3-lobed, terminal lobe emarginately truncate, lateral lobes with two sinuses, glabrous, bright green above, lighter beneath, stipulate in bud. Autumn tint brilliant golden yellow.

A deciduous *tree*, 75–100 ft.; *Branchlets* pendent; *Bark* thin and scaly on young trees, on older trees deeply furrowed, brown; *Buds* compressed laterally, dark red, glaucous; *Wood* white, light and tough, taking a good polish; used for flooring and inside work.

A native of N. America, where it attains a height of 150–200 ft.; introduced 1688; also known as Saddle Tree, from shape of leaves. Generic name derived from Greek *lirion*, a lily, and *dendron*, a tree.

CLASS I. *Dicotyledons*
DIVISION I. *Thalamifloræ*
NATURAL ORDER. *Calycanthaceæ*

Shrubs with square stems, and opposite, entire, extipulate leaves; *Flowers* solitary and lurid; numerous *Bracts*, *Sepals*, and *Petals*, similar and merging into each other, springing from fleshy receptacle which surrounds the carpels; *Stamens* numerous; *Ovary* inferior by up-growth and adhesion of receptacle; *Fruit* a capsule.



LIME (*Tilia vulgaris*)

A. Flowering branch. B. Cymes of flowers depending from bracts. C. Flower, showing pistil.
 D. Transverse section of fruit. E. Flower, from above. F. Fruit.

CALYCANTHACEÆ

CAROLINA ALLSPICE, *Calycanthus floridus*.

Gardens, shrubberies. May be grown against a wall, or as a shrub in the open in a moist spot. May—August.

The genus *Calycanthus* contain three hardy deciduous shrubs with lurid purple or red sweet-scented flowers. They thrive best in a mixture of peaty loam and leaf-mould in the sheltered shrubbery or against a south or west wall. Layering of shoots may be done in July or August; seeds sown as soon as ripe, or in spring in a cold frame.

Flowers lurid purple, solitary and terminal, $1\frac{1}{2}$ in. diam., strongly aromatic when crushed, like Strawberries, Apples, or Quinces; *Bracts*, *Sepals*, and *Petals* numerous, similar, and merging into each other, linear-oblong, acute or obtuse, $\frac{1}{2}$ – $\frac{2}{3}$ in. long; *Stamens* numerous, inserted on top of receptacle, filaments all but obsolete; *Fruit* rare; a capsule.

Leaves opposite, oval, obtuse, entire, coriaceous, deep green, downy beneath, shortly petiolate, 1– $1\frac{1}{2}$ in. broad.

A deciduous *shrub*, 6–8 ft., forming a dense, round-headed bush; branchlets downy; *Branches* and roots smelling of camphor when bruised; *Bark* used as substitute for cinnamon.

Introduced from Carolina, 1726.

GLAUCOUS-LEAVED ALLSPICE, *Calycanthus glaucus*.

Gardens, shrubberies. May.

Flowers greenish-purple, almost scentless, solitary and terminal; *Sepals* and *Petals* linear or linear-lanceolate, acute; *Fruit* a capsule.

Leaves opposite, ovate-lanceolate, tapering acuminate, flattened, green above, glaucous and pubescent beneath.

A deciduous *shrub*, 4–8 ft.; *Branchlets* glabrous.

Introduced from Carolina, 1726. Syn. *C. fertilis*.

TREES AND SHRUBS

WESTERN ALLSPICE, *Calycanthus occidentalis*.

Gardens, shrubberies. Best on wall; grows best in a compost of peat. June—October.

Flowers lurid purplish-red, only slightly scented, 3 ins. diam., solitary and terminal, pedicels stout; *Bracts*, *Sepals*, and *Petals* numerous, similar, densely pubescent; *Stamens* numerous, inserted on top of ovary, filaments all but obsolete; *Ovary* spuriously inferior; *Fruit* a capsule, many seeded.

Leaves opposite, broadly ovate or elliptical, entire, obtuse or acute, scabrous, veins and midrib downy underneath, shining green both sides.

A deciduous *shrub*, 6–12 feet; *Bark* smooth; *Suckers* freely produced; *Buds* small; *Wood* aromatic.

Native of California; discovered by Douglas, 1831. Syn. *C. macrophyllus*.

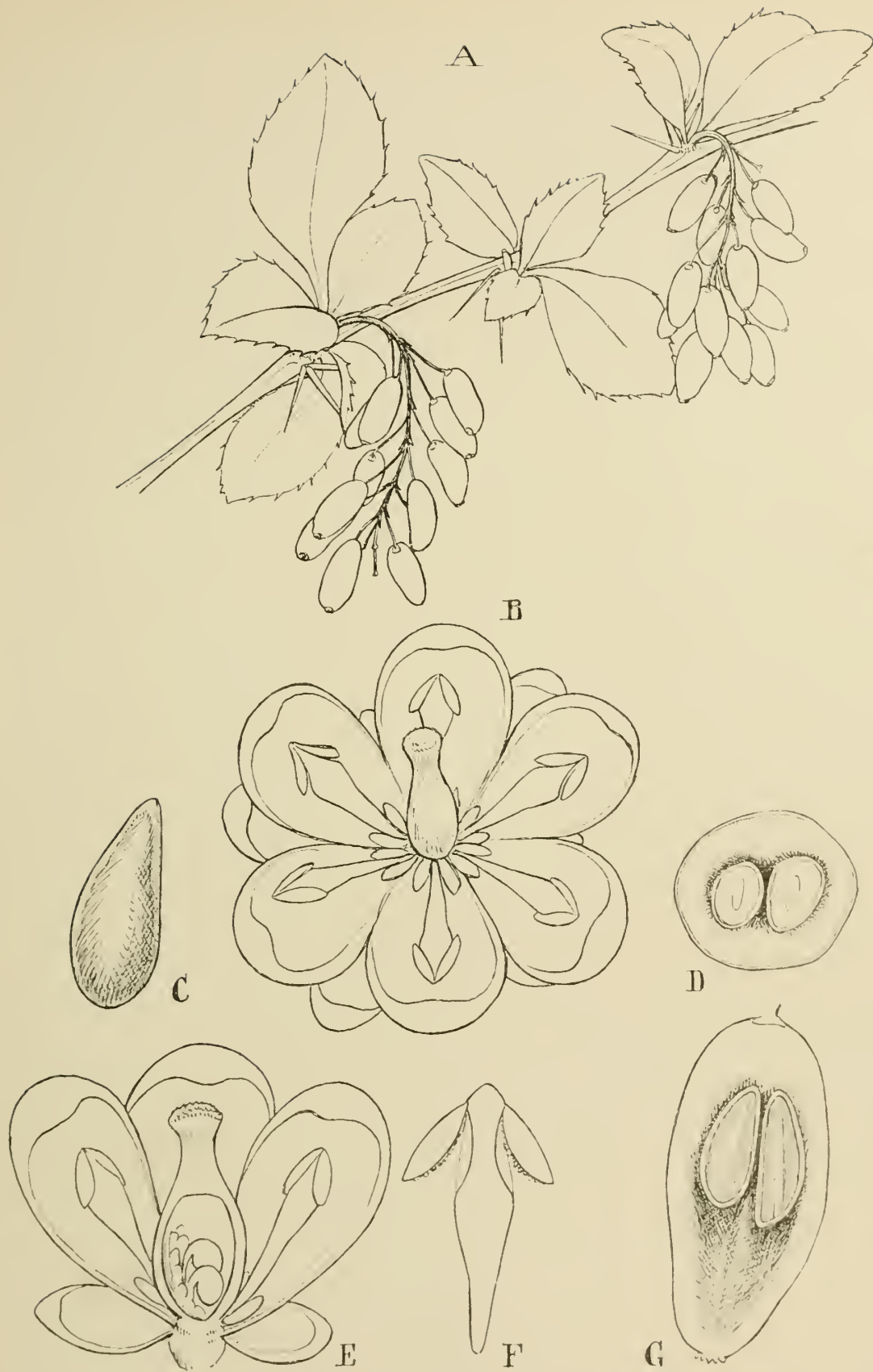
WINTER FLOWER, *Chimonanthus fragrans*.

Gardens, walls. November—February. The delicious fragrance of its blossoms makes this winter flowering shrub a general favourite. Near the metropolis it flowers well in the open, but is more often trained to a wall having a south or west aspect. It thrives in a deep, rich, sandy soil. The blossoms being produced on the previous season's wood, it is necessary to cut away, to within one inch of base, all shoots that have flowered, except the leading ones, which only need shortening. This pruning should be done in February, when flowering is finished. Propagation is effected by layering shoots in September or October.

Flowers yellow or cream, purplish inside, in axils of leaves of preceding year, fragrant, 1 in. diam., appearing before leaves unfold, perfume resembling Jonquil; *Sepals*, *Petals*, and *Stamens* numerous; *Fruit* a capsule.

Leaves opposite, lanceolate, entire, acuminate, scabrid, slightly hairy beneath, petiolate, exstipulate, 5–6 ins. long.

A deciduous *shrub*, 6–8 ft.; *Branches* slender; *Bark* inodorous.



COMMON BARBERRY (*Berberis vulgaris*)

A. Branch with mature fruit. B. Flower. C. Seed. D. Section of berry.
 E. Vertical section of flower. F. Stamen dehiscing. G. Longitudinal section of berry.

BERBERIDEÆ

Native of China and Japan; introduced 1766. Specific name from Gr. *cheimon*, the winter, and *anthos*, a flower. Syn. *Calycanthus præcox*.

CLASS I.	<i>Dicotyledons</i>
DIVISION I.	<i>Thalamifloræ</i>
NATURAL ORDER.	<i>Berberideæ</i>

Shrubs or herbs with alternate exstipulate leaves and regular flowers; *Calyx* petaloid; *Sepals* in 2 or more whorls of 2-4 each, imbricate; *Petals* hypogynous, in whorls of 2-4; *Stamens* as many as petals, opposite to them, filaments sometimes irritable; *Anthers* basifixed, dehiscing by recurved valves; *Ovary* 1-celled, of 1 carpel; *Fruit* a berry or capsule.

This Order contains some of our showiest of spring and summer flowering shrubs, over forty species being grown at Kew, where there are also fifty slightly different forms of the Common Barberry. The blossoms are of all shades of yellow, and the flowering period ranges from May to October. Most of them will thrive in ordinary garden soil, but the rarer kinds require a compost of two parts loam and one part of peat and sand. Suckers and layers are put down in October; ripened cuttings in sandy soil in a cold frame in September; seeds fresh from the pulp or berry in a sheltered border in October or November.

CORAL BERRY, *Berberidopsis corallina*.

This handsome evergreen climbing shrub does well in sandy soil when planted against a south or west wall, and needs protecting with straw or mats in winter, being fairly hardy in the south of England, and half-hardy in the north. Layering is done in autumn; cuttings inserted in sandy soil in spring; seeds sown in spring in well-drained pots of sandy soil.

The deep crimson or coral-red flowers, globular in shape, and hanging from long, slender stalks, form a contrast with the dark green foliage, and make this a very ornamental shrub. July.

Flowers deep crimson, in a *terminal drooping raceme*, leafy at base;

TREES AND SHRUBS

Sepals 9-15, petaloid, in 3 whorls; outer small, spreading; intermediate orbicular, concave; inner obovate-cuneate, erect, inserted on fleshy thalamus; *Stamens* 8-9; *Fruit* a berry.

Leaves alternate, 3 ins. long, oblong-cordate, obtuse or acute, spiny-toothed, glabrous, coriaceous, dark green; petioles long.

An evergreen climbing *shrub*, 5-10 ft.

Introduced from Chili, 1862. Generic name from *Berberis*, the Barberry, and *opsis*, like=resembling the Barberry.

COMMON BARBERRY, *Berberis vulgaris*.

Copses, hedges, gardens. The flowers, foliage, and fruit are all handsome. May, June.

Flowers golden yellow, sub-globoid, almost bell-shaped, $\frac{1}{4}$ - $\frac{1}{2}$ in. diam., protandrous; in a pendulous *raceme* of 15-20, or more, flowers, terminating the dwarf shoots; pedicels short; bracts short; triangular; *Sepals* 6, in 2 whorls, petaloid, 2-3 minute bractlets; *Petals* 6, in 2 whorls, orange-coloured, nectaries at base; *Stamens* 6, hypogynous, filaments irritable, anthers dehiscing by valves, which open upwards; *Ovary* superior, 1-celled, stigma sessile, broad, sub-peltate, green; *Fruit* a berry, oblong, $\frac{1}{2}$ in. long, orange-scarlet, 1-2 seeded; excellent for preserves, candy or pickle.

Leaves alternate, tufted, obovate or oblong-ovate, attenuated below, obtuse, spinose-serrate or dentate, glabrous, thin, dark polished green, paler beneath, 1-1 $\frac{1}{2}$ in. long; petiole short. Autumn tints red and yellow.

A deciduous *shrub*, 4-7 ft.; *Branches* grey-white to grey-brown; *Twigs* tawny or grey, bright yellow inside; *Dwarf shoots* in axils of 3-7 fid tawny yellowish spines, which are modified leaves; *Buds* short, obtuse, scales brown; *Wood* yellow; inner bark gives yellow dye for tanning.

Native of England, naturalised in Scotland and Ireland. Fungoid Pests—Barberry Leaf Mildew (*Microsphaera Berberidis*), Barberry Cluster Cups (*Aecidium Berberidis*).

BERBERIDEÆ

HOLLY-LEAVED BARBERRY, *Berberis Aquifolium*.

Gardens, banks, woodlands. Grows well under trees, and is an excellent covert plant. It is very useful for beds in winter, its dark shining leaves looking all the brighter after rain. In a poor dry soil and rather exposed it will colour most brilliantly. March—May.

Flowers orange-yellow; *Racemes* crowded, nearly erect, 4 ins. long, pedicels $\frac{1}{4}$ – $\frac{1}{2}$ in.; bracteate and bracteolate; *Fruit* a berry, globular, large, dark purple, with glaucous bloom, 1–2 seeds.

Leaves imparipinnate, leaflets 7–9, ovate, slightly cordate at base, approximate, sessile except the terminal, distantly spinescent, serrated, coriaceous, dark green, shiny, petioles vinous red; leaves rosy in spring, purplish, bronze, or crimson in winter.

An evergreen *shrub*, 3–8 ft.

Introduced from Western N. America, 1823. Also called Ash Barberrry.
Syn. *Mahonia aquifolia*.

BOX-LEAVED BARBERRY, *Berberis buxifolia*.

Gardens. This is one of the prettiest of the deciduous species. April, May.

Flowers deep yellow, fragrant, solitary and axillary, on long slender peduncles. *Fruit* a berry, blue-black.

Leaves nearly sessile, simple, resembling Box, ovate or oblong, spiny pointed, toothless, coriaceous, dull dark green above, glaucous beneath, veins indistinct, $\frac{1}{2}$ in. long, older leaves obovate, toothed.

A sub-evergreen *shrub*, 5–8 ft.; erect, straggling, tripartite spines on old bushes, longer than leaves.

Introduced from Chili (Strait of Magellan), 1828. Often called *B. dulcis*.

TREES AND SHRUBS

DARWIN'S BARBERRY, *Berberis Darwinii*.

Gardens, lawns, shrubberies. This is an evergreen shrub of extreme beauty, and conspicuous from its ferruginous shoots, by which it is at once recognised. It is an excellent covert plant. Its slender spreading shoots are wreathed in deep orange-coloured blossoms, making a striking contrast with the dark evergreen foliage. April, May; sometimes again in autumn.

Flowers deep orange-yellow, in dense erect *racemes*; *Fruit* a berry, purple.

Leaves simple, oval or oblong, $\frac{3}{4}$ –1 in. long, obtuse, usually 3 large spiny teeth at the end, and 1 or 2 near middle, very shiny, deep green above, paler beneath, principal veins conspicuous.

An evergreen *shrub*, 6–10 ft. or more; densely branched, spreading; *Shoots* ferruginous.

Introduced from S. Chili, 1847; discovered by Charles Darwin when voyaging in the *Beagle*.

CROWBERRY-LEAVED BARBERRY, *Berberis empetrifolia*.

Gardens. Does well in sandy peat, and flourishes on rockeries in a mild climate. It is a little trailing shrub, with stiff spines and pungent leaves. April, May.

Flowers yellow, in a *sub-umbellate terminal cluster* of few flowers on slender pedicels; *Fruit* a berry.

Leaves in fascicles of about 7, linear, mucronate, closely revolute.

An evergreen *shrub*, $1\frac{1}{2}$ –2 ft.; slender, trailing.

Introduced from Chili (Strait of Magellan), 1827.

JAPANESE BARBERRY, *Berberis japonica*.

Gardens. This is the earliest to flower in the open; it likes fairly good soil, and is fond of a little shade. February, March.



COMMON BARBERRY

(*Berberis vulgaris*)

BERBERIDEÆ

Flowers lemon-yellow, in erect *racemes*, 4–6 ins. long, in *terminal clusters* ;
Fruit a berry, bluish-purple.

Leaves imparipinnate, 1 ft. or more long, leaflets usually 9, about 3 ins. long, sessile, broadly cordate, or rotundate at base, oblique, spiny, coriaceous. Autumn tint red.

An evergreen *shrub*, 4–8 ft. ; *Stems* unbranched.

Native of China and Japan ; introduced 1845. Syn. *Mahonia japonica*.

ASH BARBERRY, *Berberis nepalensis*.

Gardens. Best in South and West of England ; does well against a wall. April, May.

Flowers yellow, in a cluster of erect *racemes* ; *Fruit* a berry, ovoid or globose, blue glaucous.

Leaves imparipinnate, 1–2 ft. long, leaflets 5–12 pairs, 3 ins. × 1 in. ; obovate-oblong, cuspidate, obliquely cordate, repand-toothed, 5–10 spiny teeth on each side, tricuspidate at apex, sessile, upper leaves often reduced to sheathing bracts.

An evergreen *shrub*, 4–6 ft.

Native of Nepaul ; introduced 1850 ; raised from seed supplied by the East India Company. Syn. *Mahonia nepaulensis*.

WALLICH'S BARBERRY, *Berberis wallichiana*.

Gardens. A beautiful shrub, with brown branches and very dark green foliage, turning a claret colour in winter. April—June.

Flowers sulphur-yellow, in a drooping *axillary cluster* of 6–8, or more, flowers on slender pedicels ; *Fruit* a berry, $\frac{1}{2}$ in. long, deep blue-black.

Leaves in alternate fascicles, lanceolate, 3–4 ins. long, sharp prickly pointed, finely serrated, spreading or recurved, rigidly coriaceous, rich green above, pale shining below. Autumn tint claret.

An evergreen *shrub*, 2–5 ft., at times up to 10 ft. ; *Branches* brown ; spines 3–7-fid, long, slender.

TREES AND SHRUBS

Native of Himalayas and China; introduced from Nepaul, 1820; sent home later by Hooker, and known by his name in some gardens.

CLASS I.	<i>Dicotyledons</i>
DIVISION I.	<i>Thalamifloræ</i>
NATURAL ORDER	<i>Cistineæ</i>

Mostly herbs or low shrubs, often viscid, with opposite, entire leaves and showy, regular flowers, usually yellow; *Sepals* usually 5, the 2 outer rarely wanting; *Petals* usually 5, very fugacious, convolute in bud; *Stamens* indefinite, hypogynous; *Ovary* 1-celled, or divided into 3 or more cells by parietal placentas; *Fruit* capsular.

Distinguished from Papaveraceæ by the permanent calyx.

CORBIERE'S GUM CISTUS, *Cistus corbariensis*.

Gardens, walls. June, July.

The genus *Cistus* consists of elegant evergreen shrubs or sub-shrubs, with large and handsome, but fugitive, flowers, borne in great profusion throughout the summer. They do well in ordinary soil, but best on sunny rockeries or against south walls, and need protection in severe weather. Cuttings 4 ins. long may be struck in pots of sandy soil in September in a cold frame or greenhouse; seeds are sown in March in boxes or pans, covering $\frac{1}{16}$ in. deep with sifted sandy mould; they are potted when 1 in. high, and planted outdoors in June.

Flowers white; margins and buds tinged with rose, on long axillary peduncles, 1-3 flowered; *Petals* marked at base with yellow, imbricate; *Fruit* a capsule.

Leaves opposite, cordate-ovate, petioles long, fringed on margins, acute or acuminate, reticulate, wrinkled, light green, glutinous.

An evergreen *shrub*, $2\frac{1}{2}$ -3 ft.

Native of Sicily, Spain, and S. France; introduced 1656; hybrid between *C. salvifolius* and *C. populifolius*.

CISTINEÆ

CRETAN GUM CISTUS, *Cistus crispus*.

Gardens. A very beautiful shrub, with a bushy habit; exceedingly ornamental on a rockery. June, July.

Flowers reddish-purple, saucer-shaped, $1\frac{1}{2}$ – $2\frac{1}{2}$ ins. diam., solitary, almost sessile, 3–4 together, somewhat umbellate; *Sepals* acute, villous; *Petals* 5, yellow mark near base, fugacious, convolute in bud; *Stamens* numerous, hypogynous; *Ovary* superior, divided into 5 cells by parietal placentas, style single, exserted; *Fruit* a 5-valved capsule.

Leaves opposite, exstipulate, sessile, linear-lanceolate, linear-oblong, or oblong-elliptic, tapering towards base, wrinkled, waved, three-nerved, pubescent.

An evergreen *shrub*, 2 ft.; *Branches* procumbent, ascending tortuous, often interlacing.

Native of Greece, Syria, and Crete; introduced 1656.

GUM CISTUS, *Cistus ladaniferus*.

Gardens, walls. This is one of the most valuable of wall shrubs, of robust growth in a dry and fairly rich soil. A well-drained mixture of rich loam and leaf-mould suits it best. June—August.

Flowers white, 3 ins. diam., terminal, solitary, 3–4 together, bracteate, on shoots of previous year; *Petals* yellow at base, large brownish-crimson, fringed spot above yellow base, imbricate; *Fruit* a capsule.

Leaves opposite, almost sessile, connate at base, oblong-lanceolate, entire, acute or obtuse, three-nerved, coriaceous, upper surface glabrous, deep shining green, underside tomentose, petiole short.

A sub-evergreen *shrub*, 4–6 ft.

Native of Spain, Portugal, and Southern France; introduced 1629.

LAUREL-LEAVED GUM CISTUS, *Cistus laurifolius*

Gardens, walls. The hardiest of the Rock Roses, doing well in a sunny, dry spot not exposed to cold winds. June—August.

TREES AND SHRUBS

Flowers white, 3 ins. diam., in a terminal, long-stalked *umbellate cyme*; sometimes distant pairs lower down; peduncles tomentose; bracts light red; *Calyx* hairy, lobes acute, often tinted with purple; *Petals* with yellow mark at base; *Fruit* a capsule.

Leaves, opposite, large, Laurel-like, broadly ovate or ovate-lanceolate, petioles long, dilated, connate at base, margins undulated, three-nerved, coriaceous, upper surface viscid and glabrous, deep green, underside tomentose with pale brownish felt.

A sub-evergreen *shrub*, 5-6 ft.

Native of S. France and Spain; introduced 1731.

PORTUGUESE GUM CISTUS, *Cistus lusitanicus*.

Gardens. June, July.

Flowers white; *Calyx* 4-5 lobed, thickly covered with long, silky white hairs; *Petals* 5, yellow at base, above which is a feather-edged, reddish-crimson spot; *Fruit* a capsule.

Leaves opposite, linear-lanceolate, entire, acute, glabrous, deep green, three-nerved, reticulate on under side, sessile.

A deciduous *shrub*, 2-5 ft.; much branched.

Native of Portugal; possibly a garden hybrid.

MONTPELIER GUM CISTUS, *Cistus monspeliensis*.

Gardens. This is a handsome species, with clammy foliage. June, July.

Flowers white, 1 in. diam., in a *terminal close cyme*; peduncles pilose; *Petals* broadly cuneate, crenate, imbricate, yellow blotch at base; *Fruit* a capsule.

Leaves opposite, linear-lanceolate, sessile, obtuse or acute, three-nerved, clammy, villous both surfaces.

A deciduous *shrub*, 2-6 ft.

Introduced from S.W. Europe, 1656.

CISTINEÆ

PURPLE-FLOWERED GUM CISTUS, *Cistus purpureus*.

Gardens, walls. Requires dry, well-drained soil. June, July.

Flowers reddish-purple, large, terminal, 1-6 together; peduncles short, hairy, sheathing stem; bracts sessile, foliaceous, pubescent, broad, acute, concave and connate at base; *Calyx* hairy; *Petals* 5-6, obovate or cuneate, imbricated, more or less crumpled, yellow spot at base, above which is a large, velvety, maroon blotch, slightly branched; *Fruit* a capsule.

Leaves opposite, oblong-lanceolate, wavy, obtuse or acuminate both ends, wrinkled, reticulate; petioles short, hairy, sheathing the stem; dark green.

A sub-evergreen *shrub*, 2-4 ft.; much branched; *Branches* erect, with brownish pubescence.

Introduced from the Levant, 1659.

SHOWY SUN ROSE, *Helianthemum formosum*.

Gardens. June. This beautiful bushy shrub thrives well in a rich, dry soil on sunny banks or rockeries. It may be propagated by division in October or April; by cuttings, 1-2 ins. long, in well-drained pots of sandy soil in cold frame in August or September; and by seeds in bed of light soil outdoors in April.

Flowers yellow, in a *raceme*; peduncles villous; *Sepals* 5; *Petals* 5, large, marked with purplish-brown spot at base; *Stamens* numerous, hypogynous; *Ovary* superior; *Fruit* a capsule.

Leaves opposite, obovate-lanceolate, shortly petiolate, entire, three-nerved, tomentosely villous; young ones hoary.

An evergreen *shrub*, 4 ft.; erect, much branched; *Branches* canescent.

Introduced from Portugal, 1780. Specific name from Gr. *helios*, the sun, *antheon*, a flower; generic name from L. *formosum*, beautiful.

TREES AND SHRUBS

CLASS I.	<i>Dicotyledons</i>
DIVISION I.	<i>Thalamifloræ</i>
NATURAL ORDER	<i>Tamariscineæ</i>

Shrubs or small trees, with minute alternate, exstipulate leaves and regular flowers; *Sepals* and *Petals* 4-5; *Stamens* as many or double, inserted on glandular disk, anthers versatile; *Ovary* superior, syncarpous, 3-5 carpels; *Fruit* a capsule, 3-5 valved.

Distinguished from Caryophyllaceæ by the alternate leaves and the ovules inserted on three basal placentæ.

The hardy shrubs of this order thrive well on sunny banks or in sheltered shrubberies inland in the Midlands and South of England, and around the sea-coasts, in ordinary or sandy soil. They are propagated by cuttings of shoots 4-6 ins. long inserted in sandy soil in sheltered position under a hand-light or in a cold frame, September or October.

TAMARISK, *Tamarix gallica*.

Sea-coasts, gardens, shrubberies; will thrive under almost all conditions. It makes a good hedge plant, its feathery sprays of delicate foliage forming a pleasant screen. July—September.

Flowers white or rosy-pink, $\frac{1}{8}$ – $\frac{1}{6}$ in. diam., in a dense *panicked-spike*, cylindrical; bracts shorter than flowers; *Sepals* 4-5, lanceolate, imbricate; *Petals* 4-5, persistent; *Stamens* as many or twice as many, usually 5, hypogynous, anthers versatile, apiculate, red; *Disk* hypogynous, 10-glandular, acutely 5-angled; *Ovary* superior, 1-celled, styles 3-4 short, thick, stigmas nearly sessile; *Fruit* a capsule, trigonous, 3-valved; seeds several, crowned with tuft of cottony hairs.

Leaves alternate, exstipulate, those on branchlets minute, closely imbricate, triangular, auricled, keeled; those on branches $\frac{1}{8}$ in. long, subulate, acuminate, glaucous, dotted, greyish-green, margins white and membranous. Autumn leaves brown.

A sub-evergreen *shrub*, or small *tree*, 5-10 ft.; *Branches* slender, erect, or

HYPERICINEÆ

slightly pendulous at extremities; *Branchlets* very slender, feathery, glabrous, red; *Buds* minute, curved, scales few, red-brown; *Wood* greenish-white when young, afterwards rose or reddish; not valuable.

Native of Atlantic and Mediterranean coasts; planted in East and South of England.

PALLAS'S TAMARISK, *Tamarix Pallasii*.

Gardens, shrubberies. August—October.

Flowers pinkish-white, forming a *panicle* of dense racemes; *Calyx* urceolate, 5-partite, segments linear, green; *Petals* 5, free; *Stamens* 5, apiculate, filaments twice length of petals; *Ovary* superior, style thick, stigmas 2; *Fruit* a capsule.

Leaves alternate, subulate, very acute, decurrent.

A sub-evergreen *shrub*, 8–10 ft.; *Branches* elongated, erect; *Branchlets* numerous, very slender; *Bark* reddish-fuscous.

Native of Eastern Europe and Asia (Afghanistan); introduced from Odessa, 1891. Syn. *T. odessana*.

CLASS I.	.	.	.	.	<i>Dicotyledons</i>
DIVISION I.	.	.	.	.	<i>Thalamifloræ</i>
NATURAL ORDER.	.	.	.	.	<i>Hypericineæ</i>

Herbs, shrubs, or rarely trees, with opposite or rarely whorled, exstipulate, often glandular leaves, and regular flowers, usually yellow or white, mostly paniced or in dichotomous cymes; *Sepals* 5, rarely 4, imbricate, with glandular dots; *Petals* 5, rarely 4, hypogynous, unequal-sided, dotted, imbricate, often twisted; *Stamens* indefinite, hypogynous, filaments united at base into 3 or 5 bundles; *Ovary* 3–5-celled, styles 3–5; *Fruit* a capsule or berry.

Distinguished from all other Orders by the polyadelphous stamens and unequal-sided, dotted petals.

TREES AND SHRUBS

TUTSAN, *Hypericum Androsæmum*.

Thickets, shrubberies. Thrives in sandy soil; grows well in shade. June—August.

The St. John's Worts, of which we have about twenty shrubby species, are among the handsomest of our summer yellow flowers, being laden with a wealth of golden blossoms from June to October. They mostly prefer sunny borders, but a few will do well under the shade of trees. They are propagated by cuttings of firm shoots 3 ins. long inserted in sandy soil outdoors in August or September.

Flowers yellow, regular, $\frac{1}{2}$ – $\frac{3}{4}$ in. diam., in a few-flowered terminal *corymbose* cyme; *Sepals* 5, unequal, obtuse, glandular, but not on margins, $\frac{1}{4}$ – $\frac{1}{3}$ in. long; *Petals* 5, hypogynous, oblique, twisted in bud, deciduous, not much longer than sepals; *Stamens* indefinite, hypogynous, slightly connate at base into 5 bundles, anthers versatile; *Ovary* superior, styles 3, recurved; *Fruit* a berry, globose, black, slightly succulent, incompletely 5-celled.

Leaves opposite, somewhat decussate on young shoots, lying in one plane in older stems, ovate, subcordate, entire, obtuse or acute, sessile, glabrous, minute pellucid dots, aromatic when crushed or dried, 2–3 ins. or more, rich dark green.

A deciduous *shrub*, erect, 1–3 ft.; *Stem* 4-angled.

Native of Britain. English name probably a corruption of Fr. *toute saine*, heal all—leaves formerly applied to open wounds. Generic name from *Hypericon*, old Greek name used by Dioscorides; specific name *Androsæmum* = men's blood—dark red fluid from fruit.

LARGE - FLOWERED ST. JOHN'S WORT, *Hypericum calycinum*.

Hedges, thickets, gardens. July—September. Does well in shade, and is easily cultivated in almost any ordinary garden soil, but prefers a sandy loam. It may be raised from seeds or cuttings.



LUTSAN

Hepaticum Anthesensum

HYPERICINEÆ

Flowers bright yellow, 3–4 ins. diam., solitary and terminal, 1–2 at top of stem, shortly pedicelled; in gardens, a *corymb* of 5–6; *Sepals* 5, nearly $\frac{1}{2}$ in. long, outer ones orbicular, $\frac{1}{2}$ length of petals, longitudinal glandular lines; *Petals* 5; *Stamens* numerous, long, slender, connate at base in 5 bundles; *Ovary* superior, styles 5, straight; *Fruit* a capsule ovoid, 5-celled towards base.

Leaves opposite, ovate or oblong, sessile, obtuse, coriaceous, scattered pellucid dots, glossy, dark green, 2–4 ins. long.

A sub-evergreen *shrub*, 10–16 ins.; *Stem* creeping, compressed, quadrangular.

Native of S.E. Europe; naturalised in many parts of England, Scotland, Ireland, and Channel Isles. Known also as Rose of Sharon and Aaron's Beard.

HOOKER'S ST. JOHN'S WORT, *Hypericum Hookerianum*.

Gardens. Cut specimens in the bud state will last in water for a considerable time, opening the polished buds in succession. It does well on a dry soil. July—October.

Flowers yellow, resembling *H. patulum*, but larger, more than 2 ins. diam.; fine waxy texture; inflorescence *corymbose*, terminal; styles not longer than ovary; *Fruit* a capsule, 5 persistent styles.

Leaves opposite and crowded, ovate-lanceolate, obtuse or acute, tapering at base, margins entire, slightly revolute, full of fine pellucid dots, dark glossy green above, paler beneath, 1–4 ins. Autumn tint red.

An evergreen *shrub*, 6–8 ft.; *Branches* round, slender, reddish-brown; *Buds* polished, green, scales lanceolate.

Native of mountains of N. India; introduced by Lobb, 1823. Synonymous with *H. oblongifolium*. Also called Glossy-flowered Tutsan.

MOSER'S ST. JOHN'S WORT, *Hypericum moserianum*.

Gardens, shrubberies. The handsome blossoms of this dwarf hardy shrub produce a very bright effect throughout the late summer. It likes a moist, but not too heavy soil. July—September.

TREES AND SHRUBS

Flowers rich golden-yellow, 2 ins. or more diam., solitary; *Calyx* persistent; *Petals* of good substance; *Stamens* polyadelphous, anthers crimson; *Fruit* a capsule, 5-celled, 5-valved.

Leaves opposite, oblong, entire, obtuse, dark green, pale beneath, sessile.

An *evergreen shrub*, 1–2 ft.; *Branches* arching; *Twigs* green.

A garden hybrid between *H. calycinum* and *H. patulum*, raised by Mons. Moser, of Versailles, about 1886; introduced about 1891.

SPREADING ST. JOHN'S WORT, *Hypericum patulum*.

Gardens. A fine hardy shrub, with a straggling habit. July—October.

Flowers bright yellow, 1–2 ins. diam.; inflorescence *corymbose*; peduncles bibracteate; *Sepals* 5, obtuse; *Petals* 5, twice length of stamens; *Stamens* numerous, connate in 5 bundles; *Ovary* superior, styles 5; *Fruit* a capsule.

Leaves opposite, elliptical-lanceolate, tapering at base, sessile, acute, margins revolute, without dots, dark green.

A deciduous *shrub*, 1–3 ft.; *Branches* spreading, arching, round, red or purple, 2-edged.

Native of India, China, Japan; first discovered by Thunberg in Japan; seeds sent from Japan by Richard Oldham about 1862.

CLASS I.	.	.	.	.	<i>Dicotyledons</i>
DIVISION I.	.	.	.	.	<i>Thalamifloræ</i>
NATURAL ORDER.	.	.	.	.	<i>Ternstræmiaceæ</i>

Trees or shrubs, with alternate, rarely opposite, coriaceous or rarely membranous leaves; stipules wanting or rarely minute and caducous; *Flowers* regular, usually hermaphrodite; *Sepals* 4–7, usually 5; *Petals* 4–9, usually 5, hypogynous, imbricate; *Stamens* numerous, usually united by their filaments into 1, 3, or 5 bundles, anthers basifixed and erect, or versatile; *Ovary* superior, 2–7-celled; *Fruit* fleshy, coriaceous, or slightly woody and indehiscent, or a capsule; *seeds* few, usually arillate.

TERNSTRÆMIACEÆ

COFFEE BUSH, *Stuartia pentagyna*.

Gardens. A handsome erect growing shrub, with white, shell-like flowers peeping out from a mass of deep green leaves. It should be given a sunny spot in order to ripen the wood. May—August.

The genus *Stuartia* contains three handsome flowering shrubs, with blossoms resembling a single Camellia. They thrive best in open sunny borders sheltered from north and east winds, in compost of two parts sandy loam and one of peat. They are slow-growing when young, and impatient of root disturbance. Propagated by cuttings of firm shoots in sandy soil under hand-light in sheltered position in autumn, or by layers of shoots in September or October.

Flowers creamy-white tinged with red outside, solitary and axillary, peduncles short, slightly larger than *S. virginica*; *Sepals* 5–6; *Petals* 5–6, obovate, edges jagged; *Stamens* reddish-purple, longer than *S. virginica*; *Carpels* free.

Leaves alternate, oval, acute, less hairy than *S. virginica*.

A deciduous *shrub*, 10 ft.; forming a wide-spreading bush.

Introduced from N. America, 1785. Syns. *Malachodendron ovatum*, *S. montana*, and *Stewartia Malachodendron*.

FALSE CAMELLIA, *Stuartia Pseudo-camellia*.

Gardens. A very beautiful shrub, with fine crimson tints on the autumn foliage. July, August.

Flowers creamy-white, 3 ins. diam., solitary and axillary; *Sepals* 5, dull reddish-brown above, finely serrulate; *Petals* 5; *Stamens* numerous, hypogynous, golden.

Leaves alternate, oval-elliptic, somewhat like Camellia, acuminate, shortly dentate, attenuated at base, petiole short, reddish. Autumn tints crimson and gold.

TREES AND SHRUBS

A deciduous *shrub*, 12 ft.; *Branches* erect, flexuose; *Bark* reddish-brown, peeling.

Native of Japan; introduced into France from Japan, 1868. Syn. *S. grandiflora*.

VIRGINIAN COFFEE BUSH, *Stuartia virginica*.

Gardens. This is one of the most beautiful of all summer-flowering shrubs, the large white blossoms being made especially attractive by contrast of their purple and reddish filaments and greenish anthers. It does well in peat and loam, or in pure loam, and even in sandy soil if moist at the roots. April—July.

Flowers white, $3\frac{1}{2}$ –4 ins. diam., solitary and axillary, shortly pedunculate, resembling a single Camellia; *Sepals* 5, ovate; *Petals* 5, round-ovate, 1 in. long, imbricate; *Stamens* numerous, hypogynous, filaments purple or reddish, anthers greenish; *Ovary* superior, styles 5, consolidated into 1.

Leaves alternate, oblong-ovate, obtuse or acuminate, serrulate, softly downy beneath, reticulate, membranous.

A deciduous *shrub*, 8 ft.

Introduced from N. America, 1743. Syn. *S. Malachodendron*. Genus named in honour of John Stuart, Lord Bute (1713–1792).

CLASS I.	.	.	.	.	<i>Dicotyledons</i>
DIVISION I.	.	.	.	.	<i>Thalamifloræ</i>
NATURAL ORDER.	.	.	.	.	<i>Malvaceæ</i>

Trees, shrubs, or herbs, with alternate, stipulate, simple leaves, entire or palmilobed, usually with stellate hairs; *Flowers* regular, often showy; *Calyx* gamosepalous, valvate, often with an epicalyx of 3 or more bracts; *Petals* 5, hypogynous, twisted in bud; *Stamens* indefinite, hypogynous, monadelphous; *Ovary* superior, many-celled, placentation axile, styles united, stigmas free; *Fruit* usually a carcerulus, splitting into as many mericarps as there are carpels.

MALVACEÆ

Distinguished from all other Orders by the valvate calyx and columnar stamens.

VINE-LEAVED ABUTILON, *Abutilon vitifolium*.

Gardens. Hardy in Ireland and S. of England; best against a wall, and in many parts needs protection in winter. May—July.

The genus *Abutilon* contains several species of showy shrubs usually grown in the greenhouse, two of which are hardy in the south of England. They are propagated by cuttings of the young wood inserted in a compost of peat, leaf-mould, loam and sand, and placed in a temperature of 70° in March.

Flowers porcelain-blue, cupped, 3 ins. diam., axillary; *Sepals* 5, united at base; *Petals* 5, margins waved; *Stamens* numerous, united at base; *Ovary* superior, style multifid at apex, violet; *Fruit* a capsule.

Leaves cordate, 5–7-lobed, lobes coarsely serrated, acuminate, reticulate, bright green, paler beneath, petioles long.

A deciduous *shrub* or small *tree*, 15–30 ft.

Introduced from Chili, 1837.

SYRIAN HIBISCUS, *Hibiscus syriacus*.

Gardens, shrubberies. August. This handsome shrub is seldom planted now, being for the most part replaced by some of the many garden varieties. They thrive best in a sunny situation, and with a fair amount of moisture. Propagated by cuttings under glass in spring.

Flowers white, 2 ins. diam., axillary, pedicels hardly longer than leaves; *Calyx* 5-lobed, valvate in bud; epicalyx of 5–7 bracts; *Petals* 5, twisted in bud, blotched at base with red or purple; *Stamens* numerous, monadelphous; *Carpels* 3–5; *Fruit* a capsule.

Leaves alternate, ovate, cuneate, 3-lobed, serrated, petiolate, stipulate, dark green.

A deciduous *shrub*, 6–8 ft.; *Branches* erect, straight.

TREES AND SHRUBS

Introduced from Syria, 1596; the *Althæa frutex* of old botanists; many varieties sold by nurserymen under name of Shrubby Hollyhocks.

CLASS I.	<i>Dicotyledons</i>
DIVISION I.	<i>Thalamifloræ</i>
NATURAL ORDER	<i>Sterculiaceæ</i>

Trees, shrubs, or herbs, sometimes climbing, with usually alternate leaves and deciduous stipules at base of petioles, rarely wanting; *Flowers* regular or irregular, hermaphrodite or sometimes unisexual by abortion; *Calyx* gamosepalous, usually persistent, usually 5-cleft, lobes valvate; *Petals* 5, hypogynous, free or adnate at base to staminal tube, or wanting; *Stamens* very variable, sometimes accompanied by staminodes, anthers 2-celled; *Ovary* superior; *Fruit* dry or rarely baccate.

SLIPPERY ELM, *Fremontia californica*.

Shrubberies, walls. April, May. This beautiful hardy deciduous shrub thrives in a sandy soil, and does best on a west or north wall, but will succeed in shrubberies in the south of England. It is propagated by cuttings of young shoots in sandy soil in a cold frame or under a bell-glass in March or April; seeds may be sown in pots of sandy soil in a cold frame in spring or autumn.

Flowers bright yellow, 2 ins. diam., solitary at extremities of short spur-like branches; *Calyx* campanulate, 5 sepals; *Petals* 0; *Stamens* 5, opposite sepals, hypogynous; *Ovary* superior, 5-celled.

Leaves alternate, orbicular, 3-7-lobed, few serratures, bright shining green above, tomentose beneath, 3 ins. diam.; petiole 3 ins. long.

A deciduous *shrub*, 12 ft.; young *shoots* brown tomentose.

Native of California; named after Colonel Fremont (1813-1890) the discoverer; introduced 1851; first flowered 1854; seeds afterwards sent to England by William Lobb.

TILIACEÆ

CLASS I.	<i>Dicotyledons</i>
DIVISION I.	<i>Thalamifloræ</i>
NATURAL ORDER	<i>Tiliaceæ</i>

Trees, shrubs, or rarely herbs, with usually alternate, simple, stipulate leaves and regular flowers, hermaphrodite or rarely unisexual, often cymose and protandrous; *Sepals* 5, rarely 3-4, often valvate; *Petals* usually equal in number to sepals, alternating with them, imbricate, sometimes wanting; *Stamens* usually indefinite, filaments free or united in 5-10 bundles, opposite petals, anthers 2-lobed; *Ovary* free, sessile, 2-10-celled or more; *Fruit* dry or pulpy, sometimes 1-celled.

Distinguished from Malvaceæ by the imbricate petals, the stamens free or slightly united into several bundles, the 2-celled anthers and the united carpels forming a several-celled ovary.

AMERICAN LIME, *Tilia americana*.

Parks, gardens. July, August.

The Limes are handsome, lofty-growing trees, inhabiting the temperate regions of the northern hemisphere. Their flowers are noted for their delicious perfume, and the honey is said to excel all other kinds in delicacy of flavour. Their timber has been noted since the days of the Romans for its "thousand uses," and is specially adapted for the purposes of the carver. The *liber* or inner bark readily separates into thin layers, and constitutes the well-known Russian *bast* or *bass*.

The species prefer a sunny situation and a moist soil, and are not very suitable for dry soils or exposed places. Propagation is usually effected by the layering of shoots in the autumn.

Flowers yellowish-white, in a *cyme*; bract 4-5 ins. long, 1-1½ in. broad, peduncle glabrous, 3½-4 ins. long, pedicels angled; *Sepals* 5, ovate, acuminate, pubescent, ¼ in. long; *Petals* 5, truncate, crenate; *Stamens* numerous, hypogynous, filaments united in 5 bundles, a staminodium opposite

TREES AND SHRUBS

each petal, filaments filiform, forked, each branch bearing one anther-cell; *Ovary* 5-celled, stigmas 5; *Fruit* nut-like, indehiscent, oblong to oblong-ovate, $\frac{1}{3}$ – $\frac{1}{2}$ in. long, rufous tomentose.

Leaves alternate, oval, obliquely cordate at base, acuminate, coarsely glandular serrate, thick, firm, glabrous, tufts of rusty hairs in axils of principal veins below, dark dull green above, shining and lighter green below, 5–6 ins. long, 3–4 ins. broad; petioles slender. Autumn tint pale yellow.

A deciduous *tree*, 60–70 ft.; *Branches* small, often pendulous; *Twigs* smooth, light grey to brown; *Bark* deeply furrowed, light brown; *Buds* ovate, dark red; *Wood* light brown tinged with red.

Introduced from N. America, 1752.

SMALL-LEAVED LIME, *Tilia cordata*.

Woods, parks, gardens, avenues. July, August.

Flowers yellowish-white, fragrant, regular, proterandrous, $\frac{1}{3}$ in. diam., in small *umbellate cymes* on axillary peduncles, adnate for about half their length to a leafy bract; *Sepals* 5, valvate in bud; *Petals* 5, without scale at base; *Stamens* numerous, cohering in bundles; *Ovary* superior, globular, 5-celled, style single, stigma 5-lobed; *Fruit* a small nut (*carcerulus*), $\frac{1}{4}$ in. diam., globose or ellipsoid, yellow, pubescent, thin-shelled, brittle, faintly ribbed, indehiscent, 1–2 seeds; *seeds* produced after about thirty-five years.

Leaves alternate, cordate, unequally sided, petiolate, finely serrated, acuminate, glaucous beneath, pubescent in axils of nerves, stipulate, 2–2 $\frac{1}{2}$ ins. long, 2 ins. across; upper leaves have tendency to lobing. Autumn tints yellow, yellowish-brown.

A deciduous *tree*, 60–120 ft.; *Branches* strong, somewhat erect; *Shoots* drooping; *Twigs* smooth, yellowish-brown, pliant; *Bark* ash-grey, tough, smooth; inner bark = “bast”; *Roots* extending a considerable distance; *Wood* soft, light, smooth-grained, yellowish-white; well withstands atmospheric changes.

TILIACEÆ

Synonymous with *T. parvifolia*; native of Britain; the latest to flower; long-lived, probably 500 years.

Insects injurious to Limes:—*Foliage*—Silvery Weevil (*Phyllobius argentatus*), Red Spider (*Acarus telarius*), Mottled Umber Moth (*Hybernia defoliaria*), March Moth (*Anisopteryx æscularia*); *Wood*—Goat Moth (*Cossus ligniperda*, *Trypanus cossus*).

Leaves often blackened by Lime-tree Sooty Mould (*Fumago vagans*); commonly preceded by honey-dew, upon which it thrives; also occurs on Oak, Elm, Birch, and Willow.

BROAD-LEAVED LIME, *Tilia platyphyllos*.

Woods, parks, gardens, avenues. June.

Flowers yellowish-white, resembling *T. cordata*; *Inflorescence* a cyme, peduncle 3-fid; *Petals* without a scale; *Fruit* globose or obovoid, woody, 3–5 prominent ribs.

Leaves large, 4 ins. across, always downy beneath, and sometimes both sides, axils pubescent.

A deciduous tree, 80–90 ft.; *Twigs* hairy; *Bark* rough; *Wood* white, smooth, light; used for carving, turnery, and musical instruments.

Synonymous with *T. grandifolia*; the earliest to flower; indigenous in the west of England.

COMMON LIME, *Tilia vulgaris*.

Woods, parks, gardens, avenues. June, July.

Flowers yellowish-white, like *T. parvifolia*; *Inflorescence* a cyme; *Petals* without a scale; *Fruit* a nut, coriaceous, pubescent, not ribbed.

Leaves alternate, cordate, glabrous above, pubescent in axils of veins beneath, intermediate in size. Autumn tints yellow and brown.

A deciduous tree, 80–100 ft. Terminal branches and spray upright,

TREES AND SHRUBS

lower side branches drooping, turning upwards at points; *Twigs* smooth; *Wood* white, soft; used for furniture, carving, and turnery.

Synonymous with *T. intermedia* and *T. europæa*; naturalised in Britain; the species most commonly planted; some believed to be 900 years old. Name Lime is corruption of "line," which is corruption of "lind"; "linden" = the adjective.

Nail-galls, looking like the points of tacks projecting through the leaves, are produced by the larvæ of a Mite (*Eriophyes tiliæ*); flower-bracts curled and distorted by *Eriophyes tiliarius*.

CLASS I.	<i>Dicotyledons</i>
DIVISION I.	<i>Thalamifloræ</i>
NATURAL ORDER.	<i>Rutaceæ</i>

Shrubs or trees, rarely herbs, with usually opposite, exstipulate leaves, and usually hermaphrodite flowers, regular or irregular; *Sepals* 3-5, free or connate, imbricate; *Petals* 3-5 or 0, hypogynous or perigynous, usually imbricate, rarely valvate; *Stamens* equal to or 2-3 times as many as petals, inserted on a hypogynous disk; *Ovary* superior, 2-5 carpels, distinct or united, sessile or raised on a short gynophore; *Fruit* a capsule or berry, rarely a drupe, and in *Ptelea* a samara.

HOP TREE, *Ptelea trifoliata*.

Parks, open shrubberies, plantations or woods. May, June. Best in a damp or rather shady spot. The peculiar winged fruit gives the tree a very striking appearance after the flowering period. Layering of shoots may be done at any time; seeds are sown in a sunny position in March or April.

Flowers greenish-yellow, polygamous, fragrant, in a *compound cyme*; pedicels pubescent, bracteolate; *Calyx* 4-5-partite, pubescent; *Petals* 4-5, pubescent, hypogynous; *Stamens* 3-4, hypogynous, alternate with petals; filaments pilose, short in female flowers; *Ovary* superior, 2-3-celled, puber-

RUTACEÆ

ulous; style short; stigma 2-3-lobed; *Fruit* a samara, nearly orbicular, 1 in. diam.; wings thin; dense drooping clusters persistent through winter.

Leaves alternate, trifoliate, leaflets ovate boro long, sessile, acute, entire or finely serrate, coriaceous, glabrous, pubescent when young, dark shining green, paler below, 4-6 ins. long, 2½-3 ins. wide; petioles stout, 2½-3 ins. long. Autumn tint yellow.

A deciduous *shrub*, 4-8 ft.; or small *tree*, 20 ft.; *Branches* small, spreading or erect; *Twigs* glabrous, dark brown; *Buds* nearly round, almost white; *Wood* heavy, hard, close-grained, yellow-brown.

Introduced from N. America by Bishop Compton, 1704; re-introduced by Catesby, 1724. Generic name was ancient Greek name for the Elm—applied to this plant from resemblance of fruit.

FRAGRANT SKIMMIA, *Skimmia fragrans*.

Gardens. April. The Skimmias are valuable on account of their brilliant red fruits, which, growing in profusion, remain on the plants all the year round, giving them a very ornamental appearance, especially in winter. They thrive best in a compost of peat and loam in shady or sheltered borders. They are propagated by cuttings of firm shoots inserted in sand under a bell-glass in spring or autumn; by layering in autumn; and by seeds sown when ripe in sandy loam and peat in a cold frame.

Flowers white, tinged with yellow, scented, in a terminal *thyrsoid panicle*, 5 ins. or more long, 3-4 ins. diam., rounded at apex, numerous dichotomous branches, buds appearing in late autumn; *Males*, *Petals* 4-5, obovate, nearly erect; *Stamens* as many as petals, filaments white, anthers large; *Ovary* rudimentary.

Leaves alternate, elliptic-oblong, thick, entire, acute or obtuse, glabrous, petiolate, exstipulate, coriaceous, slightly arched, sometimes slightly twisted, deep shining green, 5-6 ins. long, 2 ins. broad.

An evergreen *shrub*, 3 ft.

Native of Himalayas; said to be the male plant of *Skimmia japonica*.

TREES AND SHRUBS

JAPANESE SKIMMIA, *Skimmia japonica*.

Gardens. An excellent specimen for town gardens. March.

Flowers white, usually diœcious, scented, somewhat resembling blossom of Holly; *Inflorescence* a *thyrsoid panicle*, pedunculate, broadly-oblong, many-flowered; *Calyx* short, 4-lobed; *Petals* 4, oblong, spreading, longer than calyx; *Disk* inconspicuous; *Stamens* equal in number to and opposite petals, hypogynous; *Ovary* superior, style 3-lobed; *Fruit* a drupe, about size of a pea, red, persistent all the year.

Leaves simple, alternate, crowded in parts so as to appear sub-verticillate, oblong, entire, acuminate, pellucid-dotted, tapering into short petioles, ex-stipulate, glabrous, coriaceous, deep lustrous green.

An evergreen *shrub*, 3-4 ft.; *Branchlets* green, glabrous.

Native of Japan; name from Japanese *skimmi*, a poisonous fruit.

Skimmia Laureola.

Gardens. Needs shelter in winter. The flowers have a strong citron scent. March.

Flowers pale yellow, polygamous, fragrant, in a dense terminal *panicle*, rachis and peduncle purple-dotted; *Sepals* 5, *Petals* 5, *Stamens* 5, alternating with petals; *Fruit* a drupe, ovate, smooth, nearly size of Olive, 1-3 cartilaginous 1-seeded kernels.

Leaves alternate, sub-opposite, oblong-lanceolate, attenuated at base, entire, acute, petiolate, dark green above, yellowish beneath, 3-5 ins. long.

An evergreen *shrub*, 4 ft.; glabrous, aromatic.

Native of Nepaul.

OBLATE-BERRIED SKIMMIA, *Skimmia oblata*.

Gardens. March.

Flowers white, fragrant, in a *thyrsoid panicle*, short, terminal; *Females*, *Calyx* 4-5-lobed; *Petals* 4-5, red on outside in bud; *Stamens* rudimentary

SIMARUBEÆ

=small white filaments; *Ovary* large, stigma 4-lobed; *Fruit* a drupe, oblate, glossy, in paniced clusters, bright vermilion-red.

Leaves alternate, elliptic-obovate, entire, firm, smooth, bright green, slightly arched, shortly petiolate or sub-sessile, 3-5 ins. long, 2 ins. broad.

An evergreen *shrub*.

Introduced from Japan, 1864; male plant said to be *S. fragrans*, known in gardens as *S. fragrantissima*.

REDDISH SKIMMIA, *Skimmia rubella*.

Gardens. March.

Flowers greenish-white, odorous, buds tinted with red; *Inflorescence* a dense *thyrsus*; *Fruit* a drupe.

Leaves alternate, lanceolate-elliptic, coriaceous, entire, acute, petiolate, exstipulate.

Native of China; introduced 1874; a seedling form of *S. Fortunei*.

CLASS I.	.	.	.	.	<i>Dicotyledons</i>
DIVISION I.	.	.	.	.	<i>Thalamifloræ</i>
NATURAL ORDER.	.	.	.	.	<i>Simarubæ</i>

Trees or shrubs, with usually alternate, exstipulate, pinnate leaves, and hermaphrodite, sometimes polygamous, flowers; *Calyx* 3-5-lobed or partite; *Petals* 3-5, or rarely wanting; *Stamens* as many, or twice as many, as petals, rarely indefinite, inserted at the base of a hypogynous disk; *Ovary* superior, 4-5 lobed and celled; *Fruit* a drupe, capsule, or samara.

TREE OF HEAVEN, *Ailanthus glandulosa*.

Parks, gardens, avenues. August. This handsome tree, with its pinnate leaves 2-3 ft. long, is a desirable specimen to stand singly on a lawn. It grows with great rapidity for the first 10-12 years, but afterwards its

TREES AND SHRUBS

growth is slower. It thrives best in a light rich soil, somewhat moist, and in a sheltered position. It is propagated by cuttings of roots in pots of light soil in a warm greenhouse in March, planting out in the following November.

Flowers whitish-green, polygamous, with disagreeable odour; *Inflorescence* a terminal erect branched *panicle*; *Calyx* 5-partite, segments half ovate, united below; *Petals* 5, hypogynous, ovate or oblong-lanceolate, margins inflexed, hairy at base, valvate; *Stamens* in hermaphrodite flowers 2-3, in females 0, in males 10, hypogynous, filaments hairy below, anthers ovate to ovate-lanceolate; *Disk* 10-lobed; *Ovary* superior, syncarpous, carpels 5, styles 5, united, stigmas 5, oblong, reflexed; *Fruit* indehiscent, each carpel separating and forming a samara, 1-2 ins. long, linear-lanceolate, compressed, thin, winged, twisted at top, 1-seeded.

Leaves alternate, imparipinnate, 20-30 ins. long, leaflets 12-25, ovate-lanceolate, acuminate, entire, or with a few glandular teeth at base, coriaceous, glabrous, dark green above, paler beneath, 2-6 ins. long, $1\frac{1}{2}$ - $2\frac{1}{2}$ ins. wide, petiolule short; leaves red when young, falling with first frosts. Leaves on vigorous young trees said to reach 6 ft. in length.

A deciduous *tree*, 70-100 ft.; hemispherical head; *Twigs* glabrous, shining yellowish-green to reddish-brown or olive; *Buds* small, red-brown, grey tomentose; *Lenticels* long; *Bark* smooth; *Wood* white, soft.

Native of China; seed sent from Nankin to Collinson by Father d'Incarville in 1751.

CLASS I. *Dicotyledons*
DIVISION I. *Thalamifloræ*
NATURAL ORDER. *Aquifoliaceæ*

Trees or shrubs, with alternate, simple leaves, often evergreen and coriaceous, sometimes stipulate; *Flowers* white, often small, sometimes in axillary cymes, sometimes unisexual; *Calyx* 3-6-partite; *Petals* 4-5, distinct or slightly



HOLLY (*Ilex aquifolium*)

A. Flowering branch. B. Fruit. C. Calyx. D. Flower. E. Longitudinal section of ovary. F. Transverse section of "berry."

AQUIFOLIACEÆ

connate at base; *Stamens* 4-5, alternate with petals; *Ovary* superior, 3 or more celled; *Fruit* a drupe.

Distinguished from Celastrineæ chiefly by the absence of a disk.

HOLLY, *Ilex Aquifolium*.

Woods, hedges, gardens. May—August. A handsome tree, and valuable as a hedge plant. It is long-lived, but slow of growth. The branches, with their dark green foliage and red berries, are in great request for Christmas decorations.

The genus *Ilex* comprises about 145 species of mostly hardy shrubs and trees. They are propagated by seeds. These are buried 4-6 ins. deep in sandy soil in October, and sown in ordinary soil outdoors in the following spring or autumn, transplanting the seedlings when two years old, and again moving after another two years. For hedges they should be planted 18 ins. apart in May or September. Varieties are grafted on the Common Holly in March, or budded in May or August.

Flowers white, small, $\frac{1}{4}$ in. diameter, sometimes unisexual, and fertilised by bees; *Inflorescence* a dense axillary *umbellate cyme*; peduncles short, many-flowered; *Calyx* 4-5-toothed, ovate, persistent; *Corolla* rotate; *Petals* 4, slightly connate or free, obovate, concave; *Stamens* 4, attached by base to corolla; *Ovary* superior, 4-celled, 4 small sessile stigmas; *Fruit* a drupe, with four 1-seeded stones; bright red or yellow, flesh thin; *seeds* bony, furrowed, angular.

Leaves alternate, oval, shortly petiolate, coriaceous, glabrous, shining pale beneath, some entire, others with prickly teeth, wavy, acute or acuminate, $2\frac{1}{2}$ -3 ins. long, persistent more than one year, falling in summer.

A deciduous *tree* or bushy *shrub*, 10-50 ft.; *Bark* smooth, pale grey, often used for making *birdlime*; *Shoots* slightly pubescent; *Buds* minute; *Wood* finely grained, hard, white; used for inlaying, and as a substitute for Box and Ebony.

Native of Britain. English name from A.S. *holen*, *holegn*, the holly-tree. Leaves often disfigured by larvæ of Holly Fly (*Phytomyza aquifolia*), and by spots of the Leaf Sooty Mould (*Capnodium Footii*).

TREES AND SHRUBS

Ilex crenata.

Gardens. May. A dwarf shrub of compact habit and slow growth, but sometimes rising to a height of 20 ft., and having the general appearance of a Box-tree. The black fruit in autumn adds materially to the beauty of the plant. It strikes readily from cuttings in autumn.

Flowers white; peduncles drooping, scattered along the branches, usually 3-flowered; *Fruit* a drupe, black.

Leaves alternate, ovate, obtuse, crenate, revolute, light green and lustrous, usually under 1 in. long.

An evergreen *shrub*, 3-4 ft. or sometimes 10-20 ft.; much branched.

A native of Japan; there the most widely distributed, and most popular, of all the Hollies, being often used as a hedge plant.

HIMALAYAN HOLLY, *Ilex dipyrrena.*

Gardens. A species with very distinctive Willow-like leaves, hardly wavy, with short spiny teeth. April, May.

Flowers white, small, $\frac{1}{4}$ in. diam.; sub-sessile in axillary, sub-globular fascicles; pedicels short, stout; *Calyx* 4-partite; *Petals* 4; *Stamens* 4; *Ovary* 2-celled, or rarely 3-4-celled; *Fruit* a drupe, $\frac{1}{2}$ in. long, dark brown 2-seeded.

Leaves elliptical-lanceolate, mucronate, entire or remotely spiny-serrated, hardly wavy, dull green, shortly petiolate, $3\frac{1}{2}$ ins. long, 1 in. wide.

An evergreen *shrub*, 12 ft.; *Branchlets* angular.

Introduced from N. India, 1840. Specific name from Gr. *di*, twice, and *pyren*, *pyrenos*, a kernel, a fruit-stone, referring to the 2-seeded fruit.

AMERICAN HOLLY, *Ilex opaca.*

Parks, gardens. May, June.

Flowers white, dioecious; *Male flowers* in short pedunculate 3-9 flowered *cymes*, axillary, or scattered on base of young shoots; *Females* 1-3 flowered;

CELASTRINEÆ

pedicels slender, puberulous; *Calyx* 4-partite, lobes acute, ciliate, hypogynous, imbricate in bud; *Petals* 4, imbricate; *Stamens* 4, alternate with petals, adnate to base of corolla, anthers introrse; *Ovary* 4-celled, style 0, stigmas broad and sessile; *Fruit* a drupe, ovoid or spherical, $\frac{1}{4}$ in. diam.; red or yellow; 1-seeded nutlets ribbed.

Leaves alternate, elliptical to obovate-oblong, acute, wavy with few scattered spiny teeth, or entire, thick, coriaceous, dull yellow-green, paler beneath, 2–4 ins. long; petioles short, grooved above; stipules minute, persistent; leaves falling after three years.

An evergreen *tree*, 20–40 ft.; pyramidal head; *Branches* short, slender; *Twigs* glabrous, pale brown; *Bark* light grey, warty excrescences; *Buds* obtuse or acuminate; scales ciliate.

Introduced from U.S.A., 1744. Specific name from *L. opacus*, dark, shady, opaque.

CLASS I.	.	.	.	.	<i>Dicotyledons</i>
DIVISION II.	.	.	.	.	<i>Calycifloræ</i>
NATURAL ORDER.	.	.	.	.	<i>Celastrineæ</i>

Shrubs or small trees, with alternate or rarely opposite leaves, and small deciduous stipules; *Flowers* small, regular, cymose, greenish or purplish; *Calyx* small, 4–5-fid, imbricate; *Petals* 4–5, inserted under margin of disk, imbricate; *Stamens* 4–5, alternate with petals, inserted on flat disk; *Ovary* superior, 3–5-celled, immersed in disk; *Fruit* dehiscent or indehiscent; *seeds* usually with an arillus.

Distinguished from Rhamneæ by stamens opposite petals; from Rosaceæ by the definite stamens; and from Onagrarieæ usually by parts not being in powers of 2.

AMERICAN BURNING BUSH, *Euonymus americanus*.

Shrubberies. Generally as a wall plant; made handsome in autumn by the crimson fruit. May, June.

The genus *Euonymus* contains several useful trees and shrubs which

TREES AND SHRUBS

thrive in ordinary garden soil. The deciduous species are suitable for the shrubbery. Those of an evergreen nature should be planted against south or west walls, or as edgings to beds, or in front of shrubberies. They are propagated by cuttings of shoots of previous year's growth, 3 ins. long, inserted in sandy soil in a frame or cold greenhouse in early autumn.

Flowers greenish-purple, small, in a 1-3 flowered *panicked cyme*; peduncles slender; *Petals* nearly orbicular, claw short; *Fruit* a capsule, 3-5-lobed, prickly, warted, deep crimson; *seeds* white, with scarlet arillus, ripe in October.

Leaves elliptical-lanceolate, shortly petiolate, serrated, coriaceous, acute, deep shining green above, more or less persistent.

A deciduous *shrub*, 2-6 ft. *Branches* slender, spreading; *shoots* smooth, quadrangular, deep green when leafless.

Sometimes called "Strawberry Bush," because fruit resembles that of Common Arbutus.

Introduced from N. America, 1686.

BURNING BUSH, *Euonymus atropurpureus*.

Shrubberies. The scarlet arillus makes the fruit very attractive in autumn. May, June.

Flowers dark purple; nearly $\frac{1}{2}$ in. diam; *Inflorescence* a *trichotomous cyme*, axillary peduncles 5-15 flowered, compressed. *Calyx* lobes 4, rounded or acute; *Petals* usually 4, nearly orbicular, often erose at margins; *Stamens* 4, alternate with petals, anthers spreading; *Capsules* light purple, smooth, 4-celled, deeply 3-4-lobed, $\frac{1}{2}$ in. diam.; *seeds* 2 in each cell, chestnut-brown wrinkled coat, scarlet aril; ripe in October.

Leaves oval-oblong, petiolate, serrated, acuminate, thin, puberulent beneath, $1\frac{1}{2}$ -5 ins. long, 1-2 $\frac{1}{2}$ ins. wide. Autumn tint pale yellow.

A deciduous *shrub*, 5-12 ft.; *Branches* spreading, slender, terete; *Twigs* 4-angled; *Bark* thin, ashy-grey; *Buds* acute, scales purple, scarious, glaucous; *Wood* heavy, hard, close-grained, white tinged with orange.

Introduced from N. America, 1756.

CELASTRINEÆ

SPINDLE TREE, *Euonymus europæus*.

Hedges, thickets, shrubberies. A native shrub of rather straggling habit, made attractive in autumn by the fine tints of the foliage and the bright orange-coloured covering of the seeds. May, June.

Flowers greenish-white, proterandrous, in a *dichasial cyme*; peduncles axillary, 1-2 ins. long, 3-5 flowered; *Calyx* small, 4-cleft; *Petals* 4, obovate, imbricate; *Stamens* 4, alternate with petals, inserted into glands on a flat fleshy disk, half as long as petals; *Ovary* superior, 4-celled, style 1, stigma 4-lobed; *Fruit* a 4-lobed, 4-celled capsule, pale crimson, fleshy; *seeds* with a bright orange-coloured arillus; ripe in October.

Leaves opposite, ovate or oblong-lanceolate, $1\frac{1}{4}$ -5 ins. long, shortly petiolate, finely serrated, acute or acuminate, glabrous, stipules small, caducous. Autumn tints crimson and gold.

A deciduous *shrub*, 5-10 ft.; or a *tree*, 20 ft.; *Twigs* opposite, square, smooth, green, fetid; *Bark* grey, smooth; *Buds* sub-opposite, short, slightly 4-angled bud scales, glabrous, green, margins and tips red; *Wood* hard, tough; used for skewers, turnery, drawing-charcoal, and finer kinds of gunpowder.

Native of Britain. English name refers to time when the wood was used for making spindles; other common names are Skewerwood, Pegwood, and Prickwood; also sometimes called Dogwood. Leaves often stripped by gregarious larvæ of Small Ermine Moth (*Hyponomeuta padella*).

JAPANESE SPINDLE TREE, *Euonymus japonicus*.

Gardens. Thrives well near sea, and is a very useful plant for hedges in towns. It is not hardy in the north. April.

Flowers white, small, in a many-flowered *dichotomous cyme*; axillary peduncles flattened; *Petals* orbicular, fringed; *Fruit* a capsule.

Leaves oblong, sharply serrated, acuminate, dark glossy green.

An evergreen *shrub*, 10-20 ft.; *Branchlets* pendulous, slightly compressed.

TREES AND SHRUBS

Introduced from Nepaul, 1804. One of the most ornamental of evergreen shrubs. Several varieties with variegated leaves are in cultivation.

BROAD-LEAVED SPINDLE TREE, *Euonymus latifolius*.

Shrubberies, gardens, lawns. June.

Flowers white, becoming purple as they fade; *Inflorescence* a many-flowered *trichotomous cyme*; *Petals* oval, ovate; *Fruit* a 4-lobed capsule, somewhat winged, purple, with orange arillus.

Leaves oblong-elliptical, serrated, glabrous, glossy green.

A deciduous *shrub*, 6-8 ft.; *Branches* smooth, somewhat compressed; *Buds* opposite, acute.

Introduced from Europe, 1863.

CLASS I.	.	.	.	.	<i>Dicotyledons</i>
DIVISION II.	.	.	.	.	<i>Calycifloræ</i>
NATURAL ORDER.	.	.	.	.	<i>Rhamnæ</i>

Trees or shrubs with alternate, stipulate leaves, and small green or yellowish cymose flowers, sometimes unisexual; *Calyx* 4-5-toothed, valvate in bud; *Petals* 4-5, minute, or obsolete; *Stamens* 4-5, epigynous, opposite petals, alternate with calyx lobes, other versatile; *Ovary* 3-4-celled, free or sunk in fleshy disk; *Fruit* a capsule, or drupaceous and indehiscent.

ALATERNUS, *Rhamnus Alaternus*.

Shrubberies. A shrubby evergreen, in general appearance resembling a Phillyræa. It succeeds well in all but heavy, wet soils. April—June.

The genus *Rhamnus* contains some sixty species, of which about thirty are hardy shrubs or trees, but few are valuable from a garden standpoint. They do well in sunny or shady shrubberies in ordinary soil. They are propagated by cuttings in ordinary soil in September; by layering in March or September; or seeds sown outdoors in autumn.

RHAMNEÆ

Flowers green, diœcious, honey-scented, in a short axillary *raceme*; *Fruit* a drupe.

Leaves alternate, ovate-elliptical or lanceolate, very variable, slightly toothed, glabrous, coriaceous, deep glossy green.

An evergreen *shrub*, or small *tree*, 20 ft.

Introduced from S. Europe, 1629. Leaves sometimes attacked by Buckthorn Leaf-spot (*Phyllosticta Rhami*).

PURGING BUCKTHORN, *Rhamnus cathartica*.

Woods, thickets, hedges. Prefers chalky soils. May, June.

Flowers yellowish-green, diœcious, small, entomophilous, proterandrous, solitary or in axillary *cymose clusters*, on previous year's wood; pedicels short; *Calyx* 4-cleft, valvate; campanulate in males, cupular in females; *Petals* 4, very narrow, as large as calyx teeth; *Stamens* 4, on perigynous disk, opposite petals; *Ovary* superior, 4-celled, stigmas 4; *Fruit* a drupe, about size of pea, globose, enclosing four small 1-seeded nuts, blue-black; ripe in September; *seeds* obovoid, grooved at back.

Leaves alternate, fascicled at ends of shoots, sub-opposite lower down, ovate or oblong, shortly petiolate, minutely serrated, acuminate, veins prominent, divergent, yellowish-green, young ones downy beneath, 1-2 ins. long; stipules subulate, deciduous. Autumn tint yellowish-green.

A deciduous *shrub*, 5-10 ft.; *Branches* spreading, opposite, smaller ones with terminal thorns; *Bark* black; *Dwarf shoots* strongly ringed; *Buds* erect, sub-opposite, ovate-pointed, dark brown to blackish; scales smooth ciliate; *Lenticels* large; *Wood* hard; *heart-wood* reddish-yellow, *sap-wood* whitish-yellow; used for turnery; juice of berries used for sap-green of painters; bark yields yellow dye.

Native of Britain. English name said to be a corruption of German *Buxdorn*, the Thorn-bearing Box; *Rhamnos* was old Greek name used by Theophrastus; specific name is Latin for *purging*, or *purgative*.

TREES AND SHRUBS

ALDER BUCKTHORN, *Rhamnus Frangula*.

Woods, thickets, hedges. Prefers clay or damp soil. May—July.

Flowers greenish-white, all hermaphrodite, protandrous, $\frac{1}{5}$ in. diam., in an axillary *cyme*, two or three in each axil, peduncles longer; *Calyx* campanulate, 5-cleft; *Petals* 5; *Stamens* 5; *Ovary* superior, style simple, stigma undivided; *Fruit* a drupe with 3 stones, globose, at first green, then red, finally a dark purple, nearly $\frac{1}{2}$ in. diam.; *seeds* compressed, broadly obovoid.

Leaves alternate, obovate or elliptical, shortly petiolate, entire, obtuse or acuminate, thin, sometimes downy on under side, veins numerous, diverging equally from midrib; stipules subulate, minute, caducous. Autumn tints reddish and green.

A deciduous shrub, 5–10 ft.; *Branches* more erect, alternate, slender, without thorns, purplish-brown; *Bark* black; *Buds* hairy, no scales; *Lenticels* whitish; *Wood* known as Black Dogwood, soft, spongy; used in manufacture of gunpowder; *heart-wood* yellowish-red, *sap-wood* light yellow; *Bark* yields yellow colouring matter; unripe *drupes* yield green.

Native of Britain. Called Black or Berry-bearing Alder. Leaves sometimes attacked by Buckthorn Leaf-spot (*Phyllosticta Rhamni*).

NEW JERSEY TEA, *Ceanothus americanus*.

Gardens, shrubberies. One of the hardiest of the genus, free flowering, doing well against a wall in a light, well-drained soil. June—August.

The *Ceanothuses* are propagated by cuttings in pots of sandy soil in a cold frame or cool greenhouse in October. The readiest way of obtaining strong plants is by layering of shoots in autumn.

Flowers white; *Inflorescence* an axillary and terminal *cymose panicle*; rachis pubescent, elongated, pedicels $\frac{1}{4}$ – $\frac{1}{2}$ in. long; *Calyx* tube 5-lobed; *Petals* 5, claw narrow; *Stamens* 5, filaments filiform; *Ovary* immersed in disk, 3-lobed, style short, 3-cleft; *Fruit* dry, 3-lobed, separating into 3 nutlets, depressed, nearly black, $\frac{1}{8}$ in. long.



SPINDLE TREE (*Euonymus europaeus*)

A. Flowering branch. B. Fruit.

RHAMNEÆ

Leaves alternate, ovate, acute or acuminate, obtuse or sub-cordate at base, serrated, pubescent beneath, strongly 3-nerved, 1–3 ins. long, $\frac{1}{2}$ –1 in. wide; petioles $\frac{1}{6}$ – $\frac{1}{2}$ in. long.

A deciduous *shrub*, 3–4 ft.; *Stem* erect or ascending, branching, puberulent; *Root* deep red.

Introduced from Eastern N. America, 1713. Also called Red Root and Mountain Sweet.

BLUE BUSH, *Ceanothus azureus*.

Gardens, shrubberies, walls. This is a beautiful shrub for planting in masses in large beds, or for clothing a wall, but is best sheltered from cold winds. It likes a light, porous soil. June—September.

Flowers azure-blue, in an axillary *thyrsoid cyme*; rachis downy; pedicels smooth; *Fruit* a drupe.

Leaves alternate, ovate-oblong, obtuse, acutely serrated, glabrous above, hoary and downy beneath.

A deciduous *shrub*, 6–10 ft.

Introduced from Mexico, 1818. Also called Blue-flowered Red Root.

Ceanothus dentatus.

Gardens, walls. Requires southern aspect; one of the earliest to flower. May, June.

Flowers blue, in *cymose clusters*; peduncles naked; *Fruit* a drupe, 3-lobed.

Leaves fascicled, obovate or oblong-elliptic, acute, undulate or revolute.

A deciduous *climber* or erect *shrub*, 4–10 ft.; nearly glabrous.

Introduced from California, 1848. Syn. *C. Lobbianus*.

STRAGGLING BLUE BUSH, *Ceanothus divaricatus*.

One of the best for covering walls. Requires southern aspect. When in a favourable situation will make shoots 6 ft. long in a season. May—September.

TREES AND SHRUBS

Flowers pale blue; *Inflorescence* racemose; *Fruit* a drupe.

Leaves alternate, oblong or oblong-ovate, rounded at base, obtuse or acute, glabrous.

An evergreen *climber*, 10 ft.; or small *shrub*, 3–4 ft.; *Branches* spinose and straggling.

Native of California and Oregon; introduced 1848.

Ceanothus papillosus.

Walls. Somewhat tender, but very beautiful, its numerous branchlets being clothed with small deep green leaves, and its flowers, borne in dense clusters, being of a pleasing shade of pale blue. May, June.

Flowers pale blue, in a terminal *panicle*; peduncles naked; *Fruit* a drupe.

Leaves alternate, oblong-lanceolate, obtuse both ends, glandular-serrulate, upper surface glandular, viscid, deep green.

An evergreen *climbing shrub*, 12 ft.; or small *shrub*, 2–3 ft.

Introduced from California, 1848.

Ceanothus rigidus.

Walls. Requires sunny aspect. Forms a freely-branched shrub, clothed with small, deep green leaves. April—June.

Flowers purplish-blue, in a terminal *panicle*; *Fruit* a drupe.

Leaves alternate, obovate, cuneate, often emarginate, slightly serrated, rigid, deep green.

A deciduous *climber*, 6–8 ft.

Introduced from California, 1848.

CALIFORNIAN LILAC, *Ceanothus thyrsiflorus.*

Gardens, shrubberies. Best on wall, but will grow as a standard in favoured localities. Its foliage is glossy, and its blossoms intensely blue. June—September.



ALDER BUCKTHORN (*Rhamnus frangula*)

A. Fruiting branch. B. Flowers. C. Single flower, enlarged. D. Section of flower, enlarged.

AMPELIDEÆ

Flowers blue, in a *thyrsoid cluster* of small *corymbs*, 2–3 ins. long, in axils of upper leaves or small bracts; *Calyx* 5-lobed, petaloid, lobes triangular; *Petals* 5, inserted under margin of disk, unguiculate, spreading, deciduous; *Stamens* 5, inserted on perigynous disk, opposite petals; *Ovary* immersed in disk, 3-celled, styles short, united below, stigmas 3-lobed, spreading; *Fruit* a drupe, 3-lobed, sub-globose, black, separating into three 2-valved nutlets.

Leaves alternate, oblong or oblong-ovate, obtuse, glandular serrate, glabrous on upper surface, paler and pubescent below, 1–1½ in. long, ½–1 in. wide; petioles stout, stipules acute.

A deciduous *shrub* or small *tree*, 9 ft.; *Branches* spreading, angled; *Twigs* pubescent when young, yellow-green; *Bark* thin, red-brown, scaly.

Introduced from N. America, 1861.

VEITCH'S BLUE BUSH, *Ceanothus veitchianus*.

Walls, gardens. Requires sunny aspect. Best on a wall, in light, porous soil. May—July.

Flowers bright blue, in dense terminal *clusters*; *Fruit* a drupe.

Leaves alternate, oblong-ovate or oval, glandular serrulate.

An evergreen *shrub*, 6 ft.

Introduced from California.

CLASS I.	.	.	.	.	<i>Dicotyledons</i>
DIVISION II.	.	.	.	.	<i>Calycifloræ</i>
NATURAL ORDER	.	.	.	.	<i>Ampelideæ</i> (The Vine Order)

Shrubs with a watery acid juice in the leaves, stems, and unripe fruits; usually climbing by means of tendrils arising opposite the leaves; *Flowers* small, green, regular; *Calyx* minute; *Petals* 4–5, inserted on a disk, valvate in bud, usually separating at the base and remaining connate above; *Stamens* 4–5, opposite petals, anthers versatile; *Ovary* superior, usually 2-celled; *Fruit* a succulent berry.

TREES AND SHRUBS

Distinguished from Celastrineæ and Rhamneæ chiefly by their climbing habit, and the stamens being more decidedly hypogynous.

VIRGINIAN CREEPER, *Vitis quinquefolia*.

The genus *Vitis* contains many species of Vines, over forty of which are given in the Kew Hand-list.

Walls. June. This is a luxuriant and rapid-growing creeper, climbing by means of tendrils, but requiring a support. It is useful for covering walls, arbours, verandahs, old stumps, &c. It has a most striking appearance in autumn, when its foliage turns to brilliant shades of crimson and scarlet. It is propagated by cuttings of firm shoots 6 ins. long inserted in pots of sandy soil in a cold frame or greenhouse in September.

Flowers greenish-purple, fertilised by bees; *Inflorescence* a corymbose raceme; peduncles and pedicels red; *Calyx* minute, slightly 4-5-toothed; *Petals* 4-5, concave, thick, expanding before they fall; disk none; *Stamens* 4-5, opposite petals, anthers versatile; *Ovary* superior, 2-celled. *Fruit* a small drupe, blue-black, 2-3-seeded.

Leaves compound, palmate, 3-5 oblong leaflets, 2-6 ins. long, acute or acuminate, mucronately toothed, glabrous on both surfaces; brilliant scarlet and crimson in autumn.

A deciduous climber, 30-60 ft.; *Branches* furnished with tendrils, whose apices expand into sucker-like disks.

Introduced from N. America, 1629. Sometimes called American Ivy. Synonymous with *Ampelopsis quinquefolia* and *A. hederacea*. Generic name *ampelopsis*, from Gk. *ampelos*, a vine, and *opsis*, resemblance.

GRAPE VINE, *Vitis vinifera*.

Walls, fences. June. This well-known tendril-bearing woody climber is useful for covering walls or pillars. The leaves are handsomely tinted in autumn, and the fruit is edible. Many varieties are grown. Outdoor Vines are

AMPELIDEÆ

grown best in a compost of two parts sandy loam and one part in equal proportions of wood ashes, old mortar, bones, and rotten manure. They are propagated by cuttings of shoots 6 ins. long with a slice of an older branch attached at the base, inserted in a shady position outdoors in October or November; layering of shoots may be done in summer or autumn; also by seeds sown in heat, "eyes" in sandy soil in heat, "in arching" and grafting.

Flowers yellowish-green, small, regular, entomophilous, in a *corymbose raceme*, opposite a leaf; *Calyx* minute, mitræform, 5-toothed, limb wanting; *Petals* 5, distinct at base, united at apex, thrown off as a small 5-rayed star; *Stamens* 5, opposite petals, inserted around a sub-hypogynous disk, anthers versatile; *Ovary* superior, style short, stigma simple, lobed; *Fruit* a succulent berry, 1-celled, 2-4-seeded; *seeds* hard, pyriform, grooved.

Leaves simple, alternate, 3-5 lobed, variable, cordate at base, margins coarsely toothed, glabrous, pubescent beneath, $2\frac{1}{2}$ - $5\frac{1}{2}$ ins. diam., stipules scaly, caducous. Autumn tints orange and red.

A deciduous *climber*, 20-50 ft.; easily trained; tendrils twining, opposite leaves; *Branches* woody, tough; *Twigs* knotted; *Buds* conical, glabrous.

Found wild in Asia Minor. Has been cultivated for 5000-6000 years. Currants, raisins, and sultana raisins are dried varieties of grapes.

JAPANESE CREEPER, *Vitis inconstans*.

Walls. June. The most rapid-growing plant for covering walls, climbing by means of branched tendrils provided with suckers, which attach the plant so firmly to the surface that no nailing is required. The autumn foliage is a brilliant crimson. It is easily propagated by cuttings from young wood in spring, placed in gentle heat.

Flowers green, small, inconspicuous, resembling those of Virginian Creeper, arranged in a *raceme*; *Fruit* a small drupe.

Leaves simple, alternate, very variable, young leaves cordate, toothed, teeth mucronate; older leaves deeply divided into three palmate lobes, coarsely toothed, glabrous, flushed with red in summer, brilliant crimson in autumn,

TREES AND SHRUBS

3–3½ ins. diam., petioles long, tendrils opposite leaves, expanding at ends into a group of suckers.

A deciduous *climber*, 20–60 ft.; *Stems* pliant.

Introduced from Japan by Mr. J. G. Veitch, 1868. Synonymous with *Ampelopsis tricuspidata* and *A. Veitchii*; known also as small-leaved Virginian Creeper.

CLASS I.	. . . . .	<i>Dicotyledons</i>
DIVISION II.	. . . . .	<i>Calycifloræ</i>
NATURAL ORDER .	. . . . .	<i>Sapindaceæ</i>

Usually trees or shrubs, rarely herbs, with mostly exstipulate, alternate leaves, either simple and lobed, or compound, digitate or pinnate; *Flowers* mostly irregular, small for the size of the plant; *Sepals* usually 4–5, sometimes wanting, free or connate, often unequal, imbricate; *Petals* usually 4–5, sometimes 0, imbricate; *Stamens* very variable, usually 8, sometimes 2–12 or indefinite, inserted within, on, or around a disk; *Ovary* 2–3-celled and lobed; *Fruit* capsular or indehiscent, drupaceous, baccate, or sometimes a samara.

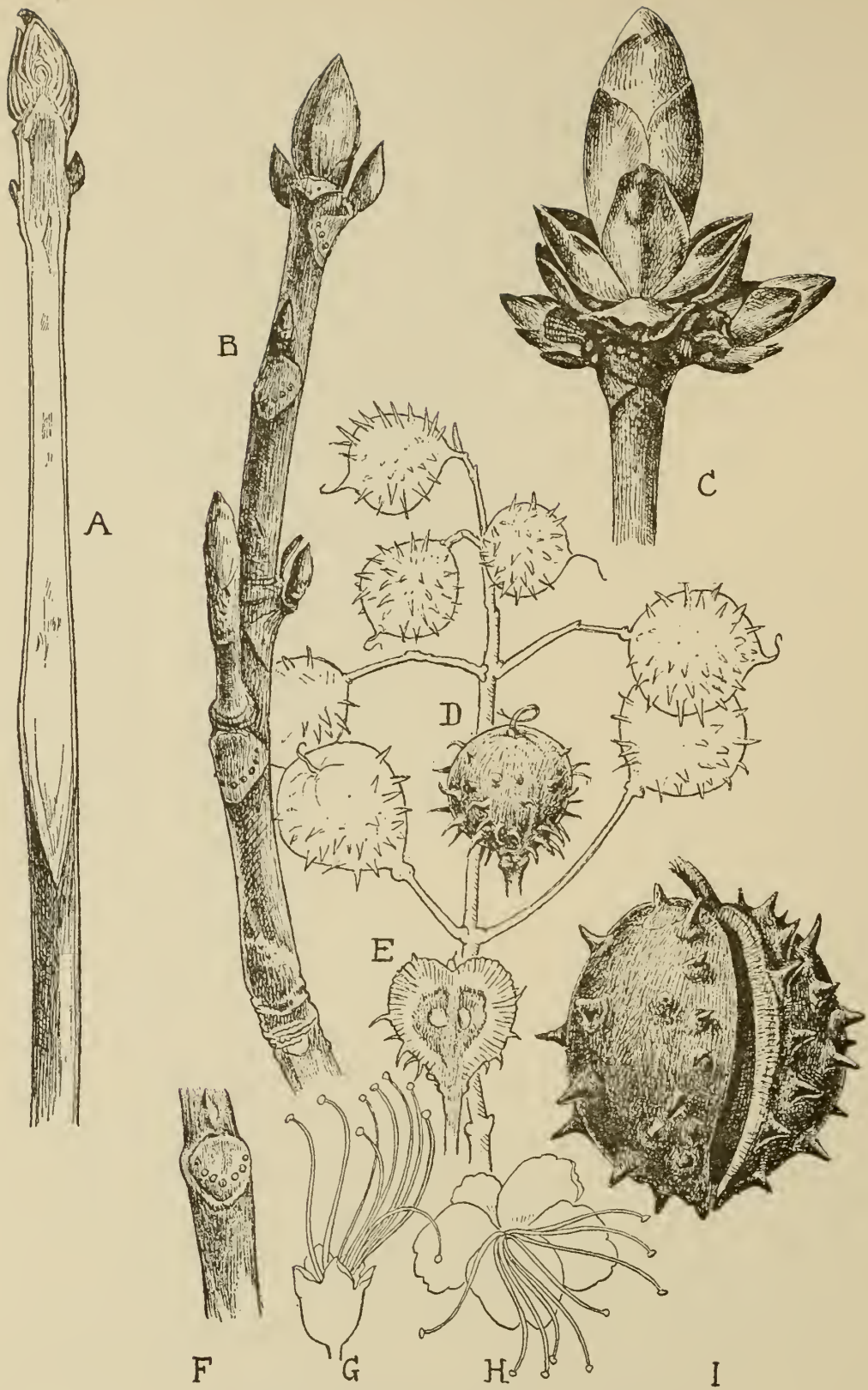
An Order of 600–700 species divided into several tribes, some of which, as Acerineæ and Staphyleæ, are sometimes considered as separate Orders.

This Order contains many handsome deciduous shrubs or trees suitable for parks, plantations, shrubberies, and gardens. Among the best known are the Horse-Chestnuts, Buckeyes, and the innumerable Maples.

SCARLET HORSE-CHESTNUT, *Æsculus carnea*.

Parks, gardens. May—June. A handsome tree, which will grow in most soils, but prefers that of a loamy character. The Horse-Chestnuts and Buckeyes are propagated by layers in February; by grafting in March, and budding in July, on the Common Horse-Chestnut; seeds are sown 3 ins. deep in a shady border in March.

Flowers scarlet; *Inflorescence* a *thyrsus*, shorter than *Æ. Hippocastanum*;



HORSE CHESTNUT (*Aesculus hippocastanum*)

- A. Section of twig. B. Twig in winter. C. Opening leaf bud. D. Fruit in early stage.
 E. Section of same. F. The horseshoe mark. G. Flower after removal of petals.
 H. Flower. I. Mature fruit, in husk.

SAPINDACEÆ

Calyx 4-lobed; *Petals* 4, claws shorter than calyx; *Stamens* 8; *Fruit* a capsule, not so spinous as *Æ. Hippocastanum*.

Leaves compound, opposite, petiolate, digitate; leaflets 5-7, obovately cuneate, unequally serrated, acute, deep green. Autumn tint yellow.

A deciduous *tree*, 20-30 ft.; *Bark* lighter; *Buds* with little resin.

Introduced from N. America, 1820. A hybrid between *Æ. Hippocastanum* and *Æ. Pavia* (*P. rubra*). Synonymous with *Æ. rubicunda*.

FETID BUCKEYE, *Æsculus glabra*.

Parks, gardens. April, May.

Flowers pale yellow-green, polygamous; *Inflorescence* a *thyrsus*, 5-6 ins. long, pubescent, pedicels short; only lower flowers perfect and fertile; *Calyx* 5-lobed, campanulate, imbricated in bud; *Petals* 4-5, imbricated, nearly equal, puberulous, limb about twice as long as claw; *Stamens* usually 7, exserted, filaments long, pubescent, orange, anthers hairy; *Ovary* sessile, 3-celled, pubescent; style slender, curved; stigma entire; *Fruit* a capsule, 1-2 ins. long, ovate or obovate, pale brown, prickly; *seeds* 1-1½ in. broad.

Leaves opposite, exstipulate, digitate, leaflets 5-7, usually 5, oval-oblong or obovate, acuminate, finely serrated, entire at base, pubescent when young, yellow-green, paler beneath, 4-6 ins. × 1½-2½ ins. Autumn tint yellow.

A deciduous *tree*, 20-30 ft.; *Branches* spreading; branchlets orange-brown, pubescent, to reddish-brown and glabrous; *Bark* ashy-grey, furrowed, broken into thick rough plates; *Twigs* dark brown, scaly; *Buds* acuminate, ⅔ in. long, not resinous, scales triangular; *Wood*, light, soft, close-grained, not strong, nearly white.

Native of N. America; also called Ohio Buckeye.

HORSE-CHESTNUT, *Æsculus Hippocastanum*.

Parks, gardens, avenues. April, May. This, the most showy of all our flowering trees, is equally at home in park, garden, or avenue, "a thing of

TREES AND SHRUBS

beauty, and a joy for ever." It thrives best in a rich loamy soil in level, well-sheltered situations. It is easily raised from seed.

Flowers white, tinged with crimson, dotted with yellow; irregular, entomophilous, proterogynous; *Inflorescence* a *thyrsus*, upper flowers usually males, lower hermaphrodite; *Calyx* 5-lobed; *Petals* 5; *Stamens* 7, curved, inserted on a fleshy disk; *Ovary* 3-celled, style long, curved, glabrous; *Fruit* a 3-valved capsule, thick, leathery, spinous, usually containing two dark-red glossy seeds; produced after twenty years.

Leaves opposite, compound, digitate, petiolate, exstipulate; leaflets usually 7, obovately cuneate, acuminate, unequally serrated, thin, downy in young stage, disarticulating from the rachis, at times 1 ft. long; leaves sometimes 1 ft. across, usually lying somewhat horizontally. Autumn tints yellow, orange, golden-brown.

A deciduous *tree*, 80-100 ft.; *Branches* in opposite pairs, curving downwards, the extremities curling upwards in winter; *Twigs* very stout, smooth; *Bark* greenish-grey, somewhat smooth and flaking, bitter, used for tanning and yellow dye; *Trunk* sometimes twisted; *Buds* ovoid-acute, reddish-brown, covered with thick coat of varnish; scales are modified petioles; *Leaf-scars* like a horse-shoe with nails; *Wood* soft, weak; used for packing-cases, blind-wood, and moulds.

A native of Greece, Persia, and N. India; introduced about 1550; lives to about 200 years.

Foliage subject to Horse-Chestnut Leaf-spot (*Septoria Hippocastani*); timber bored by larva of Wood Leopard Moth (*Zeuzera æsculi*, *Z. pyrina*).

SMOOTH-FRUITED HORSE-CHESTNUT, *Æsculus parviflora*.

Gardens. Prefers moist situation, and thrives well in strong, clay soil. July, August.

Flowers white, in a long dense *thyrsus*; *Calyx* tubular, obconical; *Petals* 4, nearly similar, erect, narrow, claws long; *Stamens* 6-7, three times as

SAPINDACEÆ

long as petals, giving a fringed appearance; *Fruit* a capsule, small, smooth, without prickles, seldom ripening in England.

Leaves opposite, palmate, petioles long, reddish-brown, leaflets 5-7, oblong-lanceolate, bright green above, downy beneath, minutely serrated, acuminate.

A deciduous *shrub*, 3-9 ft.; or small *tree*, 10-15 ft.; several stems and stoloniferous shoots; *Branches* slender, spreading, turning upwards at extremities, or rooting if touching the ground.

A native of N. America; introduced 1820. Known in America as Buckeye; often called *Pavia alba* or *P. macrostachya*; genus *Pavia*, in honour of Peter Paiv, Professor at Leyden, seventeenth century.

YELLOW HORN, *Xanthoceras sorbifolia*.

Gardens. A fine shrub or small tree, in its foliage resembling the Mountain Ash. It does well in light garden soil, but best against a wall. It is propagated by seeds sown in light soil outdoors in spring or autumn. April, May.

Flowers ivory-white, large, regular, polygamous, in a terminal *raceme*, 8 ins. long; pedicels long, bracteate at base; *Sepals* 5, equal, boat-shaped, imbricate; *Petals* 5, elongated, clawed, without scales, reddish streaks at base, slightly deflected when expanded; *Disk* cup-like; *Stamens* 8; *Ovary* superior, 3-celled; *Fruit* a 3-valved capsule, resembling a Peach in shape and texture, 2 ins. long, 1½ in. diam.; ripe in July.

Leaves alternate, imparipinnate, stipulate, leaflets 7, ovate-lanceolate, sharply serrated, acuminate.

A deciduous *shrub* or small *tree*, 5-15 ft.; *Branches* erect; *Twigs* brown; *Buds* green.

Native of Mongolia; introduced about 1870. Generic name from *xanthos*, yellow, and *keras*, a horn, in allusion to the yellow, horn-like glands or nectaries between the petals; specific name from resemblance of leaves to those of the True Service Tree (*Pyrus Sorbus*).

TREES AND SHRUBS

COMMON MAPLE, *Acer campestre*.

Thickets and hedgerows. Will grow in dry situations, and under the shade of other trees. May, June.

The Maples, of which there are about thirty species in cultivation, succeed best in a well-drained, loamy soil, and they prefer a sheltered position. They are propagated by layers in October; grafting in March; budding in August; and seeds sown in a sheltered position in October.

Flowers green, $\frac{1}{4}$ in. diam., regular, entomophilous or anemophilous, lower ones staminate, upper bisexual, sometimes proterandrous, in a short, erect, terminal, loose corymb-like *panicle of cymes*, pedicels short, hairy; *Sepals* 5, linear-oblong, hairy; *Petals* 5, narrower than sepals; *Stamens* 8, inserted on a hypogynous disk; *Ovary* 2-lobed, glabrous or downy, style 1, stigmas 2; *Fruit* a samara, 2-seeded, wings horizontal, slightly curved, linear-oblong, $1\frac{1}{2}$ in. long, red in late summer, brown when ripe, glabrous except at seed-vessel, which is pubescent.

Leaves opposite, palmately 5-lobed, lobes and sinuses rounded, crenate, exstipulate, rarely 4 ins. across, petioles red. Autumn tints rich yellow, red, golden-brown.

A deciduous *tree*, 20–30 ft. *Branches* spreading; *Twigs* brown; *Bark* corky, deeply fissured, brown, *Buds* ovate, scales green, ciliate; *Wood* soft, close-grained, beautifully veined.

Native of Britain. Known also as Field Maple; common name from A.S. *mæpel*, *mapul*, whence *mapul-treo*, *mapulder*, the maple-tree; Latin name from *acer*, *eris*, maple-tree, and *campester*, *tris*, *tre*, belonging to a field—*campus*, an open field.

Leaves often hoary with Maple blight or mildew (*Uncinula Aceris*), or spotted with Maple-leaf Blotch (*Rhytisma punctatum*). Small pimple-like galls produced by Mites (*Eriophyes macrorhyncus* and *E. macrochelus*).



OAK GALLS

A. Cherry Gall. B. Oak Apple; its gall-wasp (*Teras terminalis* or *Cynips folii*) shown above, enlarged. C. Blister Gall—gall of *Spathogaster vesicatrix*. D. Spangle Gall—gall of *Neuroterus lenticularis*, shown above, enlarged. E. Marble Gall—gall of *Cynips Kollari*, with one of the galls cut open, showing larva in its central chamber. F. Artichoko Gall—gall of *Cynips gemma*, with wasp shown below, enlarged. G. Gall of *Neuroterus fumipennis* (to left of leaf). H. Currant Gall—gall of *Spathogaster baccharum*, on catkins, and above on under side of leaf; its insect below, enlarged. I. Gall of *Biorhiza aptera*, on roots.

SAPINDACEÆ

ROUND-LEAVED MAPLE, *Acer circinatum*.

Gardens. Needs a sheltered situation. April, May.

Flowers greenish-white, monœcious, in a terminal, stalked *corymb*, nodding, 10–20 flowers; *Sepals* purple or red, oblong to obovate, acute, villous, longer than petals; *Petals* cordate; *Stamens* 6–8, filaments slender, exserted in males; *Ovary* glabrous, style divided nearly to base, stigmas exserted; *Fruit* a samara, smooth, carpels thick, oblong, wings widely extended, bright red when young, purplish-brown when ripe.

Leaves orbicular, cordate at base, 7–9-lobed, lobes nearly all one size, sinuses not deep, but acute, serrated, glabrous, pale reddish-green at first, bright green later; $3\frac{1}{2}$ ins. by $3\frac{1}{2}$ ins., petioles stout, grooved, clasping stem. Autumn tint scarlet.

A deciduous *shrub*, 5–6 ft.; or a small *tree*, 20–40 ft.; round headed; *Branches* spreading, contorted; *young shoots* slender, frequently tinged with red; *Bark* thin, smooth, red-brown; *Buds* obtuse, scales bright red; *Wood* hard, heavy, fine-grained, not strong, light brown, sometimes nearly white.

A native of N.W. America; introduced 1826. Also known as the Vine Maple.

SILVER-LEAVED MAPLE, *Acer dasycarpum*.

Parks, gardens. Soil must not be too dry. A fine handsome tree, with foliage having a bluish-white or silvery bloom on the under surface. April.

Flowers greenish, appearing before leaves, in a lateral *corymb* with short pedicels; *Petals* 0; *Ovary* tomentose; *Fruit* a samara, large, broad-winged, pubescent, dropping when leaves are fully developed; wings divaricating, sometimes $\frac{1}{2}$ in. wide.

Leaves palmately 5-lobed, truncate at base, recesses blunt, unequally and deeply serrated, pale bluish-white underneath, rich green above, 4–6 ins. long, petioles and veins on upper side crimson. Autumn tints scarlet and orange.

TREES AND SHRUBS

A deciduous *tree*, 30–40 ft.; semi-pendulous, much branched; growth rapid; *Twigs* red; *Buds* carmine; *Wood* soft, little value.

Introduced from N. America, 1725. Synonymous with *A. eriocarpum* (Michaux) and *A. saccharinum* (Linnæus).

JAPANESE MAPLE, *Acer japonicum*.

Gardens. Requires protection from cold winds in spring. April.

Flowers deep purplish-red, large; *Fruit* a samara.

Leaves usually 10-lobed, small, in early spring a very light green, colouring well in autumn.

A deciduous *shrub* or small *tree*, 10–20 ft.; very slow in growth.

Introduced from Japan, 1863. Many varieties with deeply cut and highly coloured leaves.

CALIFORNIAN MAPLE, *Acer macrophyllum*.

Parks, gardens, avenues. A tree of rapid growth, elegant in aspect, but requiring shelter for its leaves to come to perfection. May.

Flowers greenish-yellow, fragrant, conspicuous, monœcious, appearing after leaves are full grown; *Inflorescence* a drooping *compound raceme*, 4–6 ins. long, pedicels slender, pubescent; *Sepals* petaloid, obovate, obtuse; *Petals* spathulate; *Stamens* 9–10, filaments, long, slender, hairy at base, exerted in males, anthers orange; *Ovary* hoary, tomentose, styles united at base, stigmas long, exerted; *Fruit* a samara, 2 large, widely extended winged carpels, stiff, stinging hairs at base; ripe in September.

Leaves digitately 5-lobed, roundish deep sinuses, lobes slightly 3-lobed, 6–8 ins. across, nearly 1 ft. long, glossy green, pubescent, lobelets acute, petioles long. Autumn tint yellowish-brown, orange.

A deciduous *tree*, 50–90 ft.; ample head, rounded; *Trunk* 10–15 ft. in circumference; *Twigs* purplish; *Bark* brown, deeply furrowed, square plate-

SAPINDACEÆ

like scales; *Buds* obtuse; *Wood* soft, close-grained, markings like Bird's-eye Maple, polishes well.

Introduced from N. California, 1826. Also known as Large-leaved Columbia Maple and Oregon Maple.

MONTPELIER MAPLE, *Acer monspessulanum*.

Rarely grows beyond the size of a shrub. May.

Flowers pale yellow, expanding just before leaves; in a loose *corymb* of 6–10 flowers, on long, slender, forked peduncles; *Fruit* a samara, small, smooth, wings parallel; peduncles slender, $1\frac{1}{2}$ in. long.

Leaves cordate, 3-lobed, lobes equal, entire, oval, glabrous, downy in axils of principal veins on under side, small, shining dark green, petioles long.

A deciduous *shrub* or small *tree*, 10–30 ft.; dense round head: *Branches* forked, much ramified; *Bark* reddish-brown.

Introduced from S. Europe, 1739.

BOX ELDER, *Acer Negundo*.

Parks. This differs from other Maples in having pinnate leaves. The variegated forms are among the most common of all trees in town gardens. April.

Flowers yellow-green, dioecious, very small, appearing a little before leaves; *Males* in *fuscicles*, on filiform pedicels; *Females* in *racemes*; *Calyx* 5-lobed, campanulate; *Petals* absent; *Stamens* 4–6, filaments slender, hairy, exserted, anthers linear, surmounted by connective; *Ovary* pubescent, on rudimentary disk; style divided into two long stigmatic lobes; *Fruit* a samara, 1– $1\frac{1}{2}$ in. long, glabrous, slightly incurved, wing finely veined; racemes 6–8 ins. long.

Leaves imparipinnate, 3–5 leaflets, ovate or oval, acute or acuminate, coarsely and deeply serrated, odd leaflets usually 3-lobed, pubescent when

TREES AND SHRUBS

young, nearly glabrous when old, 2-5 ins. long, 1-3 ins. wide, white mottled with green, petioles 2-3 ins. long. Autumn tint yellow.

A deciduous *tree*, 30-40 ft.; *Branches* stout, wide spreading; *branchlets* pale green, glabrous; *Bark* pale grey or light brown, deeply furrowed, short thick scales; *Buds* acute or obtuse, scales tomentose; *Wood* soft, weak, creamy-white.

Introduced from U.S.A., 1688. The variegated varieties are more usually grown. Synonymous with *Negundo fraxinifolium* and *N. aceroides*. Known as Ash-leaved Maple.

ITALIAN MAPLE, *Acer opulifolium*.

Parks, gardens. May.

Flowers greenish-yellow, small, in a nearly sessile, lax, terminal, branched *corymb*; pedicels hairy, short; *Ovary* smooth; *Fruit* a samara, large, bright green, glabrous, thin; wings broad, horizontal.

Leaves opposite, variable; on stronger spray and near base of young shoots they are large, nearly orbicular, cordate at base, 5-lobed, 1-2 obtuse serratures; at ends of branches more pointed and more deeply divided, glabrous, deep green above, pale and downy beneath, especially the veins and axils of ribs, 4 ins. long, 5 ins. broad; petiole long.

A deciduous *tree*, 8-20 ft.; dense round head; lower branches slender, much divided, horizontal; *Wood* hard and compact; best of Maples.

Native of Corsica, Pyrenees, and Alps; introduced from France, 1823. Often called French or Guelder Rose-leaved Maple.

JAPANESE MAPLE, *Acer palmatum*.

Shrubberies. Requires protection from cold winds in spring. May.

Flowers in a 5-7 flowered *umbel*; *Fruit* a samara.

Leaves palmate, 5-7-lobed; lobes oblong, acuminate, serrated.



SYCAMORE (*Acer Pseudo-platanus*)

A. Flowering branch. B. Section of older flower, with samara partly formed. C. Mature fruit (samaras).
 D. Section of samara, showing cotyledonous leaves folded. E. Flower.

SAPINDACEÆ

A deciduous *shrub* or small *tree*, 15–20 ft.; slow in growth.

Introduced from Japan, 1820. Many varieties of different colours, often divided into three groups: 5-lobed, 7-lobed, and much dissected.

STRIPED MAPLE, *Acer pennsylvanicum*.

Parks. The peculiarly striped bark makes this a very distinctive tree. May, June.

Flowers canary-yellow, monœcious, appearing when leaves are nearly full grown; *Inflorescence* a slender, drooping, terminal *raceme*, 4–6 ins. long; pedicels $\frac{1}{4}$ – $\frac{1}{2}$ in. long; *Sepals* linear-lanceolate to obovate, $\frac{1}{4}$ in. long; *Petals* smaller, obovate; *Stamens* 7–8, shorter than petals; *Ovary* purplish-brown, glabrous; style stout; stigmas spreading, recurved; *Fruit* a samara, glabrous; wings thin, spreading.

Leaves opposite, rounded or cordate at base, 3-lobed at apex, finely serrated or serratulate, acuminate, thin, membranous, ferruginous pubescence when young, glabrous when old, except in axils of principal veins, pale below, 5–6 ins. \times 4–5 ins.; petioles stout, grooved, $1\frac{1}{2}$ –2 in. Autumn tint light yellow.

A deciduous *tree*, 20–30 ft.; *Branches* erect; *branchlets* pale greenish-yellow to bright red-brown; *Trunk*, and *branches* after 2–3 years, striped with broad, pale longitudinal lines; *Bark* rough; *Buds* stalked, scales red; *Wood* light, soft, close-grained, satiny, light brown.

Introduced from U.S.A., 1755. Known also as Moose Wood and Snake-barked Maple.

NORWAY MAPLE, *Acer platanoides*.

Parks, gardens, avenues. A rapid-growing and very handsome tree, with foliage resembling the Plane. April, May.

Flowers bright yellow, appearing just before leaves, smooth; early flowers mostly female, later ones males by abortion; *Inflorescence* a nearly erect-stalked corymb-like *panicle of cymes*; *Stamens* in males as long as

TREES AND SHRUBS

petals; *Ovary* glabrous; *Fruit* a samara, large, flat, thin, smooth; wings slightly curved, nearly horizontal, each $2\frac{1}{4}$ ins. long; *seed* not usually produced till between forty and fifty years old.

Leaves palmate, angularly 5-lobed, cordate at base, lobes broad, acuminate; thin, deep glossy green above, glabrous, shining, few coarse, sharply-pointed serratures, shortly petiolate, 4 ins. long, 7 ins. broad. Autumn tint yellow, or yellow tinged with red.

A deciduous *tree*, 50–60 ft., with dense round head; *Bark* of young shoots bright green, afterwards changing to reddish-brown dotted with white points; bark of trunk fissured, not scaly; *Buds* scaly, quadrangular.

Introduced from Europe, 1683.

SYCAMORE, *Acer Pseudo-platanus*

Looked upon in the fourteenth century as a rare exotic, this tree is now common in parks, gardens, and avenues, where, as Gerard and Parkinson both have told us, “it specially is planted for the shadowe-sake.” No tree propagates itself more readily in this country. May, June.

Flowers greenish-yellow, protandrous, staminate or bisexual, visited by bees; *Inflorescence* a pendulous raceme of *umbellate cymes*, pedicels short; *Sepals* 4–9; *Petals* 4–9; *Stamens* 8, rather long, hairy, inserted on a fleshy hypogynous disk; *Ovary* 2-lobed, tomentose, style 1, stigmas 2, curved; *Fruit* a samara, scimitar-shaped, wings divergent, red-brown, $1\frac{1}{2}$ ins. long; produced after twenty years.

Leaves opposite, palmately 5-lobed, cordate at base, unequally serrated, lobes acuminate, glabrous beneath; exstipulate, 4–8 ins. across, dark shining green above, paler, sometimes reddish beneath, often viscid with *honey dew*; petiole slender, green or red. Autumn tint brown.

A deciduous *tree*, 40–60 ft.; *Branches* large, massive, rounded; *branchlets* turned upwards and slightly thickened; *Bark* ash-grey, flaking, smooth; *Buds* ovoid-pointed, scales olive-green with brown border; young *wood* soft, white, older a yellowish tint; used for furniture.

SAPINDACEÆ

Introduced from Central Europe; extensively planted, seeding freely in Britain; often called the Great Plane, and known in Scotland as the Plane; ordinarily lives 150–250 years; growth rapid.

Autumn leaves often disfigured by black blotches of a fungus (*Rhytisma acerinum*). Leaves devoured by Cockchafer (*Melolantha vulgaris*). Globular pimple-galls on foliage produced by a Mite (*Phyllocoptes acericola*).

RED MAPLE, *Acer rubrum*.

Parks. Need fairly moist soil somewhat sheltered. March, April.

Flowers crimson or scarlet, appearing before leaves, in sessile *corymbose* clusters, lateral; *Sepals* oblong, obtuse; *Petals* narrowly oblong; *Stamens* 3–8; *Fruit* a samara, $\frac{3}{4}$ –1 in. long; wings straight, extended, small, smooth, bright red, maturing in spring; pedicels elongated.

Leaves palmate, 5-lobed, cordate at base, deeply and unequally serrated, sinuses acute, glabrous and bright green above, downy and glaucous beneath, $3\frac{1}{2}$ ins. \times $3\frac{1}{2}$ ins. petioles, slender, reddish. Autumn tints red and yellow.

A deciduous *tree*, 30–40 ft.; *Branches* diverging, slender, red; *Trunk* smooth; *Twigs* red; *Bark* smooth, flaky; *Wood* hard, fine-grained, not strong, light reddish-brown; little value.

Native of N. America; introduced from Canada, 1656.

SUGAR MAPLE, *Acer saccharinum*.

Thrives in deep, free, rich soil. April, May.

Flowers greenish-yellow, small, monœcious or diœcious, unfolding before leaves; *Inflorescence* a drooping *corymb*; peduncle short, pedicels pilose; *Calyx* 5-partite; *Petals* 0; *Stamens* 7–8, filaments slender, glabrous; *Ovary* obtusely 2-lobed, pale green, hairy; styles united at base; *Fruit* a samara; wings small, falcate, smooth, diverging, pubescent when young; pedicels elongated; ripening before leaves.

Leaves cordate, variable, palmately 5-lobed; lobes sinuate, acuminate,

TREES AND SHRUBS

glabrous, glaucous beneath, 4 ins. long, 5 ins. broad; petioles slender, red on upper side. Autumn tint orange-scarlet.

A deciduous *tree*, 30–80 ft.; *Branches* loose; tree broad-base, round-topped; growth slow; *Bark* on young stems and branches smooth, grey, tinged red; old trunks red-brown, furrowed, thin scales; *Buds* small, scales ovate, bright red, ciliate; *Wood* hard, strong, light-coloured; used for veneer; maple sugar from sap in small quantities.

Introduced from N. America, 1735, probably by Peter Collinson. Also known as Bird's-eye Maple.

TARTARIAN MAPLE, *Acer tartaricum*.

Shrubberies. May.

Flowers pale yellowish-green, sometimes tinged with red; *Inflorescence* a crowded erect, compound *raceme*; *Fruit* a samara, downy and tinged with red when young, smooth and brown when ripe, in August, thin, wings parallel, only slightly separated.

Leaves cordate, sometimes 3-lobed, acuminate, serrated, reticulated on upper side when young, glabrous on both surfaces later, bright green above, 4 ins. long, $2\frac{1}{2}$ ins. broad. Autumn tint reddish-yellow or brown.

A deciduous *tree*, 12–30 ft.; round head, sometimes 20 ft. diam.

A native of Tartary and south of European Russia; introduced 1759. One of the earliest to expand its leaves.

CLASS I. . . . *Dicotyledons*
DIVISION II. . . . *Calycifloræ*
NATURAL ORDER . . . *Staphyleaceæ*

Branched shrubs with opposite, stipulate, 3–5 foliate or pinnate leaves, and regular, white flowers in axillary racemes or panicles; *Sepals* 5, equal, deciduous; *Petals* 5, erect, about as long as calyx, imbricated; *Stamens* 5, perigynous; *Ovary* superior; *Fruit* a membranous capsule, bladder-like.

A small Order, sometimes placed with the Celastrineæ or Sapindaceæ.



HORSE CHESTNUT

Esculus Hippocastanum

STAPHYLEACEÆ

COLCHICAN BLADDER-NUT, *Staphylea colchica*.

Gardens, shrubberies. Best in fairly moist, loamy soil. June.

The genus *Staphylea* contains five species of hardy, branched shrubs. They are propagated by cuttings of firm shoots 6-8 ins. long in sandy soil in a cold frame or in a sheltered position in September; by layers of shoots in September or October; or suckers in October to February.

Flowers white, $\frac{2}{3}$ in. long, in a terminal *corymbose panicle*, erect or slightly nodding; *Sepals* 5, petaloid, white, linear, spreading, united only at base; *Petals* 5, linear-spathulate, erect; *Stamens* 5, perigynous; *Ovary* superior, 2-celled, stigma 2-lobed; *Fruit* a membranous capsule, green, 3 ins. long, $1\frac{1}{2}$ in. broad, flattened, 3-seeded.

Leaves opposite, ternate or 5-foliate, leaflets approximate, ovate-oblong, acuminate, serrulate, glabrous above, dark green, paler and puberulous towards base beneath, petioles long, leaflets sub-sessile.

A deciduous *shrub*, 3-8 ft.; *Twigs* green; *Buds* opposite, flattened, acute, without scales.

Introduced from the Caucasus. Also known in gardens as *S. regliana*. Generic name from Gr. *staphyle*, a cluster of grapes; specific name from Gr. *colchicon*, meadow saffron—*Colchicus*, relating to Colchis, the native country of the sorceress Medea, who assisted Jason to obtain the Golden Fleece, and afterwards became his wife.

BLADDER-NUT, *Staphylea pinnata*.

Gardens, shrubberies. The bladder-like capsules, with their white seeds, make this a very distinctive shrub. May, June.

Flowers white, small, in an axillary *panicle*, bracteate; *Sepals* 5, equal, deciduous; *Petals* 5, erect, imbricated; *Stamens* 5, inserted on perigynous disk; *Ovary* superior; *Fruit* a membranous bladder-like capsule; *seeds* globose, white, pistachio-flavoured, used for rosaries.

TREES AND SHRUBS

Leaves opposite, imparipinnate, leaflets 5-7, elliptical-oblong, serrate, acuminate, glabrous, stipulate, petiole long.

A deciduous *shrub*, 6-12 ft.; *Suckers* freely produced; *Branches* ascending; *Twigs* brown; *Bark* smooth; *Buds* acute, flattened.

Native of S. Europe. Known also as Job's Tears and St. Anthony's Nuts.

CLASS I.	. . . .	<i>Dicotyledons</i>
DIVISION II.	. . . .	<i>Calycifloræ</i>
NATURAL ORDER	. . . .	<i>Anacardiaceæ</i>

Trees or shrubs with resinous, acrid, or milky juice, alternate, simple or compound, exstipulate leaves, and small, regular, minute, diœcious or polygamous flowers; *Calyx* usually 5-lobed, imbricated in bud; *Petals* usually 5, imbricated; *Stamens* usually 5, alternate with petals, inserted on margin or under an annular, fleshy, 5-lobed disk; *Ovary* usually superior, 1-celled, styles 3; *Fruit* drupaceous.

DWARF SUMACH, *Rhus copallina*.

Gardens. A handsome shrub in autumn, easily distinguished by its petioles being winged between the leaflets. July.

The genus *Rhus* contains about 120 species, of which less than twenty are hardy shrubby plants in cultivation. Some contain poisonous properties, and require very careful handling. They are suitable for sunny borders or shrubberies, and some are remarkable for their brilliant tints in autumn. They are propagated by cuttings of firm shoots 6-8 ins. long in ordinary soil in a cold frame or under a hand-light in October or November; by cuttings of roots 2-3 ins. long planted 3 ins. deep in sandy soil in October or November; or by layers of shoots in autumn.

Flowers greenish-yellow, diœcious, minute, in a compact *thyrsoid panicle*, 4-6 ins. long, bracteate and bracteolate; *Calyx* puberulous, lobes ovate, acute, one-third as long as petals; *Petals* rounded, reflexed above middle, deciduous; *Stamens* longer than petals, filaments slender, anthers orange; *Ovary* ovate;

ANACARDIACEÆ

Fruit drupaceous, obovate, flattened, red with glandular hairs; stone orange-brown, bony.

Leaves alternate, imparipinnate, 6–8 ins. long, leaflets 9–21, ovate-lanceolate, acute, entire or serrate, lower pairs smaller and shortly petiolulate, subcoriaceous, dark shining green above, pale and pubescent beneath, 2–2½ ins. long; petioles winged between leaflets. Autumn tint dark rich maroon.

A deciduous *shrub*, 1–8 ft.; *Branches* spreading, erect, downy; *Twigs* reddish-brown; *Bark* brown tinged with red; *Buds* minute, rusty-brown tomentose.

Introduced from N. America, 1688. Common name “Sumach” derived from *sumac* or *shumac*, a dye made of powdered leaves of *R. Coriaria*.

CHITTAM WOOD, *Rhus cotinoides*.

Gardens. Said to colour best in poor soil, and certainly one of the most lovely of autumn-tinted shrubs. April, May.

Flowers greenish-yellow, diœcious, minute, in a slender terminal *panicle*, few-flowered, flowers 3–4 together in loose umbels at ends of pedicels; *Calyx* lobes 5, ovate-lanceolate, obtuse, persistent; *Petals* 5, oblong, acute, twice as long as calyx, deciduous, inserted under margin of disk; *Stamens* 5, shorter than petals; *Ovary* sessile, obovate; styles 3, short, spreading, stigmas large; *Fruit* drupaceous, smooth, in feathery panicles 8–12 ins. long, pedicels 2–3 ins. long, hairy; drupe compressed.

Leaves alternate, simple, oval or obovate, obtuse or slightly emarginate, tapering towards base, margins wavy, revolute, membranaceous, dark green on upper surface, paler below, silky when young, 4–6 ins. long, 2–3 ins. wide; petioles stout. Autumn tints orange and scarlet.

A deciduous *shrub*, 8–15 ft.; *Branches* brittle; *Twigs* dark red; *Bark* light grey; *Buds* small, scales dark red-brown; *Wood* light, soft, coarse-grained, bright orange.

Native of Southern U.S.A.; discovered by Nuttall on the Grand River, 1819; there grows as tree, 35 ft. Specific name = like the *Rhus Cotinus* (Gr. *eidos*, form).

TREES AND SHRUBS

SMOKE PLANT, *Rhus Cotinus*.

Gardens, shrubberies. This is one of the most curious and remarkable of hardy shrubs. Some of the pedicels are flowerless and reduced to mere threads, giving the inflorescence a wig-like appearance. In late summer and autumn the feathery panicles take on a beautiful fleshy tint, and the glaucous round leaves become a rosy-crimson, giving the whole plant a very striking character. It will grow in some of the poorest soils. June, July.

Flowers yellow, polygamous, minute, in a loose *panicle*; some of the pedicels transformed into white awns, giving a feathery appearance; *Calyx* 5-partite; *Petals* 5; *Stamens* 5, filaments rose-red; *Ovary* 1-celled; *Fruit* drupaceous, white, smooth, half-heart shaped; 1-seeded, stone triangular; pedicels long, hairy; ripe in September.

Leaves alternate, simple, obovate or orbicular, acute, entire, stiff, coriaceous, bright glossy green, strongly aromatic, 3 ins. × 2 ins.; petioles long, slender. Autumn tint reddish-yellow or crimson.

A deciduous *shrub*, 6–8 ft.; rambling; *branchlets* pubescent, olive-green or red; *Buds* minute; *Wood* yellow or greenish; used in cabinet-work and turnery; young twigs yield yellow dye.

Introduced from S. Europe, 1656. Called also Wig-tree and Venetian Sumach.

SMOOTH SUMACH *Rhus glabra*.

Gardens. The bright red fruiting panicles are very handsome, and retain their beauty well into the winter. It may be distinguished from the Staghorn Sumach by the smooth wood and leaves and the more or less glaucous leaflets. June.

Flowers—*Males* greenish-yellow; *Females* greenish-red, with crimson hairs; *Inflorescence* a terminal *panicle*; *Fruit* a drupe, with bright red hairs; stone smooth.

Leaves alternate, imparipinnate, leaflets 17–31, lanceolate-oblong, serrate,

ANACARDIACEÆ

nearly glabrous, deep glossy green above, whitish beneath, 2–4 ins. long. Autumn tint rich red.

A deciduous *shrub* or small *tree*, 12–18 ft. ; *Branches* glabrous. Introduced from N. America, 1726.

POISON IVY, *Rhus Toxicodendron*.

Gardens. Well adapted for growing over low walls or stumps, but requires very careful handling. Contact between any portion of the plant and the bare skin causes poisoning, the parts affected becoming greatly swollen and inflamed ; some persons appear to be immune, but others are affected even by walking near the plant. June.

Flowers greenish-yellow, in a loose, slender, axillary *panicle*, 1–3 ins. long ; *Calyx* 5-partite ; *Petals* 5, elliptical ; *Stamens* 5 ; *Ovary* superior, ovoid, styles 3 ; *Fruit* a drupè, red.

Leaves alternate, leaflets 3, rhombic-ovate, 1–4 ins. long, acute, notched, sinuate or lobed, downy beneath. Autumn tint purplish-red.

A deciduous *twining shrub*, climbing by adventitious rootlets over rocks and stones ; sometimes erect and bushy.

Native of N. America and Japan ; introduced 1640. Also called Poison Oak. The generic name is from *Rhous*, the old Greek name used by Theophrastus ; specific name from Greek *toxicon*, poison, and *dendron*, a tree. Syn. *R. radicans*. Known also in gardens as *Ampelopsis japonica* and *A. Hoggii*.

STAGHORN SUMACH, *Rhus typhina*.

Gardens, shrubberies. This is the species most frequently seen in gardens, and is a very handsome plant in autumn. The young shoots are always hairy, and their curious appearance has given the plant its common name. If cut back and reduced to one or two shoots in the spring, the plant will produce immense leaves, giving a splendid effect in autumn. June.

Flowers greenish-yellow, polygamous, small ; *Males*—*Calyx* 5-partite,

TREES AND SHRUBS

persistent, hairy, lobes acute, shorter than petals, fused to hypogynous disk; *Petals* 5, yellow-green, sometimes tinged red, strap-shaped, inserted under margin of disk, deciduous; *Stamens* 5, alternate with petals, on margin of disk; filaments subulate, anthers ovoid, orange; *Females*—*Calyx* lobes nearly as long as petals; *Petals* green, narrow, acuminate, erect; *Ovary* ovoid, 1-celled, styles 3, connate at base, stigmas capitate; *Inflorescence* a terminal *thyrsoid panicle*, males 8-12 ins. long; females $\frac{1}{2}$ -2 ins.; *Fruit* a dry drupe, in dense erect panicles 6-8 ins. long, 2-3 ins. wide, covered with crimson-purple tomentum.

Leaves alternate, imparipinnate, 16-24 ins. long, leaflets 11-31, oblong-lanceolate, acute, serrate, rarely lacinate, nearly sessile, dark green above, paler beneath, glabrous, pairs near middle 2-6 ins. long, 1-1 $\frac{1}{2}$ in. wide; petioles hairy. Autumn tints scarlet, crimson, purple, orange.

A deciduous *shrub* or small *tree*, 10-30 ft.; *Branches* stout, tortuous, velvety hairy; *Twigs* pilose, stout, terete, olive-brown; *Bark* thin, brown, smooth; *Buds* conical, very short, blunt, hairy; *Wood* light, brittle, soft, coarse-grained, orange streaked with green; tree abounds in white viscid juice, turning black on exposure to air.

Introduced from U.S.A., 1629. Also called Vinegar Tree.

POISON SUMACH, *Rhus venenata*.

Gardens. The autumn foliage is of "unparalleled splendour." The plant easily bleeds when bruised, and the sap is extremely poisonous and irritating to the skin. July.

Flowers yellow-green, polygamous, minute, in a loose, slender, axillary *panicle*; pubescent, bracteate, bracteolate, bibracteolate near middle; *Calyx*-lobes acute, erect, reflexed at apex; *Petals* 3 times length of calyx-lobes; *Stamens* twice as long as petals in males, filaments slender, anthers large, orange; *Ovary* ovoid-globose; styles short, spreading, stigmas capitate; *Fruit* drupaceous, ovate, acute, glabrous, white, sometimes tinged yellow; stone thin, grooved.

LEGUMINOSÆ

Leaves alternate, imparipinnate, 7–14 ins. long, leaflets 7–13, obovate-oblong, acute or rounded, entire, pubescent when young, afterwards glabrous, dark shining green above, pale below, revolute, 3–4 ins. long, 1½–2 ins. wide; petioles slender, red or green. Autumn tints scarlet and orange.

A deciduous *shrub*, 12 ft.; *Branches* slender; *Twigs* glabrous, reddish-brown to orange-brown and grey; *Bark* thin, grey, smooth; *Buds* acute, scales purple, ciliate.

Introduced from N. America, 1713. Syn. *R. vernix*. Known as Poison Dogwood.

CLASS I.	<i>Dicotyledons</i>
DIVISION II.	<i>Calycifloræ</i>
NATURAL ORDER	<i>Leguminosæ</i>

Trees, shrubs, or herbs with alternate, stipulate leaves, usually ternate or pinnate, sometimes tendrilled; *Calyx* inferior, 5-partite, often irregular, the odd lobe anterior; *Petals* usually 5, papilionaceous or irregular, inserted at bottom of calyx-tube; *Stamens* 10 or indefinite, inserted in calyx-tube or rarely hypogynous, free, diadelphous, or rarely in 3 bundles; *Ovary* superior, usually monocarpellary; *Fruit* a legume, or sometimes a lomentum, rarely a drupe.

All the British species have papilionaceous flowers, and the anterior position of the odd lobe of the calyx distinguishes the Order from all others.

SCOTCH LABURNUM, *Laburnum alpinum*.

Gardens. Laburnums thrive in almost any soil or situation. They may be propagated by seeds sown outdoors in March or April. June.

Flowers yellow, smaller than *L. vulgare*, in a pendulous *raceme*, longer than *L. vulgare*, pedicels downy; *Calyx* downy; *Fruit* a pod shorter than *L. vulgare*, smooth, upper suture winged.

Leaves trifoliate, petiolate, glabrous, leaflets ovate-lanceolate, rounded at base, green both surfaces, glabrous, or bordered with short spreading hairs.

TREES AND SHRUBS

A deciduous *tree*, 15–20 ft.; *Branches* terete.

Introduced from Europe about 1596.

LABURNUM, *Laburnum vulgare*.

Parks and gardens. This species and its varieties are common in town gardens. It will readily propagate itself by seed. April—June.

Flowers yellow, papilionaceous, proterandrous, nearly 1 in. long, visited by bees; *Inflorescence* a pendulous terminal *raceme*; pedicels pubescent; *Calyx* shortly toothed, pubescent; standard of *Corolla* veined with dark lines; *Stamens* monadelphous; *Style* ascending; *Fruit* a legume, downy; upper suture thickened and keeled, but not winged; green, becoming black; *seeds* 2-7, kidney-shaped, poisonous.

Leaves trifoliolate, petiolate; leaflets ovate-lanceolate, entire, pubescent beneath, acute or mucronate; stipules small, filamentous, persistent. Autumn tint yellow.

A deciduous *tree*, 20-25 ft.; *Branches* terete, whitish; *Bark* smooth, grey-green, poisonous to cattle, but eaten by rabbits; *Twigs* olive, smooth, silky *Lenticels* conspicuous; *Buds* silky, scales few; *Wood* hard, dark, coarse-grained, taking a good polish; *sap-wood* yellow, *heart-wood* yellow-brown, greenish-brown to black; used in turnery and cabinet-work.

A native of S. Europe; introduced 1596. Foliage destroyed by larva of Laburnum Moth (*Gemistoma laburnella*); also subject to Laburnum Leaf-spot (*Phyllosticta Cytisi*).

MOUNT ETNA GENISTA, *Genista aethnensis*.

Gardens. A handsome species, well suited for groups or in borders. The genus *Genista* contains about a dozen hardy flowering shrubs. They thrive in almost any well-drained soil, and are easily raised from seed sown outdoors in March or April. The dwarf species do well on rockeries, and the taller are suitable for shrubberies. June—August.

LEGUMINOSÆ

Flowers golden-yellow, papilionaceous in a terminal *raceme*; *Fruit* a legume.

Leaves alternate, simple, linear, few, entire, silky.

A deciduous *shrub*, 15-18 ft.; *Branches* long, slender, terete, arching or pendulous.

Native of Sicily and Sardinia; introduced 1816. Also called Rock Broom.

PETTY WHIN, *Genista anglica*.

Heaths, moist moors, bushy pastures. Very suitable for the rockery or wild garden. May, June.

Flowers yellow, papilionaceous, $\frac{1}{2}$ in. long, in a short, leafy *raceme*, axillary, shortly pedicelled; *Calyx* persistent, teeth short, triangular; *Corolla* glabrous, petals narrow; *Fruit* a legume, $\frac{3}{4}$ in. long, broad, acuminate both ends, glabrous, deciduous, compressed; *seeds* shining, olive.

Leaves alternate, simple, ovate-lanceolate, entire, acuminate, sessile, $\frac{3}{16}$ in. long.

A deciduous *shrub*, 1-2 ft.; *Stem* slender, spreading, ascending, curved; lower branches converted into slender, recurved, simple or branched spines, $\frac{1}{2}$ -1 in. long.

Native of Britain. Called also Needle Green Weed, Needle Furze, and Heather Whin.

SPANISH GORSE, *Genista hispanica*.

Gardens. This is a dense, spiny undershrub, well suited for the rock-garden. June.

Flowers golden-yellow, papilionaceous, in a terminal *raceme*, somewhat capitate; *Fruit* a legume.

Leaves alternate, lanceolate, entire, villous.

A deciduous *shrub*, 1-2 ft.; *Spines* branched, stiff, floriferous branches unarmed.

Native of South-western Europe; introduced 1759.

TREES AND SHRUBS

HAIRY GREENWEED, *Genista pilosa*.

Heaths, thickets, waste places. A delightful little rock-garden plant, which grows freely and blossoms abundantly. May—September.

Flowers bright yellow, papilionaceous, $\frac{1}{2}$ in. long; *Racemes* short and leafy; pedicels short, in axils of previous year's leaves; *Calyx* silky, 2 upper lobes lanceolate, 3 lower subulate; keel of *Corolla* pubescent; *Fruit* a legume, $\frac{2}{3}$ in. long, hairy, flat, valves bulging over seeds, deciduous.

Leaves alternate, simple, obovate-lanceolate, entire, obtuse, recurved, silky beneath, $\frac{1}{4}$ in. long, petioles very short, stipules ovate, obtuse.

A deciduous *shrub*, 6–12 ins.; *Stem* prostrate, much branched, tortuous, woody.

Native of Britain.

ARROW-JOINTED GENISTA, *Genista sagittalis*.

Gardens, rockeries. This is suitable for undergrowth or as edging for a bed, and does well on rock-work. May, June.

Flowers yellow, papilionaceous, in an ovate, terminal, leafless *raceme*; *Fruit* a legume.

Leaves alternate, ovate-lanceolate, few, entire.

A deciduous *shrub*, 6 ins.; *Stems* prostrate; *Branches* herbaceous, ascending, winged and jointed, membranous.

Introduced from S. Europe, 1750.

DYER'S GREENWEED, *Genista tinctoria*.

Thickets and pastures. Very useful for growing on dry soils. July—September.

Flowers yellow, papilionaceous, $\frac{1}{2}$ in. long, not honeyed, in a terminal, short, slender *raceme*, pedicels short; *Calyx* shortly 2-lipped, much shorter than corolla, glabrous, 2 upper teeth broadly lanceolate, 3 lower shorter



LABURNUM (*Laburnum vulgare*)

A. Flowering shoot. B. Petals of flower. C. Pistil. D. Seeds. E. Fruit. F. Flower, with petals removed.

LEGUMINOSÆ

very narrow, acuminate, deciduous above base; *Petals* 5, standard oblong; wings gibbous at base, adnate to staminal tube; keel petals clawed, separating and not resilient after deflection; *Stamens* 10, monadelphous, anthers alternately short and versatile, and long and basifixed, outer 4 ripening first; *Ovary* superior, 1 carpel, style incurved, stigma oblique; *Fruit* a legume, glabrous, narrow, much flattened, nearly 1 in. long, 5-10-seeded.

Leaves alternate, simple, lanceolate to elliptical or nearly ovate, sessile, entire, nearly glabrous, often shining; 1-1½ in. long, ¼-⅜ in. broad; stipules minute, subulate.

A deciduous *shrub*, 1-2 ft.; *Stem* woody, branched, decumbent at base; flowering branches erect or ascending, hard, rigid, no spines, green.

Native of Britain. Yields a yellow dye. Specific name from *L. tingo, tinctum*, to dye, to stain.

TWIGGY GENISTA, *Genista virgata*.

Gardens, shrubberies. One of the most beautiful of the genus, doing well in a poor, sandy soil. It is useful for house decoration. June, July.

Flowers yellow, papilionaceous, silky; *Inflorescence* racemose; *Fruit* a legume.

Leaves alternate, oblong-lanceolate, entire, silky pubescence, ½ in. long.

A deciduous *shrub*, 10-15 ft.; *Branches* twiggy, terete, striated.

Introduced from Madeira, 1777.

YELLOW SPANISH BROOM, *Spartium junceum*.

Gardens. This very ornamental shrub is easily grown in a poor soil and exposed situation. It is best increased by seed sown in fine soil outdoors in autumn or spring. July—September.

Flowers golden-yellow, papilionaceous, large, fragrant, in a terminal *raceme*; bracts and bracteoles minute, very caducous; *Calyx* somewhat spathaceous; standard large; wings obovate; keel incurved, acuminate; *Fruit* a legume.

TREES AND SHRUBS

Leaves few, alternate, 1-foliate, exstipulate.

A deciduous *shrub*, 6-12 ft.; *Branches* green, slender; young shoots dark green, Rush-like.

Native of Mediterranean and Canary Isles; introduced 1548. Generic name used by Dioscorides, derived from Gr. *spartos*, a shrub growing in Spain, used for making cords or ropes; specific name from L. *juncus*, a rush.

FURZE or GORSE, *Ulex europæus*.

Heaths, commons, and sandy wastes. This showy spring shrub is useful for covering sandy banks, and does well near the sea. It is propagated by cuttings inserted in ordinary soil in a shady position outdoors in spring or autumn, or in a cold frame in August; seeds sown in light soil outdoors in April, best where plants are to remain. February, March; August, September.

Flowers yellow, odorous, entomophilous; *Inflorescence* a raceme formed of flowers solitary in the axils of spines on the preceding year's shoots; *Calyx* gamosepalous, nearly as long as corolla, membranous, yellow, black spreading hairs, deeply 2-lipped, upper lip with 2, lower lip 3, minute teeth, 2 lax ovate bracts at base; *Corolla* papilionaceous, $\frac{3}{4}$ in. long, petals narrow, clawed, standard ovate, wings and keel obtuse, wings longer than keel; *Stamens* 10, monadelphous, anthers alternately short and versatile, and long and basifixed; *Ovary* superior, included in staminal sheath, 1 carpel, 1-celled, style smooth, stigma capitate; *Fruit* a legume, oval-oblong, $\frac{3}{4}$ in. long, turgid, black, villous with brown hairs, few-seeded.

Lower *leaves* sometimes 1-foliate and lanceolate, but mostly reduced to spines or small scales, exstipulate.

A densely spinous *shrub*, 2-5 ft., sometimes up to 10 ft.; *Stem* erect, downy, angular; *Branches* spreading, ending in a stout thorn; spines furrowed, rigid, 1-2 ins. long.

Native of British Isles.



COMMON FURZE, OR GORSE
(Ulex europaeus)

A. Flowering Branch. B. Seedling, showing ovate leaves. C. Fruit.
 D. Flower, sprung after rilling by Bee. E. Pod, showing seed.

LEGUMINOSÆ

DWARF FURZE, *Ulex nanus*.

Heaths, commons, and wastes. Useful for growing on semi-wild banks, and is better when planted in rather poor, dry soil. July—November.

Flowers yellow; *Inflorescence* more racemose than in *U. europæus*; *Calyx* $\frac{1}{2}$ in. long, pubescent with adpressed hairs, or glabrous, teeth minute; *Corolla* $\frac{1}{2}$ in. long, wings usually shorter than keel; *Fruit* a legume, $\frac{1}{2}$ in. long, persistent till following season.

Leaves mostly reduced to spines.

A spiny *shrub*, 1–3 ft.; *Stem* procumbent; *Branches* drooping; spines weak, deflexed, $\frac{1}{2}$ –1 $\frac{1}{2}$ in. long.

Native of British Isles. Specific name is Latin for a *dwarf*. Known as Cat Whin.

WHITE SPANISH BROOM, *Cytisus albus*.

The genus *Cytisus* contains about twenty hardy shrubs, many of which are showy species, and mostly bearing yellow flowers resembling the Laburnums and Genistas. They are inclined to become leggy with age, so should have the old wood cut out occasionally, that they may produce young flowering shoots. They may be propagated by cuttings in March or April; by layers in October or November; or seeds sown outdoors in March or April.

Cytisus albus is an extremely beautiful shrub of rapid growth, thriving best on rather light sandy soils. It makes handsome groups in the shrubby border, or looks well on a lawn. May.

Flowers white, papilionaceous, in *fascicles* disposed in long *racemes*; *Fruit* a legume.

Leaves alternate, simple and ternate, sessile, leaflets linear-oblong, entire, silky.

A deciduous *shrub*, 6–10 ft., or more in sheltered position; *Branches* terete, twiggy.

TREES AND SHRUBS

Native of Spain and Portugal; introduced 1752. Also called White Portugal Broom. Syns. *Genista multiflora*, *Sarothamnus albus*, *Spartium album*, &c.

ARDOINO'S BROOM, *Cytisus Ardoini*.

Rockeries. Thrives in dry soil and sunshine. April, May.

Flowers golden-yellow, papilionaceous; 1–6 in axils, usually secund; pedicels hairy, ebracteolate, about twice length of calyx; *Calyx* campanulate, scarious in upper half, hairy; *Fruit* a legume.

Leaves alternate, trifoliate, leaflets obovate, small, hairy, silky when young.

A deciduous *shrub*, 4–12 ins.; *Stems* decumbent, rod-like, springing from a knotted and twisted stock.

Native of Maritime Alps, Italy; introduced 1867.

COMMON BROOM, *Cytisus scoparius*.

Heaths, commons, gardens. Requires soil well drained and open, growing well on banks, and in situations too dry for other plants. Its flowers are the largest of the genus. May, June.

Flowers bright yellow, rarely white, 1 in. long, not honeyed, papilionaceous, axillary, solitary or in pairs; pedicels short, slender; *Calyx* campanulate, much shorter than *Corolla*, slightly 2-lipped, upper lip minutely 2-toothed, lower minutely 3-toothed, ebracteate; *Petals* all broad, standard broadly orbicular, marked with honey guides, wings oblong, keel obtuse, often deflected, claws free; *Stamens* 10, 5 long, 5 short, monadelphous, tube entire; *Ovary* superior, 1 carpel; style very long, spirally incurved, smooth or slightly hairy; stigma terminal, minute, capitate; *Fruit* a legume, 1½–2 ins. long, flat, hairy on edges, glabrous on sides, black, valves twisted after dehiscence; *seeds* shining, olive.

Leaves alternate, 1–3 foliate, leaflets obovate, $\frac{1}{4}$ – $\frac{1}{2}$ in. long, entire, shortly petiolate, upper ones sessile, silky; stipules minute; dead leaves brown.

LEGUMINOSÆ

A deciduous *shrub*, 2–6 ft.; *Branches* straight, erect, rigid, prominently angled, without thorns, glabrous or nearly so, green.

Native of Britain. Described by some botanists under name of *Sarothamnus scoparius*. Syns. *Genista scoparia*, *Spartium scoparium*.

LEAD PLANT, *Amorpha canescens*.

Gardens. Light loamy soil and sunny position; frequently cut by winter, but reviving in spring. Propagated by cuttings in autumn, layers in summer, or suckers in winter. July, August.

Flowers dark purplish-blue or violet, in terminal elongated *spicate raceme*, 2–7 ins. long; *Standard* nearly orbicular or obcordate, concave, $\frac{1}{8}$ in. long; *Anthers* golden; *Fruit* a legume, slightly longer than calyx, 1-seeded.

Leaves imparipinnate, 2–4 ins. long, leaflets 21–49, $\frac{1}{3}$ – $\frac{1}{2}$ in. long, ovate-elliptical, approximate, sub-sessile, obtuse or acute, rounded or truncate at base, densely white tomentose, pellucid dots.

A deciduous *shrub*, 1–3 ft.; densely white canescent all over, somewhat straggling.

Native of N. America; introduced from Missouri, 1812. Also called Shoe-strings.

BASTARD INDIGO, *Amorpha fruticosa*.

Gardens, shrubberies. Requires a sheltered situation. June, July.

Flowers dark bluish-purple, small, in a *spicate raceme*, elongated, usually in fascicles at tops of branches, pedicels short; *Corolla* of only one petal—the standard, ovate, concave, emarginate, 2–3 times as long as calyx; *Stamens* exserted, monadelphous below; *Ovary* sessile, 2-celled, style curved, stigma terminal; *Fruit* a legume, $\frac{1}{4}$ – $\frac{1}{3}$ in. long, oblong, acute, curved, glabrous, glandular, thick-stalked, usually 2-seeded, nearly indehiscent.

Leaves imparipinnate, 6–16 ins. long, leaflets 17–21, 1–2 ins. long, elliptic-oblong, obtuse, entire, pellucid dots, lower ones distant from stem; petioles swollen at base.

TREES AND SHRUBS

A deciduous *shrub*, 6–10 ft.; very straggling; *Stems* glabrous or slightly villous; suckers abundant.

Native of N. America; discovered in Carolina, 1724. Generic name from Gr. *a*, not; *morphe*, form, referring to the incomplete formation of the flowers. Known in gardens by sixteen synonyms.

GERARD'S INDIGO, *Indigofera gerardiana*.

Shrubberies, walls. July, August. Requires loamy soil; best in equal parts of loam, leaf-mould and peat. An elegant, slender, much branched shrub, suitable for planting against a south wall. In the open it is usually cut back to the ground in winter. It is propagated by cuttings of firm shoots 2–3 ins. long in pots of sandy peat under bell-glass in heat in summer; seeds are sown in well-drained pots of sandy soil in heat, February–March.

Flowers rosy-purple, papilionaceous, in an axillary raceme of 12–20 flowers; *Calyx* oblique, teeth lanceolate, as long as tube; *Stamens* diadelphous, anthers apiculate; *Ovary* superior, sessile, style short, stigma capitate; *Fruit* a legume, cylindric, straight, slightly hairy.

Leaves alternate, imparipinnate, leaflets elliptic-oblong, obtuse, pale grey-green, glaucous and hoary beneath; stipels setaceous, persistent.

A deciduous *shrub*, 2–3 ft.; much branched.

Native of Himalayas; introduced 1842.

CHINESE KIDNEY-BEAN TREE, *Wistaria chinensis*.

Walls, arbours, sometimes climbing over trees. One of the most beautiful of climbing shrubs, doing well in any good garden soil. Propagated by layers of young shoots in summer, detached in following year. May, June; sometimes again in August.

Flowers bluish-lilac, large, inodorous, in a pendant terminal raceme; bracts very caducous; *Calyx* 5-toothed, 2 upper teeth short and sub-connate, lower ones usually longer; *Corolla* papilionaceous, standard large, 2 parallel ridges

LEGUMINOSÆ

at base, wings oblong-falcate, each with one auricle; *Fruit* an elongated pod, torulose, 2-valved; *seeds* ripen only after warm summers.

Leaves imparipinnate, leaflets ovate, entire, acuminate, in distant pairs, slightly silky.

A deciduous *climber*, 20 ft.

Introduced from China, 1816. Named in honour of Caspar Wistar (1761–1818), Professor of Anatomy in University of Pennsylvania.

LARGE-FLOWERED WISTARIA, *Wistaria multijuga*.

Walls. May, June.

Flowers lilac, with purple wings and keel, smaller than in *W. chinensis*; borne in terminal *racemes* $1\frac{1}{2}$ – $2\frac{1}{2}$ ft. long, somewhat lax; *Fruit* a pod.

Leaves pinnate; leaflets numerous, elliptic-ovate, acuminate.

A deciduous *climber*.

Introduced from Japan, 1874.

ROSE ACACIA, *Robinia hispida*.

Gardens. A rather spiny shrub which flowers profusely, and does well on a trellis or wall. It will thrive in almost any soil except a wet and stagnant one. It is usually propagated by grafting on the False Acacia. May, June.

Flowers deep rose, papilionaceous, large, very showy, inodorous, borne in a loose, nodding, *axillary raceme*; peduncle hispid; *Calyx* hispid; *Fruit* a legume, compressed, almost sessile, hispid, glandular, many sided; valves thin, flat; *seeds* rarely ripened in Britain.

Leaves alternate, imparipinnate, 6 ins. long, leaflets 11–19, ovate or oblong-ovate, rounded or slightly cordate at base, glabrous, shortly petiolate, tipped with long bristle, deep green, 1–2 ins. long.

A deciduous *shrub* or small *tree*, 6–12 ft.; *Branches* spreading, tortuous, very brittle; *Shoots* hispid, purplish-brown.

Native of N. America.

TREES AND SHRUBS

LOCUST, *Robinia neomexicana*.

Gardens. June—August. Robinias may be propagated by cuttings of shoots 6–8 ins. long in ordinary soil in sheltered position outdoors in autumn; layers in September or November; suckers in October or November; seeds in ordinary soil outdoors November or March.

Flowers deep rose, 1 in. long, papilionaceous, in a *raceme*; pedicels slender, $\frac{1}{2}$ in. long, glandularly hairy; *Standard* and wing petals broad; *Fruit* a legume, glandularly-hispid; *seeds* brown, slightly mottled.

Leaves alternate, imparipinnate, 6–12 ins. long, leaflets 15–21, elliptical-oblong, cuneate or rounded at base, apex mucronate, thin, glabrous above, puberulous on midribs beneath, pale blue-green, $1\frac{1}{2}$ in. long, 1 in. broad; petioles pubescent; stipules developing into spines.

A deciduous *shrub* or small *tree*, 15–20 ft.; *Twigs* reddish-brown, puberulous; *Bark* thin, furrowed, brown.

Native of N. America.

LOCUST TREE, *Robinia Pseudacacia*.

Parks, gardens. A very useful tree for town gardens, many handsome old trees being scattered throughout the country. April, May.

Flowers white, papilionaceous, protandrous, fragrant, borne in a loose, pendulous, slender *axillary raceme*, 3–5 ins. long; bracts membranous, very caducous; *Calyx* inferior, 5-partite, spotted, teeth short and broad, 2 upper ones sub-connate; *Petals* 5, standard large, reflexed, naked within; wings falcate-oblong, free; keel incurved, obtuse; *Stamens* 9 united, 1 free; *Ovary* superior, 1-celled, style bent at right angles to ovary, stigma capitate; *Fruit* a legume, 2–3 ins. long, very thin, smooth, dark brown, usually 4–8 seeded, persistent through winter; *seeds* brown, streaked with black.

Leaves imparipinnate, 4–12 ins. long, leaflets 9–19, shortly petiolate, oblong-ovate or elliptical, entire, obtuse or acute, thin, soft, bright green above,



COMMON BROOM (*Cytisus scoparius*)

A. Fruit-bearing branch. B. Flower. C. Pistil. D. Flower, with petals removed, showing the 10 stamens and curved style.

LEGUMINOSÆ

glabrous, glaucous or bluish below, stipules spiny, strong, sharp, persistent for several years. Autumn tint yellow.

A deciduous *tree*, 30-60 ft.; *Branches* long, slender, tortuous, zigzag; *Branchlets* and spray short; *Twigs* olive-brown, very brittle; *Bark* brown, longitudinally furrowed; *Buds* minute, naked, 2-5 hidden in base of petiole; *Wood* hard, strong, fine-grained, durable, but liable to crack; *heart-wood* yellow or greenish.

Native of N. America; introduced 1640-1646. Generic name in honour of Jean Robin, herbalist to Henry IV. of France, and Professor of Botany at the Jardin des Plantes, Paris; he received the first seed from N. America in 1601; the cultivation was continued by his son Vespasian Robin.

CLAMMY LOCUST, *Robinia viscosa*.

Parks, gardens. May, June.

Flowers rose, papilionaceous, nearly inodorous, $\frac{2}{3}$ in. long, in a crowded axillary *raceme*, glandularly-hispid; pedicels slender, hairy; bracts lanceolate, acuminate, dark red, deciduous; *Calyx* dark red, lobes subulate, hairy; Standard of *Corolla* with a pale yellow blotch, wings broad; *Fruit* a legume, linear-lanceolate, glandularly-hispid, 2-3 $\frac{1}{2}$ ins. long.

Leaves alternate, imparipinnate, 7-12 ins. long, leaflets 13-21, ovate, acute, acuminate or mucronate at apex, cuneate or slightly cordate at base, dark green and glabrous above, pale and pubescent beneath, 1 $\frac{1}{2}$ -2 ins. long; petioles and petiolules glandularly-hispid.

A deciduous *tree*, 20-40 ft.; *Branches* slender, spreading; *Twigs* reddish-brown, glandularly-hispid, clammy, viscid; *Bark* smooth, brown tinged with red; *Wood* heavy, hard, close-grained, brown.

Introduced from N. America, 1797.

TREES AND SHRUBS

BLADDER SENNA, *Colutea arborescens*.

Gardens, shrubberies, plantations. May—August. Does well in sandy soil. A quickly-growing shrub with yellow flowers succeeded by bladder-like pods with a reddish tinge. Propagated by cuttings of firm shoots in sandy soil in October; seeds sown outdoors October or March.

Flowers yellow, papilionaceous, in an axillary *raceme* of about 6 flowers on long peduncles; *Calyx* campanulate, teeth acuminate; *Standard* orbicular, with orange blotch, wings small, oblong-lanceolate; *Stamens* diadelphous; style long, curved, hairy; *Fruit* a legume, inflated, tinged with red.

Leaves alternate, imparipinnate, leaflets 9–15, elliptical, retuse, entire, ciliate, underside paler green, densely hairy.

A deciduous *shrub*, 6–12 ft.; rapid in growth; *Twigs* terete, green; *Bark* smooth; *Lenticels* numerous, horizontal.

Native of Mediterranean region; introduced 1570.

ORIENTAL BLADDER SENNA, *Colutea cruenta*.

Gardens, shrubberies. June, July.

Flowers copper-red, papilionaceous, in a 3–6 flowered axillary *raceme*, little shorter than leaves; *Standard* with yellow spot at base; *Fruit* a legume, dry, membranous, oval, inflated, opening at the point, green; tinged with red, ripe in August.

Leaves alternate, imparipinnate, leaflets 9–13, obovate, emarginate or slightly lobed at apex, rounded at base, bright glaucous green above, downy beneath, inserted widely apart; petiole pubescent; stipules small.

A deciduous *shrub*, 4–8 ft.; many stemmed, round headed; young *shoots* pubescent.

Native of Iberian Peninsula and Levant; introduced 1731. Syns. *C. orientalis*, *C. sanguinea*.

LEGUMINOSÆ

SIBERIAN PEA TREE, *Caragana arborescens*.

Gardens, shrubberies. April, May. Thrives in sandy soil, and in dry, gravelly situations, and succeeds better than most shrubs in smoky districts. Propagated by cuttings of roots inserted 3 ins. deep outdoors in October; layers of strong shoots in September; seeds sown outdoors in November or March. Used as a stock for grafting in March.

Flowers yellow, papilionaceous, in a *fascicle*; pedicels 1-flowered; *Calyx* cylindrical teeth acute. Claws of *petals* nearly as long as calyx; standard broad, edges reflexed; keel obtuse, equal in length to wings and standard; *Stamens* diadelphous, anthers uniform; style glabrous, stigma terminal, minute. *Fruit* a legume, linear, valves convex, glabrous, 2 ins. long.

Leaves alternate, paripinnate, leaflets 8-14, oval-oblong, villous, mucronate; petiole unarmed; stipules spinescent.

A deciduous *tree*, 15-20 ft.; *Branches* olive-green; *Buds* chaffy.

Introduced from Siberia, 1752. Called Caragan by the Monguls.

SCORPION SENNA, *Coronilla Emerus*.

Gardens. April—September. Needs well-drained soil and sunny position, doing well on rockwork. Propagated by cuttings in well-drained pots of sandy soil under bell-glass, March-May; seeds in light soil in heat in March.

Flowers bright yellow, reddish before opening, papilionaceous, in 3-5 flowered *umbels* on axillary peduncles; *Petals* with long narrow claw; *Fruit* a lomentum, cylindrical.

Leaves alternate on young shoots, crowded together on other parts, imparipinnate, 2 ins. long, leaflets small, 5-9, obovate or oblong, mucronate, entire, odd leaflet largest.

A deciduous *shrub*, 4-6 ft.; sub-evergreen in mild seasons; *Shoots* slender, green, angled; *Buds* flattened, darkened, hirsute.

Native of S. Europe; introduced 1596. Generic name from L. *corona*, a crown, in reference to the umbellate inflorescence.

TREES AND SHRUBS

SATIN FLOWER, *Hedysarum multijugum*.

Gardens. May—August. Requires a sunny position. Seeds are sown outdoors in April, and seedlings transplanted in June.

Flowers rosy-purple or pale vermilion pink, in an elongated axillary, erect *raceme* of 8–10 flowers; *Fruit* a lomentum.

Leaves alternate, imparipinnate, leaflets 20–40, obovate or oblong, obtuse, underside and petioles silky pilose.

A deciduous *shrub*, 2–5 ft.; loose-growing; *Branches* silky pilose, tortuous; *Bark* scaly; *Twigs* reddish-brown.

Introduced from S. Mongolia, 1883. Generic name from the Greek, used by Dioscorides; specific name=consisting of many pairs of leaflets—*L. multus*, many; *jugum*, a yoke, a pair; *jugo*, -are, I join.

AMUR YELLOW WOOD, *Cladrastis amurensis*.

Gardens. July. Does well in sandy soil in open shrubberies or against walls. Propagated by cuttings of roots outdoors in spring; seeds in ordinary soil outdoors in March.

Flowers greenish-white, papilionaceous, small, in a long, dense, erect *raceme*; pedicels short; *Fruit* a legume; *seeds* ripen only in hot seasons.

Leaves alternate, imparipinnate, leaflets 7–9, ovate-oblong, greyish-green, silky pubescent when young.

A deciduous *shrub*, 8 ft., or small *tree*; *Bark* olive-green, peeling in old trees.

Introduced from Amur Valley, 1878.

VIRGINIAN YELLOW WOOD, *Cladrastis tinctoria*.

Gardens. Does well in warm moist soil, in open shrubberies or singly on lawns. May.

Flowers white, papilionaceous, in a dense drooping paniced *raceme*, 12–14



BLACKTHORN (*Prunus spinosa*)

Flowers and fruit.

LEGUMINOSÆ

ins. long, bracteate and bracteolate; *Calyx* persistent, teeth 5, short, obtuse; *Stamens* 10, all distinct, filaments slender; anthers versatile; *Ovary* subsessile; style incurved. *Fruit* a legume, ripening only in hot summers, 2 ins. long, flat.

Leaves alternate, imparipinnate, 12–18 ins. long in young specimens, in older trees about half that size, leaflets 5–11, oval or ovate, entire, acuminate, shortly petiolate, nearly glabrous, bright green. Autumn tints bright golden-yellow, orange, crimson.

A deciduous *shrub*, 8 ft.; *Branches* slender, spreading, pendulous; *Bark* silvery-grey or light brown, smooth; *Buds* concealed in petioles; *Wood* clear yellow colour, splitting with difficulty; valuable as fuel, yielding yellow dye.

Introduced from N. America, 1812; there makes a round-headed tree, 20–30 ft. Synonymous with *Virgilia lutea*.

JAPANESE PAGODA TREE, *Sophora japonica*.

Parks, gardens. August, September. This forms a beautiful dense, round-headed tree, somewhat resembling a Robinia, showing to best advantage on an open sheltered lawn. It likes a deep, rich, loamy soil. It is the latest flowering of our large trees, noticeable in spring through its graceful bluish-green foliage, and made conspicuous in winter by the deep green of its young shoots. Propagated by cuttings in sandy soil in March; seeds in light soil in April. Used as a stock for grafting the weeping variety in March.

Flowers creamy-white, papilionaceous, in a loose terminal *panicle*, bracts small; much sought after by bees when fallen to ground; *Calyx* oblique, teeth short; *Ovary* shortly stipitate, stigma terminal, minute; *Fruit* a pod, moniliform, indehiscent; *seeds* rare in Britain.

Leaves imparipinnate, petiolate, exstipulate, leaflets 9–15, oblong-ovate, entire, acute, dark bluish-green.

A deciduous *tree*, 30–80 ft.; *Branches* spreading, massive, naked young wood dark green; *Roots* deep; *Bark* rough; growth rapid.

Native of China; seeds first sent by Father d’Incarville to Bernard de

TREES AND SHRUBS

Jussien (1747); first grown in England by Gordon at Mile End Nursery, 1753. Generic name altered from *Sophoro*, the Arabic for a papilionaceous-flowered tree.

BRASILETTO, *Cæsalpinia japonica*.

Gardens, shrubberies. April—June. Best on wall; prefers loamy soil. This is a very attractive and beautiful loose rambling shrub, the long flexible shoots being furnished with reddish hooked prickles. It is propagated by seeds sown in sandy soil in a cold frame at any time.

Flowers bright canary-yellow, in a terminal erect *raceme*; pedicels alternate, filiform; *Calyx* 5-cleft, turbinate, imbricate; *Petals* 5, nearly equal, upper shortest; *Stamens* 10, free, anthers uniform, reddish; *Ovary* superior; *Fruit* a legume, compressed, not winged, coriaceous, indehiscent.

Leaves alternate, bipinnate, 1 ft. long, leaflets sub-sessile, oblong, obtuse, entire, glabrous, bright green; petioles prickly.

A deciduous *shrub*, 6–8 ft.; *Stems* with curved spines; *Branches* straggling, spiny; *Twigs* reddish-brown.

Introduced from Japan, 1888. Named in honour of Andreas Cæsalpinus, an Italian botanist (1519–1603).

KENTUCKY COFFEE-TREE, *Gymnocladus canadensis*.

Parks, gardens. May—July. A handsome deciduous tree, made attractive by the size and elegance of its leaves. It prefers a well-drained loamy soil, and does best in a shady shrubbery or on a lawn. It is propagated by root-cuttings inserted 2 ins. deep in a shady position in October or March; seeds are sown in light soil in a shady position outdoors in autumn or spring.

Flowers greenish-white, regular, diœcious; *Males* in a short terminal *racemose corymb*, 3–4 ins. long; *Females* in a *raceme*, 10–12 ins. long; bracts scarious, caducous; *Calyx* tubular, 10-ribbed, 5-lobed, lanceolate, acute;

LEGUMINOSÆ

Petals 4–5, oblong, keeled, pilose on back, grooved, tomentose inner surface; *Stamens* 10, free, shorter than petals, on margin of disk, anthers orange; *Ovary* 1-celled, hairy; stigma 2-lobed; *Fruit* a legume, 6–10 ins. long, 1½–2 ins. wide, dark red-brown, glaucous, 2-valved, pulpy; *seeds* ¾ in. long; formerly used as substitute for coffee.

Leaves 5–9 pinnate, 1–3 ft. long, 18–24 ins. wide, pinnæ with 6–14 leaflets, usually alternate, ovate, acute or mucronate, cuneate or rounded at base, shining bronze-green, paler beneath, 2–2½ ins. long, 1 in. wide; petioles long; stipules lanceolate or obovate, glandular-serrate. Autumn tint yellow.

A deciduous *tree*, 50–60 ft.; *Branches* few, thick; *Twigs* pubescent; *Bark* deeply fissured, dark grey tinged with red; *Wood* heavy, strong, coarse-grained, durable, light brown tinged with red.

Introduced from U.S. America, 1748; there reaches 110 ft. Generic name from Gr. *gymnos*, naked, and *klados*, a branch; referring to naked appearance of branches in winter.

HONEY LOCUST, *Gleditsia triacanthos*.

Parks, gardens. June. This is a handsome tree, whose trunk and branches are armed with formidable spines, often 3 ins. long. It thrives well in the neighbourhood of smoky towns, doing best in sheltered borders or shrubberies. It may be propagated by seeds sown in light soil outdoors in March, the young plants being transplanted when two years old.

Flowers greenish, regular, polygamous, minute; *Male racemes* many-flowered, pubescent, 2–2½ ins. long, often fascicled; *Female racemes* few-flowered, 2½–3½ ins. long, usually solitary; *Calyx* campanulate, 3–5-lobed, lobes acute, revolute, ciliate, villose; *Petals* 3–5, nearly equal, erect; *Stamens* 6–10, inserted on margin of disk, filaments pilose, anthers green; *Ovary* sub-sessile, rarely of 2 carpels; style short, stigma terminal; *Fruit* a legume, linear-oblong, 12–18 ins. long, many-seeded, indehiscent, dark brown, pilose, twisted, succulent pulp.

Leaves paripinnate, leaflets 18–28, or sometimes bipinnate with 4–7 pairs of pinnæ, leaves 7–8 ins. long; leaflets obtuse or acute, crenate, linear-oblong,

TREES AND SHRUBS

dark shining green above, dull yellow green below, 1-1½ ins. long, ½ in. wide; petioles long; stipules minute, caducous. Autumn tint pale yellow.

A deciduous *tree*, 30-50 ft.; *Branches* slender, spreading, somewhat pendulous; *branchlets* red to greenish-brown; spines simple or trifid; *Bark* deeply fissured; *Wood* hard, strong, coarse-grained, durable, red or red-brown.

Introduced from N. America, 1700; there reaches 140 ft. Generic name in honour of Johann Gottlieb Gleditsch (1714-1786), Director of Botanic Gardens at Berlin; specific name from Gr. *tri*, three, and *akanthos*, a prickly plant; said to be the only leguminous plant without root-tubercles of nitrifying bacteria.

REDBUD, *Cercis canadensis*.

Gardens, shrubberies. April, May. An ornamental tree with leaves of a very uncommon shape. It prefers a rather light, rich soil, doing best in a warm, sheltered shrubbery, and in the north should have the protection of a wall. The species are propagated by layers of strong shoots in September or October; or better still by seeds sown in light sandy soil in gentle heat in March, transplanting seedlings outdoors in June.

Flowers red, papilionaceous, ½ in. long, in *umbellate fascicles*, less crowded, 4-8 together, pedicels longer than *C. Siliquastrum*; *Calyx* campanulate, 5-toothed; *Keel of Corolla* longer than wings; *Stamens* 10, free; anthers versatile; *Fruit* a legume, thin, flat, pink or rose, 2-3 ins. long, ½ in. wide, pedicels short.

Leaves alternate, ovate, cordate at base, entire, acute or acuminate, petiole, petioles 2-5 ins. long, thick, glabrous, villous in axils of veins beneath, rich dark green, 2-6 ins. broad; stipules small, membranous, caducous.

A deciduous *shrub* or small *tree*, 12-20 ft.; *Branches* stout; *Twigs* slender, glabrous, angled; *Bark* red-brown, fissured, scaly; *Wood* hard, weak, dark reddish-brown.

Native of N. America; introduced 1730. Also called American Judas Tree.



COMMON BROOM

(*Cytisus scutellarioides*)

ROSACEÆ

JUDAS TREE, *Cercis Siliquastrum*.

Gardens, shrubberies. Thrives in rich sandy loam, and best on a wall in cold localities. This is one of the oldest of exotic trees, and is a most beautiful object in May, when its twigs, and even large branches and trunk, are wreathed with rose-purple flowers, while later on its long red-brown pods form a striking contrast with the bluish-green foliage. May, June.

Flowers rose-purple, papilionaceous, $\frac{5}{8}$ in. long, appearing before leaves are fully developed; buds pale red; pedicels 1-flowered, arising from trunk and branches in densely-crowded fascicles; *Fruit* a legume, thin, flat, 4-6 ins. long, red-brown; *seeds* rarely ripening in this country.

Leaves alternate, simple, cordate, irregular, somewhat reniform, obtuse, emarginate, glabrous, bluish-green, petioles long.

A deciduous *shrub* or small *tree*, 20-35 ft.; *Branches* erect, head flat, spreading; *Bark* rough, furrowed; *Lenticels* numerous; *Buds* obtuse, scales brown; *Wood* hard, marked with black, green, and yellow on a grey ground; susceptible of high polish.

Native of S. Europe and W. Asia; cultivated by Gerard in 1596. Called also Red-bud and Love-tree. Generic name from Gr. *kerkis*, a shuttlecock, name given by Theophrastus. Specimen at Bath possibly 300 years old.

CLASS I.	.	.	.	.	<i>Dicotyledons</i>
DIVISION II.	.	.	.	.	<i>Calycifloræ</i>
NATURAL ORDER.	.	.	.	.	<i>Rosaceæ</i>

Herbs, shrubs, or trees, with usually alternate, stipulate leaves, sometimes glandularly serrate, simple or compound; stipules usually 2, petioles often glandular; *Flowers* usually regular and hermaphrodite, mostly red, white, or yellow; *Calyx* usually inferior, gamosepalous, and 5-lobed, with the odd lobe posterior; imbricate, and persistent, sometimes with an epicalyx; a disk usually lining the calyx or surrounding the orifice; *Petals* as many as calyx-

TREES AND SHRUBS

lobes, sometimes wanting, perigynous, imbricate, deciduous; *Stamens* usually indefinite; perigynous *Ovary* superior, or becoming inferior by upgrowth and adhesion of receptacle, carpels 1 or numerous; *Fruit* variable, superior or more or less inferior, naked or included within the persistent calyx-tube; a cynarrhodium of achenes, an etærio of follicles or drupes, or a pome.

An order of 1000–1500 species. Distinguished from Ranunculaceæ by the perigynous stamens and persistent calyx, and from Leguminosæ by the posterior odd calyx-lobe.

ALMOND, *Prunus Amygdalus*.

Gardens, shrubberies. March, April. One of the earliest and loveliest of spring-flowering trees. It will flourish in any garden soil, preferring that in which there is lime. Old and dead wood should be removed in December. Propagated by stones sown 6 ins. deep in open ground in October, and by grafting on young seedling plum-trees in March.

Flowers white or rose, appearing before leaves, protogynous, solitary or in pairs, pedicels short, axillary, *Calyx* green, 5-lobed, tube purplish, lined with a wavy disk; *Petals* 5; *Stamens* indefinite; *Ovary* superior, 1-celled; *Fruit* a drupe; epicarp a dry fibrous husk, with velvety pubescence, separating irregularly into two valves; stone pitted with irregular furrows.

Leaves alternate, oblong-lanceolate, petiolate, serrated, lower teeth glandular, glabrous, hairy beneath when young, $1\frac{3}{4}$ –4 ins. \times $\frac{3}{4}$ –1 in. Autumn tints red and yellow.

A deciduous tree, 10–30 ft.; *Branches* slender, spreading; *Twigs* brown; *Bark* rough and peeling; *Buds* small, conical, scales red-brown.

Introduced from Barbary, 1548; Syn. *Amygdalus communis*. Specific name from Gr. *Amygdale*, an almond, *amysso*, to scratch, referring to channel in stone of fruit.

ROSACEÆ

WILD PLUM, *Prunus communis*.

Copses, hedgerows. March, April.

Flowers white, appearing with leaves; pedicels solitary or in pairs, glabrous; *Fruit* a drupe, oblong, variable in shape and colour, pendent, 1-1½ in. diam.

Leaves ovate-lanceolate; downy on ribs beneath, convolute, acute, crenated or biserrate, petiolate; stipules linear, persistent.

A deciduous *tree*, 20 ft.; *Branches* straight, without spines; *shoots* glabrous; *Bark* brown; *Twigs* glabrous, slightly angular above, red, passing to grey; *Buds* conoid-pointed; *Wood* used in small turnery.

Found in an apparently wild state, being self-sown, but not truly indigenous; Syn. *P. domestica*. Name Plum from A.S. *plume*, a plum; L. *prunus*, a plum.

Insects injurious to Plums:—*Bark*—Fruit-tree Bark Beetle (*Scolytus rugulosus*), Mussel Scale (*Mytilaspis pomorum*); *Leaves*—Plum Aphis (*Aphis pruni*), Oblong Weevil (*Phyllobius oblongus*), Vapourer Moth (*Orygia antiqua*), Winter Moth (*Cheimatobia brumata*), March Moth (*Anisopteryx æscularia*), Cherry and Pear Saw-fly (*Selandria atra*); *Wood*—Shot-borer Beetle (*Xyleborus dispar*), Goat Moth (*Cossus ligniperda* or *Trypanus cossus*), Wood Leopard Moth (*Zeuzera æsculi* or *Z. pyrina*).

Fungoid Pests:—Plum-tree Rust (*Puccinia Pruni*), Plum Pockets or Bladder Plums (*Exoascus insititiæ*), Plum-tree Mildew (*Podosphaera tridactyla*).

BULLACE, *Prunus insititia*.

Woods, thickets, hedges. March, April.

Flowers white, as in Sloe, but appearing with leaves; pedicels in pairs, downy; *Petals* broader; *Fruit* a drupe, globose, glabrous, black or yellow, drooping, ¾-1 in. diam.

Leaves ovate or ovate-lanceolate, downy beneath, larger, broader, more coarsely toothed, convolute, acute, serrate, pubescent, become glabrous above, 1¾-2½ ins. × 1-1¼ in.; stipules linear, pubescent.

A deciduous *shrub*, 10-15 ft.; *Branches* round, only slightly spinous,

TREES AND SHRUBS

straight; *Bark* brown; *Twigs* pubescent, red, green, passing to grey; *Buds* long conoid, scales ciliate.

A questionable native of Britain; probably in many instances an escape from cultivation.

Name from Middle English *bolas*; Old French *beloce*, a bullace.

“Witch Knots” sometimes caused by presence of *Exoascus insititæ*. “Bladder plums” produced by the same fungus.

BLACKTHORN OR SLOE, *Prunus spinosa*.

Woods, thickets, hedges. Gilbert White remarks that “this tree usually blossoms while cold north-east winds blow, so that the harsh, rugged weather obtaining at this season is called by the country people blackthorn winter.” In places where the Blackthorn grows abundantly, as in the impenetrable undergrowths of Epping Forest, its effect is singularly striking, large tracts appearing as if a snowstorm had passed over, loading the branches with a white mantle. March, April:

Flowers white, appearing before or with the leaves, protogynous, $\frac{1}{2}$ – $\frac{3}{4}$ in. diam., single or two together, on short glabrous peduncles; *Calyx* 5-lobed, inferior, glabrous, deciduous; *Petals* 5, obovate; *Stamens* 15–20, perigynous; *Ovary* of 1 carpel, superior, 1 terminal style; *Fruit* a globose, fleshy drupe, erect, with a hard, smooth, or rugged stone; nearly black, with bluish bloom, $\frac{1}{2}$ in. diam., very astringent.

Leaves alternate, variable, ovate or oblong, petiolate, finely serrated, usually glabrous, acute or obtuse, $1\frac{1}{4}$ – $2\frac{1}{2}$ ins. \times $\frac{1}{2}$ – $1\frac{3}{4}$ in. Autumn tints yellow to reddish.

A deciduous *shrub*, 10–15 ft.; much branched; *Branches* irregular, spinous, very tough; *Bark* black; *Twigs* red-brown passing to black, rigid, much branched; *Buds* minute, scales nearly glabrous, brown-red; *Stems* used as walking-sticks.

Indigenous in Britain. Some authorities consider this to be the parent of the Damson.



COMMON LAUREL (*Prunus Laurocerasus*)

A. Flowering branch. B. Fruit. C. Longitudinal section of drupe.

ROSACEÆ

Insect Pests:—Mottled Umber Moth (*Hibernaria defoliaria*), March Moth (*Anisopteryx æscularia*).

Leaves attacked by Plum Powdery Mildew (*Uncinula Prunastri*), Plum-leaf Blotch (*Polystigma rubra*). Galls occur on the leaves of Sloe, Bullace, Damson, Greengage, and Plum, caused by a Mite (*Eriophyes similis*).

GEAN, *Prunus Avium*.

Woods. May, June.

Flowers white, up to 1½ in. diam., in an *umbel*; *Calyx tube* contracted at mouth, lobes entire; *Corolla* open, petals deeply notched, almost obovate, flaccid; *Stamens* and *Pistil* maturing simultaneously; *Fruit* a drupe, heart-shaped, black or red, sweet or bitter, not very juicy, staining.

Leaves broadly oval, large, drooping, acuminate, sharply serrate, pubescent beneath, flaccid, thin, two glands at base, pale green, 2–5 ins. × 1¾–2½ ins., petiole long. Autumn tints orange-red, yellow, crimson-red, brown.

A deciduous *tree*, 10–40 ft.; *Branches* short, stout, satiny, peeling, erect; no suckers; a fast-growing tree; *Wood* reddish, fine-grained, tough, used for tool-handles and cabinet-work.

Native of Britain. Thought by some to be the parent of our Black Heart Cherries.

WILD OR DWARF CHERRY, *Prunus Cerasus*.

Woods, thickets, hedgerows. This light and graceful tree, with somewhat scanty foliage, is made conspicuous in spring by its beautiful clusters of white blossoms, and again in autumn, when the crimson hue of its fading foliage irresistibly catches the eye. May, June.

Flowers white, protogynous, resembling Blackthorn, flowering before leaves, in an almost sessile *umbel* of 2, 3, or more flowers on pedicels 1–2 ins. long; buds surrounded by brown scales, the inner ones often becoming leaf-like; *Calyx tube* not contracted, lobes crenate; *Corolla* cup-shaped; *Petals*

TREES AND SHRUBS

slightly notched, oval, firm, sub-erect; *Fruit* a drupe, globular, red or black, without bloom, acid, juicy, not staining.

Leaves alternate, ovate, or ovate-oblong, shortly petiolate, erect, crenate-serrate, acuminate, glabrous, coriaceous, 2-4 ins. long; usually 1-2 glands at top of petiole, or base of blade, dark blue-green, stipules narrow, often toothed and glandular, very deciduous. Autumn tint crimson.

A deciduous *shrub*, 6-8 ft., or a *tree*, 30-80 ft.; *Suckers* produced freely from the rhizomes; *Branches* red, slender, and drooping; *Bark* reddish; *Twigs* glabrous, slender, pendent; *Buds* small, scales brown, smooth; *Wood* strong, fine-grained, reddish, easily polished, used for small turnery and pipes.

Thought to be the parent of our Kentish and Morello cherries. English name Cherry derived from Old Northern French *cherise*; Old French *cerise*; L. *cerasus*; Gr. *kerasos*.

Chief insects injurious to cultivated Cherries:—*Bark*—Fruit-tree Bark Beetle (*Scolytus rugulosus*); *Fruit*—Garden Chafer (*Phyllopertha horticola*), Mottled Umber Moth (*Hybernia defoliaria*); *Leaves*—Cherry Aphis (*Myzus cerasi*), Cockchafer (*Melolantha vulgaris*), Winter Moth (*Cheimatobia brumata*), Cherry and Pear Saw-fly (*Selandria atra*). Fungoid Pest:—Witches Broom (*Exoascus Cerasi*).

BIRD CHERRY, *Prunus Padus*.

Woods, thickets, hedges. In its wild state this rarely attains the dimensions of a tree, but in cultivation may reach a height of 30 ft. or more. Some of the varieties have racemes of blossoms 6-8 ins. in length. May, June.

Flowers white, resembling the Blackthorn, $\frac{1}{2}$ - $\frac{3}{4}$ in. diam., erect when first open, drooping after fertilisation, of short duration, protogynous; *Inflorescence* a loose pendulous axillary *raceme*, 2-6 ins. long, on previous year's wood; pedicels $\frac{1}{4}$ in. long, erect in fruit, bracts linear, deciduous; *Calyx lobes* obtuse, glandular-serrate; *Petals* notched at edges; *Fruit* a small drupe, globular, black, polished, very bitter-sweet, not very juicy, staining; stone wrinkled.

Leaves oval or ovate-lanceolate, slightly cordate at base, biserrate, acuminate,

ROSACEÆ

thin, glabrous, serrations not glandular, 2-4 ins. long; 2 glands on petiole, stipules linear-subulate, glandularly serrate. Autumn tints greenish-yellow to reddish.

A deciduous *shrub*, 6-8 ft., or a *tree*, 10-30 ft.; *Bark* glabrous, grey, astringent; *Twigs* red-brown, stiff, erect, glabrous; *Buds* large, ovoid, pointed, scales brown.

Indigenous in various parts of Britain; not found in south of England; leaves often eaten by gregarious larvæ of Small Ermine Moth (*Hyponomeuta evonymella*).

COMMON OR CHERRY LAUREL, *Prunus Lauro-cerasus*.

Shrubberies, gardens. April, May. Best in sheltered situations and in deep rather light soil. Propagated by cuttings of ripe shoots 6 ins. long in cold frame in September; pruning should be done in April.

Flowers white, small, fragrant, produced after young leaves, in an erect axillary *raceme*, shorter than leaves; *Calyx* tubular; *Petals* spreading; *Stamens* numerous; *Carpels* superior, solitary; *Fruit* a drupe, ovate-acute, green at first, afterwards black, bitter, ripe in October.

Leaves alternate, ovate-lanceolate, petiolate, distantly serrated, slightly acuminate, glabrous, coriaceous, shining, lighter green beneath, 4-6 ins. long, $1\frac{1}{4}$ - $1\frac{3}{4}$ in. wide; smelling of bitter almonds when crushed; 2-4 glands near base of lamina; dying leaves yellow and brown.

An evergreen *shrub*, 10-12 ft., or sometimes 20-30 ft.; *Bark* dark green; *Shoots* green; *Buds* small, green.

A native of Asia Minor; introduced about 1576; liable to be cut down by severe frosts; growth rapid. Name Laurel from "M.E. *lorel, lorer, laurer*; O.F. *lorier* (F. *laurier*), a laurel-tree; L. *laurum*, acc. of *laurus*, a laurel-tree" (Skeat). Insects may be killed by being dropped into a closed box or bottle containing the bruised leaves.

TREES AND SHRUBS

PORTUGAL LAUREL, *Prunus lusitanica*.

Shrubberies. A fine evergreen of very hardy growth, able to resist severe frost. June.

Flowers white, resembling Common Laurel, in an erect axillary *raceme*, longer than leaves; *Fruit* a drupe, ovate, red.

Leaves ovate-lanceolate petiolate, serrated, thin, hard, not glandular, dark green, pendent, not scented of almonds, petioles purplish.

An evergreen *shrub*, or *tree*, 10-25 ft.; *Branches* erect, spreading; *Buds* and twigs purple-red; *Bark* on old trees rough.

A native of Portugal; there 40-60 ft.; introduced, 1648. More hardy than Common Laurel; and one of the most elegant shrubs.

OSO BERRY, *Nuttalia cerasiformis*.

Gardens, shrubberies. February, March. A very pretty and exceptionally free-flowering shrub, one of the first to bloom. Its short, stiff, pendulous racemes have much the appearance of a Currant. It likes a rich soil and sheltered position. It is usually propagated by suckers planted in October or November; seeds may be sown in shady position outdoors in spring or autumn. Necessary pruning should be done immediately after flowering.

Flowers dull white, diœcious in an axillary drooping *raceme*; *Calyx* gamosepalous, 5-lobed, inferior; *Petals* 5, perigynous; *Stamens* 15, perigynous; *Ovary* superior, carpels 5; *Fruit* a drupe, coriaceous, purple bloom, 5 carpels, 2-3 seeds; not often fruiting in England.

Leaves alternate, obovate, petiolate, obtuse or acute, entire.

A deciduous *shrub*, 5-8 ft.; nearly globose, branching freely; *Suckers* abundant; *Twigs* brown; *Buds* yellow-green.

Native of California; introduced 1848. Genus named after Thomas Nuttall, a North American botanist; died 1859.



DEWBERRY (*Rubus cœsius*)

Flower and fruit.

ROSACEÆ

BEAUTIFUL NEPAL SPIRÆA, *Spiræa bella*.

Gardens. The genus *Spiræa* contains many hardy shrubs, of which about sixty are given as being cultivated at Kew. They thrive well in open sunny borders or shrubberies. Straggly shoots should be cut back moderately short directly after flowering. Propagation is carried on by means of cuttings of young shoots inserted in sandy soil under hand-light or in a frame in shade in summer; also by offsets planted in autumn. May, June.

Flowers rosy-red, unisexual, in a loose terminal *corymbose cyme*, pubescent; *Calyx* lobes deflexed, persistent; *Stamens* indefinite, on a fleshy disk; disk adnate to calyx; *Carpels* 5; *Fruit* an etærio of follicles, 5 reddish, shining glabrous carpels, ripe in September.

Leaves alternate, ovate, sharply serrated, acute, light green, glabrous on upper surface, glaucous beneath, principal veins on underside pubescent, $\frac{1}{2}$ -2 ins. long, petioles long.

A deciduous *shrub*, 3-4 ft.; *Stems* flexuose, glabrous, red; *Branches* loose, slender, spreading, downy.

Native of Nepal and Bhootam; introduced 1820.

Spiræa bullata.

Gardens, rockeries. A good dwarf shrub for the rock-garden or sunny banks. July.

Flowers rosy-carmine, in a terminal *corymb*, much branched; pedicels short, villous; bracteolate; *Fruit* an etærio of follicles.

Leaves alternate, sub-sessile, ovate-oblong, crenate, dark green and bullate above, paler beneath, coriaceous, glabrous, nerves pinnate, prominent on underside.

A deciduous *shrub*, 1-1 $\frac{1}{2}$ ft.; *Branches* erect, wiry, cylindrical, red-brown down.

Native of Japan. Syns. *S. crispa*, *S. crispifolia*. Specific name refers to the blistered or puckered leaves (L. *bullata*, a bubble).

TREES AND SHRUBS

HOARY SPIRÆA, *Spiræa canescens*.

Gardens. A very free-flowering shrub with hoary stems. June, July.

Flowers white or pale pink, in a *corymb*, pedicels slender, unibracteate; *Calyx* campanulate, 5-lobed, green, yellowish-green ring at base of sepals; *Corolla* of 5 petals, obovate; *Stamens* indefinite, perigynous, inserted under yellow disk, filaments white, anthers yellow; *Styles* 5; *Fruit* an etærio of follicles.

Leaves alternate, oval or obovate, obtuse, entire, villous.

A deciduous *shrub*, 5-8 ft.; *Stems* erect, branched, arching, hoary.

Introduced from Himalayas, 1879. Twenty-four synonyms in Kew List.

GERMANDER-LEAVED SPIRÆA, *Spiræa chamædrifolia*.

Gardens. June, July.

Flowers white, in a terminal hemispherical *corymb*; pedicels slender, elongated; *Sepals* reflexed; *Fruit* an etærio of follicles.

Leaves alternate, exstipulate, petiolate, ovate, acute, deeply serrated at apex, pubescent, pale green.

A deciduous *shrub*, 1-2 ft.; dense, twiggy.

Widely distributed through Europe, Asia, America; introduced 1789.

WHITE-BEAM-LEAVED SPIRÆA, *Spiræa discolor*.

Gardens, shrubberies, lawns. This most graceful of all Spiræas, when covered with its plume-like panicles of creamy-white blossoms, is indeed worthy of its name of Spray Bush. Its silvery foliage makes it a very distinct species. It is easily established in almost any soil, and makes strong and rapid growth. July.

Flowers creamy-white, in a many-flowered, terminal, nodding *panicle*; *Calyx* inferior, 5-lobed, persistent; *Petals* 5; *Stamens* numerous, perigynous, longer than petals; *Ovary* superior, carpels 5, 1-valved, cartilaginous, free; *Fruit* an etærio of follicles.

ROSACEÆ

Leaves alternate, cuneate at base, petiolate, rigid, dark green above, silvery beneath; those on young shoots resembling the Hawthorn.

A deciduous *shrub*, 6-12 ft.; much branched; *Branches* erect; *Twigs* light brown; *Buds* reddish, hirsute.

Introduced from N.W. America, 1827. Synonymous with *S. aricefolia*.

DOUGLAS'S SPIRÆA, *Spiræa Douglasi*.

Gardens. July, August. Prefers damp soil. A very desirable, hardy, and free-growing shrub, throwing out young shoots from the base of the stem, so that by lifting and dividing a plant great numbers of young specimens may be obtained.

Flowers rosy-red, in a dense, terminal, *thyrsoid panicle* 6-9 ins. long; flowers nearly sessile; *Calyx* golden; *Corolla* rose-red; *Stamens* inserted on calyx, long exserted, filaments and anthers rose-red; *Styles* 5, white, stigmas capitate; *Fruit* an etærio of follicles.

Leaves alternate, simple, oblong-lanceolate, obtuse, serrulated towards apex, downy beneath, dark green above, petioles short.

A deciduous *shrub*, 3-6 ft.; *Branches* erect, young shoots pubescent.

Introduced from N.W. America, 1840.

JAPANESE SPIRÆA, *Spiræa japonica*.

Gardens. A handsome species of erect growth, and probably the best known. June—September.

Flowers rosy-red, in a terminal flat *corymb*; *Fruit* an etærio of follicles.

Leaves alternate, simple, lanceolate, acute, serratures thickened at tips, glabrous, young leaves red.

A deciduous *shrub*, 4-6 ft.; young shoots red.

Native of Japan; introduced 1859. Synonymous with *S. callosa* and *S. Fortunei*. Many varieties in gardens.

TREES AND SHRUBS

LINDLEY'S SPIRÆA, *Spiræa lindleyana*.

Gardens. July—September. One of the largest and most handsome species, thriving best in a deep, moist soil, but also doing well on warm chalky soils, especially near water. It produces suckers freely, and may be easily propagated from seed.

Flowers white, small, in a large terminal *panicle*, very feathery, 2-3 ft. long, overhanging; *Calyx* white, campanulate, 5-toothed, recurved; *Stamens* numerous, filaments white; *Styles* 5, capitate, spreading; *Fruit* an etærio of follicles; carpels coriaceous, cohering at base, completely splitting into two halves, prominent smooth keel down back.

Leaves alternate, imparipinnate, 1 ft. or more in length, leaflets 11-23, 3-5 ins. long, 1¼ in. wide, sessile, ovate-lanceolate, acuminate, coarsely serrated, glaucous beneath, membranous, petioles stout, purplish-red.

A deciduous *shrub*, 4-15 ft., pyramidal; *Branches* ascending; *Twigs* green; *Bark* rough; *Lenticels* conspicuous; *Buds* ovoid, scales green.

Native of Nepaul; introduced 1840.

INTERMEDIATE SPIRÆA, *Spiræa media*.

Gardens. This forms a somewhat erect, freely-branched shrub, clothed with rather pale glaucous green leaves, and studded with corymbs of white blossoms. May, June.

Flowers white, in a terminal *corymb*, 12 ins. or more long; *Stamens* longer than petals; *Fruit* an etærio of follicles.

Leaves alternate, elliptic-lanceolate, acute, slightly serrated, rarely entire, hairy beneath, leaves on flowering and sterile branches similar.

A deciduous *shrub*, 5-8 ft. dense; *Branches* terete, sub-erect.

Native of Europe and Northern Asia. Syn. *S. confusa*.

ROSACEÆ

PRUNUS-LEAVED SPIRÆA, *Spiræa prunifolia flore-pleno*.

Gardens. A very beautiful early-flowering shrub, more often grown than the single type. April.

Flowers white, doubled like little rosettes, in *fascicles* along branches; pedicels 1-flowered, of unequal length.

Leaves alternate, small, connate at base, irregularly serrated in upper half, glabrous. Autumn tint scarlet.

A deciduous *shrub*, 3 ft.; *Branches* long, slender, arching.

Introduced from Japan, 1845.

WILLOW-LEAVED SPIRÆA, *Spiræa salicifolia*.

Moist woods, plantations. June—August.

Flowers pink or rosy, small, in a dense, terminal, sub-cylindric *racemose cyme*; *Calyx* inferior, 5-lobed, persistent; *Petals* 5; *Stamens* numerous, perigynous; *Ovary* superior, carpels 5, free; *Fruit* an etærio of follicles.

Leaves alternate, simple, oblong-lanceolate, serrate, glabrous, green on both sides, 2–3 ins. long.

A deciduous *shrub*, 3–5 ft., erect; *Stem* stoloniferous; *Suckers* numerous; young *shoots* glabrous.

Naturalised in N. England and S. Scotland; used in hedges in N. Wales. Generic name from Gr. *speiras*, to wind (garlands); specific name from L. *salix*, *-icis*, the willow; *folium*, a leaf.

SORBUS-LEAVED SPIRÆA, *Spiræa sorbifolia*,

Gardens. Prefers cool, moist soil. July, August.

Flowers white, in a *thyrsoid panicle*; *Sepals* reflexed; *Petals* spreading; *Stamens* numerous, nearly $\frac{1}{2}$ in. long; *Styles* 5, one-third the length of stamens; *Fruit* an etærio of follicles; keel indistinct, hairy.

Leaves alternate, stipulate, imparipinnate, 6–10 ins. long, leaflets 13–25, sessile,

TREES AND SHRUBS

lanceolate, doubly and sharply serrated, bright green. 2–4 ins. long, petioles purplish-red on upper side.

A deciduous *shrub*, 3–6 ft; *Branches* stiff, spreading; *Suckers* freely produced; *Twigs* terete.

Native of N. Europe and Asia; introduced 1759.

THUNBERG'S SPIRÆA, *Spiræa Thunbergi*.

Gardens. The earliest to flower. It likes a rich open soil, with plenty of moisture and full sunshine, and will then produce its blossoms literally in thousands. February—May.

Flowers white, very small; resembling Hawthorn; axillary, mostly ternate, along length of shoots; *Ovary* free, not inflated; *Fruit* an etærio of follicles.

Leaves alternate, simple, linear or linear-lanceolate, acute, attenuated both ends, serrulated, rarely entire, glabrous both sides, exstipulate. Autumn tint crimson.

A deciduous *shrub*, 1–3 ft.; *Branches* very slender, slightly drooping; *Buds* minute.

Native of China and Japan.

NINE-BARK, *Neillia opulifolia*.

Shrubberies. June. A handsome shrub with flowers resembling a Spiræa. It does well in open sunny shrubberies or on banks, and should be moderately pruned after blooming. Propagated by cuttings of firm shoots, 2–3 ins. long, inserted in sand under bell-glass at any time; seeds may be sown in sandy soil in sheltered position outdoors in autumn or spring.

Flowers white or purplish, in a terminal *umbellate corymb*, nearly spherical, many flowered, 1–2 ins. diam.; pedicels slender, glabrous, or slightly pubescent, $\frac{1}{2}$ – $\frac{3}{4}$ in. long; *Calyx* campanulate, 5-lobed, glabrous or nearly so, persistent; *Petals* 5, inserted at throat of calyx; *Stamens* 20–40, inserted with petals; *Pistil* of 1–5 carpels, shortly stipitate, stigmas terminal, capitate; *Fruit* of 3–5 follicles, purplish, membranous, glabrous, shiny, obliquely-subulate tipped, twice length of calyx.

ROSACEÆ

Leaves alternate, ovate or orbicular, resembling Guelder Rose, 1–2 ins. long, 3-lobed, obtuse or acute at apex, cordate, truncate, or cuneate at base, crenate-dentate; stipules caducous.

A deciduous *shrub*, 3–10 ft.; *Branches* recurved, twigs glabrous; *Bark* peeling in thin strips.

Native of N. America; introduced 1690. Genus named after Patrick Neill, Secretary to Caledonian Horticultural Society in early nineteenth century. Syn. *Spiræa opulifolia*.

Stephanandra Tanakæ.

Gardens. June. A shrub resembling a *Spiræa*. Propagated by cuttings under a hand-light in August.

Flowers greenish-white, very small, puberulous, in a terminal pendulous *panicle*, 3–4 ins. long; *Sepals* 5, petaloid; *Petals* 5; *Stamens* numerous; *Ovary* superior.

Leaves alternate, triangular-ovate, 3-lobed, lobes acuminate, serrated, bright green, 2 ins. long, 2 ins. wide. Autumn tint golden-yellow.

A deciduous *shrub*, 3–8 ft.; *Branches* brown; *Buds* rose-coloured, pointed. Introduced from Japan, 1893. Syn. *Neillia Tanakæ*.

JEW'S MALLOW, *Kerria japonica*.

Gardens and shrubberies. April, May. This is not so well known as the double variety, but is of more graceful habit, and has a longer flowering period. It does well in a good loamy soil, and is excellent for a south or west wall or on a trellis. Old and weak shoots should be cut out after flowering. Propagated by cuttings of young shoots 2–3 ins. long, inserted in sandy soil under a hand-light or in cold frame in summer; layering of shoots in October; division of roots in autumn.

Flowers orange-yellow, 1 in. across; solitary, terminal, peduncles about $\frac{1}{2}$ inch long, glabrous; *Sepals* 5; *Petals* 5, oblong-elliptical, obtuse, spreading; *Stamens* indefinite; *Ovary* superior.

Leaves alternate, ovate-lanceolate, petiolate, sharply and deeply serrated,

TREES AND SHRUBS

acuminate, bright green and almost glabrous above, paler and slightly hairy beneath, exstipulate, thin.

A deciduous *shrub*, 3-4 ft.; *Branches* slender, twiggy, round, bright green, glabrous; *Buds* pointed, red-brown, scales ciliate.

Named after M. Kerr, sometime Superintendent of the Botanic Garden in Ceylon. Introduced from China. Better known in its double-flowered form (*K. jap. flore-pleno*); introduced from Japan 1700. The latter grows to a height of 8 ft., and does well on a wall. It was at one time erroneously named *Corchorus japonicum*.

WHITE KERRIA, *Rhodotypos kerrioides*.

Gardens, shrubberies. A handsome shrub, resembling *Kerria japonica*, but white. It requires the same treatment, and is propagated in the same manner. April, May.

Flowers white, resembling a single Rose, nearly 2 ins. diam.; solitary and terminal, shortly pedicellate; *Calyx* persistent, villous within; *Petals* 4, orbiculate, shortly clawed; *Stamens* indefinite; *Ovary* superior, several free carpels. *Fruit* an etærio of fleshy drupels, usually 4, brilliant black.

Leaves decussate, simple, ovate-acuminate, argutely serrated, petiolate, silky beneath, 3 ins. long, 1½ in. wide, stipules free, membranous, much wrinkled.

A deciduous *shrub*, 4-15 ft.; *Branches* decussate, twiggy.

Introduced from Japan by Siebold, 1866; there known as Jamabuki. Generic name from Gr. *rhodon*, a rose, and *typos*, a model or type; specific name from resemblance of foliage to *Kerria japonica*.

ALABAMA SNOW WREATH, *Neviusia alabamensis*.

Gardens. May. Requires a sunny position, and prefers a rather free, rich loam. Propagated by cuttings under a hand-light in summer; layering of shoots in October.

Flowers white or yellowish-green, 1 in. diam., in *axillary clusters*.



BRAMBLE or BLACKBERRY (*Rubus fruticosus*)

A. Quincifoliate leaf. B. Flowering stem, with ternate leaves. C. Fruit.
 D. Section of flower, transverse. E. Section of fruit, transverse.

ROSACEÆ

Leaves alternate, petiolate, serrate, acute, glabrous, 2-3 ins. long.

A deciduous *shrub*, 4-6 ft.; *Branches* bright brown; *Twigs* red-brown.

Native of Alabama; introduced 1880. Named after Rev. R. D. Nevius, who discovered it in Alabama, 1857.

BRUSH BUSH, *Eucryphia pinnatifolia*.

Gardens. July, August. Thrives best in peaty loam and sheltered position. One of the most handsome of summer flowering shrubs, its four large shell-like petals reminding one of a *Stuartia*, while its cluster of stamens gives it a close resemblance to the St. John's Worts. Propagated by cuttings of young shoots in pots of sandy soil in cold frame in summer; layering of shoots in October.

Flowers white, $2\frac{1}{2}$ -3 ins. diam.; usually borne in pairs near upper part of branches; *Calyx* 5-lobed; *Petals* 4, obovate; *Stamens* numerous, anthers red at first, afterwards bright yellow; *Fruit* a capsule (follicle), hard, woody.

Leaves alternate, pinnate, leaflets 3-5, acute, serrate, dark glossy green. Autumn tints crimson, scarlet, and gold.

An evergreen *shrub*, 10-20 ft.; growth slow.

Native of S. Chili; first discovered by Gray, 1845; introduced about 1877. Generic name from Gr. *eu*, well, and *kryphios*, covered, referring to the imbricate calyx.

WHITE-STEMMED BRAMBLE, *Rubus biflorus*.

Gardens, shrubberies. May. The finest of the White-stemmed Brambles, made conspicuous by the waxy bloom secreted on the bark. It thrives best in a good loamy soil. Old flowering stems should be cut out in December. Propagated by division, October to May; seeds sown in shady border as soon as ripe, or in shallow pans with sandy peat and leaf-mould in a cold frame.

Flowers white, $\frac{1}{2}$ - $\frac{3}{4}$ in. diam., 1-3 together on axillary, slender, drooping peduncles, the last armed with prickles; *Calyx* 5-lobed, pubescent, persistent; *Petals* 5; *Stamens* numerous, perigynous; *Ovary* superior, carpels numerous, inserted on a convex receptacle; *Fruit* an etærio of fleshy drupels, 20-30, golden-yellow, globose, $\frac{3}{4}$ in. diam.

TREES AND SHRUBS

Leaves alternate, palmately compound, leaflets 3-5, ovate, lobed, doubly serrated, acute, white and tomentose beneath, pubescent or hairy above, 1-1½ in. long, stipules adnate to petioles, lanceolate.

A deciduous *shrub*, 10 ft.; *Stems* and *branches* rambling, white with glaucous bloom, giving appearance of having been whitewashed; prickles very strong, recurved.

Native of Himalayas; introduced 1818. In gardens is often confused with *R. leucodermis*, a North American species.

DEWBERRY, *Rubus cæsius*.

Open fields and stony wastes, occasionally hedges and thickets. July, August. Cultivated in peaty soil on sunny rockeries. Propagated by division in October to May.

Flowers white, in a short *corymbose panicle*, few flowered; *Sepals* narrow, spreading, fused below, tomentose; *Fruit* an *etærio* of small drupels on a conoid receptacle, large, black, pruinose, acid, adherent to receptacle.

Leaves alternate, 3-5 foliate, 3-7 ins. long, leaflets 1¼-3¾ ins. long, 1-3 ins. wide, terminal on long petioles, ovate or 3-lobed, laterals sub-sessile, ovate or 2-lobed; unequal and coarsely serrated, prickles on petioles and ribs, pale green. Autumn tint purplish.

A deciduous *shrub*, scrambling; *Shoots* slender, prostrate, seldom arching, glabrous, waxy bloom; *prickles* unequal, small.

Native of Britain.

END OF VOL. I

Return on
or before



qQK488.C6

SCIII



3 5002 00143 1431

Cooper, Charles Samuel.
Trees & shrubs of the British Isles, nat

Y.1

Science qQK 488 .C6 1

Cooper, C. S.

Trees & shrubs of the
British Isles

