BRITISH WILD FLOWERS IN THEIR NATURAL HAUNTS

HORWOOD
BRITISH WILD FLOWERS
1. Dyer's Weed or Weld (Reseda luteola, L.)
2. Rock Rose (Helianthemum Chamae slate, Milla)
3. Hairy Violet (Viola hirta, L.)
4. Musk Mallow (Malva moschata, L.)
No. 1. Dyer's Weed or Weld
(Reseda Luteola, L.)

a, Flower, showing 3 left petals, numerous stamens, and 3 stigmas.  
b, Flower head, with 3 cypselae, and 3 calyces below.  
c, Seed.  
d, Upper part of plant with stem-leaves and 2 racemes of flowers in bud and expanded, the lower ones most advanced.

No. 2. Rock Rose
(Heathianthum Chamissois, Mill.)

a, Flower, with petals removed, showing calyx with sepals, and bracts or outer sepals below, with central stamens and stigma.  
b, Petal detached.  
c, Pistil with capitate stigma.  
d, Flower from below, showing 2 outer, 3 inner sepals.  
e, Capsule opening by 3 valves, showing seeds on placenta.  
f, Part of plant, showing opposite leaves, small stipules, and flowers in various stages in axils of bracts, on a scorpioid cyme.

No. 3. Hairy Violet
(Viola hirta, L.)

a, Androecium and gynaeicum enlarged, sepals and petals removed.  
b, Capsule splitting by valves, showing seeds.  
c, Part of plant, showing habit, short rootstock, hairy leaf-stalks and leaves, flower-stalks with bracts low down, and flowers with spur and sepals.

No. 4. Musk Mallow
(Malva moschata, L.)

a, Androecium, with stamens in column, and gynaeicum, showing tufted stigmas.  
b, Gynaeicum, with tufted stigmas.  
c, Fruit, schizocarp, with persistent sepals.  
d, Mericarp or detached carpel.  
e, Upper part of plant, showing stem-leaves with flowers in bud and expanded, latter with 5 distinct petals.
A New British Flora

British Wild Flowers
In Their Natural Haunts

Described by A. R. Horwood
With Sixty-four Plates in Colour
Representing 350 Different Plants
From Drawings by J. N. Fitch
and Many Illustrations from
Photographs

Volume IV

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FLOWERS OF THE MOUNTAINS, HILLS, AND DRY PLACES
Mountains and hills are essentially caused by the major folds in the crust. They exhibit, exposed at the surface more usually than not, the rocks themselves, upon which in the same way are based the subsoils and soils of more lowland districts, whose derivation is not so obvious. A mountain or hill being based upon a physical character, though in itself independent of questions of soil, essentially tends to cause the plants growing on it to be adapted to dry-soil conditions as xerophiles, for the drainage is thereby at once modified. So that this group consists largely of xerophiles, with others that grow in moist hollows and are not xerophilous.

A natural classification divides such plants into Lithophytes, or plants growing on bare rock surfaces themselves (chiefly Cryptogams), and Chomophytes, which grow on hills, &c., or rocks with a covering of detritus or subsoil. Of the last are those that grow on the surface (Exochomophytes), and Chasmophytes (crevice plants), which grow in the crevices of rocks, vertical or horizontal. Those here considered, surface plants, are members of the Mesophytic associations driven to higher ground for one reason or another, which by virtue of their position are mainly xerophilous.

A change can be often noticed in the character of the common plants that have a wide range geographically and also altitudinally as we study them in different habitats. For in the hollows a ubiquitous plant like Dandelion is luxuriant in growth with broad leaves, and in wet meadows the leaves are still more broad, but upon the hills the foliage is much more divided and the whole plant adapted to a xerophilous habit, though not provided so definitely with those characters that stamp Xerophytes. Here a physiographical cause may be seen to act in such a way as to bring about a difference in vegetative characteristics. This is only one of the features that are induced by a retreat to a highland habitat, and it must be remembered that the glacial plants were driven to high ground on the retreat of the ice-sheets.
The porosity or degree of saturation and the structure of the rock itself greatly influence the nature of the habitat or subsoil in hilly regions, where soil is continually being worn down by rain and conveyed to the valleys. Some rocks are hard, such as sandstone and grits, and disintegrate little, so that there is a little soil formed, as in the case of syenitic or schistose rocks. While granitic rocks decompose so that alkaline constituents are set free, yet they again are less easy to break down than the chalk or even many types of limestones.

These main types continue to retain a mountainous character, or more or less the original position in which they were tilted, whereas others, such as carboniferous clays and shales, or triassic clays and liassic limestones and shales, are worn down into inconspicuous undulations of no altitude, though tilted originally, it may be, an equal amount.

The contrast between such types is well seen in the marked escarpment between the lower and middle Lias formed by the latter. The marlstone escarpment affords a habitat for many truly rupestral plants that grow on the bare rock, there being little soil formed above it. This difference between the resistance of rocks to weathering is again well seen in the alternation of soft shales and dykes of diorite in the Cambrian series near Nuneaton, where they give rise to a series of dykes and troughs which diversify the country and lend extra charm to an otherwise beautiful district.

The hills which are built up of older rocks, such as granite rocks with little soil, furnish a habitat for Ploughman's Spikenard, which is fond of stony places, growing in little or no soil, and Clary, which is found in such stations as well as in woodland situations on sand soil. Almost bare sand rock is a support for Musk Mallow, Wild Thyme, Sheep's Fescue. On sand soil on hills Cotton Thistle may be found, and on sand, on high as well as low ground, Sheep's Sorrel. Bare stony ground is a special requirement of Kidney Vetch, Rest Harrow, and Hare's Foot Trefoil. High clayey ground is suited to Field Scabious and Dropwort.

On limestone the Oak-leaved Mountain Avens grows luxuriantly, and Salad Burnet is found on hills where a lime soil is provided in which some proportion of clay occurs, which it may derive from chalk or even a calcareous sandstone. The chalk is a soft rock, which affords a soil derived from the rock itself on which a characteristic flora is to be found.

Some we include here which may almost, like some of the foregoing, be called Lithophytes and not merely surface plants, such as the
MOUNTAIN VEGETATION

View of Whernside (2441 feet) from summit of Ingleborough
graceful Dyer's Weed and the spreading Rock Rose, which closes its golden cup-like flowers as soon as the sun is obscured. Here grow Hairy Violet, too, Silky Mountain Vetch, Sainfoin, Box, and Musk Orchis. Wet hills are the favourite habitat of Yellow Balsam, Gentians, Felwort, and the fragrant Orchis.

**Dyer's Weed** or **Weld** (*Reseda luteola, L.*)

This plant has not been discovered in any of the early deposits. It is found to-day in the Warm Temperate Zone in Europe, N. Africa, and Western Asia, and is introduced in the United States. It is found in all the counties of Great Britain except Kirkcudbright, Stirling, Mid Perth, Westernness, Main Argyle, Dumbarton, Clyde Isles, S., Mid, and N. Ebudes, W. Ross, Sutherland, Caithness, and the Northern Isles. There is some doubt as to whether in Moray and west of the Caledonian Canal it is indigenous. It is thus much rarer in Scotland. In Ireland it is common.

Dyer's Weed or Weld may be regarded as a native, but as a dye-yielding plant its extension of range may be due in part to this cause. It is fond of high ground, hilly places, where the soil is dry and it can live as a xerophyte. It is a lime-loving plant, preferring a limy soil. It is also found on waste ground, to which it travels with other aliens like *Lepidium Draba, L. campestre*, and others of similar status.

It is a tall, erect, graceful plant, its nodding spike being heliotropic or turned to the sun, as Linnaeus noted. The leaves are entire, long, and shining, elongate-lance-shaped, and the stem is unbranched. The flowers are yellowish-green, in long terminal pointed spikes, with 4 sepals, the petals longer, and many stamens (20-24), which are very marked. The fruit, a capsule, is flattened, broad, and trilobed, with nearly round, smooth, shining black seeds.

The plant is often 3 ft. high. It flowers in July and August, and is biennial, being propagated by seeds.

In the allied *Reseda odorata* the receptacle becomes raised into a perpendicular square plate between the stamens and sepals, at first yellow, and brown after flowering is over. Honey is secreted by it, and it acts as a honey-guide. The expanded claws or stalks of the 3 upper and middle petals lie close below the lower surface of this plate, and surround the upper lateral margins with lobes pointed anteriorly, serving to protect the honey from the rain as in a box. The laminae of the petals are split up into strips, and render the flowers conspicuous.
FLOWERS OF THE HILLS AND DRY PLACES

The flower does not require to expand, the parts of the flower lying open. The honey-glands secrete honey. The anthers bend down, open, and rise up towards the honey-disk. Three or four carpels develop papillae. The stigma projects considerably above the middle of the flower, forming a resting-place for insects, and is covered with pollen from other flowers. If insects do not visit it self-pollination ensues. The visitors are Hymenoptera (Apidae), Prosopis communis, Apis mellifica, Andrena. Prosopis, a bee with a trowel-like proboscis, is enabled to lift the box formed by the petals over the honey-disk, and in so doing touches the stigma, and becomes dusted also with pollen.

The seeds are dispersed by the wind. The capsules opening above the seeds are blown out beyond the area of the parent plant, aided by the wind.

Dyer’s Weed is a sand plant, requiring a sand soil, and at the same time is a lime-loving plant, subsisting on a lime soil, being found in chalky or oolitic districts.

No fungi are parasitic on this plant. The Thysanoptera Melanothrips obesa, Eolothrips parasitica, and the Lepidoptera, Bath White (Pieris Daplidice) and Scarce-bordered Straw (Heliothis armiger) feed on it, as also Bright-line Brown-eye (Mamestra oleracea).

Pliny gave the name Reseda, from resedo, I calm, because it was supposed to be a sedative. Luteola is a diminutive of lutea, yellow.
The English names are Ash of Jerusalem, Dyer's Rocket, Dyer's Weed, Dyer's Yellow-weed, Goud, Green-weed, Italian Rocket, Weld, Woad, Wolds or Woulds, Woold, Yellow Rocket, Yellows. It is called Base Rocket because its leaves are like a rocket, and from being used as a base in dyeing wool. It was used as a yellow and green dye to colour wool and cotton. Dutch pink is also manufactured from it. The dye has also been applied to silk, and for paper, mohair, and linen. Blue cloth is dipped in it to dye it a green colour. When the plant is in flower it is plucked up, and used in the fresh and the dried state.

When wild it is biennial, the root and radical leaves being developed the first year. The cultivated plant grown from seeds in the spring is annual.

**Essential Specific Characters:**

40. *Reseda Luteola*, L.—Stem tall, erect, leaves shining, undivided, lanceolate, flowers yellow, in a terminal spike, petals unequal, exceeding the 4 sepals, capsule flattened.

**Rock Rose** (*Helianthemum Chamaecistus*, Mill.)

This plant is not found fossil in any deposits. It is found in Arctic Europe, North Africa, and Western Asia. In Great Britain it is absent from S. Somerset, Middlesex, Radnor, Merioneth, Cheshire, Mid Lanes, Isle of Man, Renfrew, Peebles, Selkirk, Linlithgow, N. Aberdeen, Wester Ross, and E. Sutherland. It is rare in West of Scotland, and in Cornwall. It ascends to a height of 2000 ft.

The Rock Rose, while especially a plant of the chalk downs, is found elsewhere on hilly ground where a certain amount of lime occurs on more stony substrata. It is accompanied by Dog violet (*Viola ericetorum*), Heath Milkwort (*Polygala depressa*), and other plants, such as Horse Shoe Vetch, *Anthyllis vulneraria*, &c.

This little plant is trailing, shrubby, with many prostrate stems, smooth below, and hairy above, adapted to growing on and amongst rocks. The leaves are linear-oblong, or acute, shortly stalked, with rolled-back margins, and deep-green, above rough to the touch, hoary below, and with 4 hairy lance-shaped stipules or leaflike organs. Some species of Rock Rose have no stipules, having broad-based leaves which serve to protect the buds. In *H. guttatum* the upper leaves bear stipules, and are narrow at the base, whilst the lower bear no stipules and have broad bases.

The flowers are large, golden-yellow, opening in the sunshine, in
loose racemes, with bracts or leaflike organs. The sepals are smooth, the inner ones blunt, ending in a point, and three-nerved. The style is longer than the ovary, and bent at the base, equaling the stamens, which when touched will spring back and lie upon the petals. The stigma ends in a knob. The seeds are numerous, and the capsule, which opens by three valves, is enclosed by the longer calyx.

The plant is never more than 6 in. high and prostrate. The flowers last from May to September. The Rock Rose is a perennial, evergreen, trailing plant, increased by means of cuttings.

There is no honey but abundant pollen. The stamens are numerous (150). The pistil projects above them, and insects alighting on the flower touch the pistil before the stamens and cross-pollinate the plant with pollen from a previously visited flower. Self-pollination takes place if no insects visit it. There are 3 sepals and 5 petals which open in the sun.

The anthers and capitate stigma mature together, the latter being a little taller. The anthers are at first close, but move outwards, and dust the insect which touches them with pollen, thus exhibiting irritability. The flower is best visited by the first insects from the corolla and by late-comers from the centre. The insect covered with pollen on a previous flower alights in the centre in the second and cross-pollinates it. Independently of insects' visits it is self-pollinated in closed and nodding flowers. There is abundant pollen sought by Diptera (Syrphidae), Hymenoptera (Apidae), Coleoptera (Cerambycidae).
The Rock Rose disperses its seeds by the aid of the wind. The capsule splits into 3-5 valves, the seeds being jerked out and dispersed by the wind. The plant is a lime-loving plant requiring a lime soil, but where that desideratum is wanting it is a rock plant, growing on various rocky subsoils.

It is galled by *Diplosis helianthemi*. The beetles *Bruchus ater*, *B. Cistii*, and the Lepidoptera *Hypochalcia ahenella*, *Bulalis fuscoalnea*, *Telesia sequar* feed upon it, also Brown Argus (*Polyommatus uralensis*), the dark Annulet (*Coleophora ochrea*), and *Laverna miscella*.

The name *Helianthemum*, given by Cordus, is from the Greek *helios*, sun, *anthemos*, flower, in allusion to its habit of opening its flower when the sun is out. *Chamaecistus* is from the Greek *chamai*, on the ground, and *cistus*, a shrub.

The English names are Rock Rose, Sot Flower, Sun Daisy, Sun Flower, Sun Rose.

This plant is often cultivated in gardens as a rock plant. Cuttings are easily made from it under glass. White and double flowers occasionally occur.

**Essential Specific Characters:**

41. *Helianthemum Chamaecistus*, Mill.—Dwarf shrub, leaves oval, opposite, with fringed stipules, green above, hoary below, flowers yellow, in a raceme, with bracts, style bent below, sepals 5, 2 small, blunt.

**Hairy Violet** (*Viola hirta*, L.)

As with the Sweet Violet no fossil seeds of this species have been found. It is confined to the cold Temperate Zone, in Europe, N. and W. Asia, extending as far as N.-W. India. It is absent in Wales from Brecon and Radnor, Pembroke, Cardigan, Merioneth, and from Mid Lanes, and the Isle of Man, but elsewhere it is universal. In Scotland it does not occur in Roxburgh, Berwick, Haddington, Edinburgh, Fife, Forfar, Kincardine. From Forfar it ranges to the south of England, and is found at a height of 1000 ft. in Yorks. It occurs also in Ireland.

The Hairy Violet is found on dry banks, and in woods, in hilly country as a rule, being addicted more especially to drier conditions than the Sweet Violet, which thrives best in the shade, but this species may also be found in damper stations in woods in low-lying situations. There is less likelihood of this species being spread artificially, and it has a less wide range.

The habit is prostrate like that of the Sweet Violet, which also has
no erect stem, the leaves arising from the rootstock directly. The leaves are likewise heart-shaped, but in this case the stolons or trailing stems with buds are absent or very short, and the bracts are below the middle of the flower-stalk. Moreover, the whole plant is hairy, or roughly hairy, giving it a greyer, less green, appearance when dry.

The flowers are not fragrant and less dark blue than those of the

Sweet Violet, but the spur is long and hooked, and the anther spurs are linear. The plant flowers later than the Sweet Violet. The capsules are pendent in this as well as in the latter, and in each the spring flowers do not produce seeds, while the later cleistogamic flowers without petals do. The flowers vary in number of spurs, some having sack-like ends to the petals or rudimentary spurs.

The Hairy Violet is not more than 6 in. high. The flowers may be found from April to May or June. The plant is perennial, increased by division of the root.

The flower is pollinated in the same way as *Viola odorata* (which see). Both are conspicuous flowers, and have two types of flower;
spring (usually infertile) and autumn, the latter cleistogamic\(^1\) and fertile though apetalous. One difference is the marked absence of scent, but as it is not so usually a woodland or shade species this is the more readily to be explained. The spur is long and hooked and two anther-spurs are lance-shaped.

The seeds of the Hairy Violet are dispersed by the plant’s own agency, the flower-stalks hanging down when the capsule is ripe, and the seeds are sown in the ground around the parent plant. The seeds are also dispersed by ants. The capsule opens by three valves.

Hairy Violet is a sand-loving plant, requiring a sand soil with a very little humus, in this differing from \(V. \) odorata.

\(Puccinia \) violae, \(Urocystis \) violae, \(Peronospora \) effusa, \(Thielavia \) basicolor are fungal parasites.

The Lepidoptera \(Argynnis \) phaia (Silver-washed Fritillary), \(A. \) adippe (High-brown Fritillary), and \(A. \) aglaia (Dark-green Fritillary) feed on it.

The specific Latin name \(hirta\) means hairy, alluding to the hairy leaves, stem, or leaf-stalk.

In \(Viola \) odorata numerous stolons or soboles are thrown out which trail over the surface and root at intervals. In \(V. \) \(hirta\) they are not prostrate, and do not root at intervals. The roots of both are covered with tubercles when advanced. The leaf-stalks are smooth in \(V. \) odorata, hairy in \(V. \) \(hirta\), and give it quite a downy, silvery appearance. The leaves are much alike, and \(V. \) odorata has hairs below, but they are more numerous in \(V. \) \(hirta\). The leaf of the Sweet Violet is glossy above, and the leaves are longer, not so heart-shaped. In \(V. \) odorata the bracts or leaflike organs are above the scape, in \(V. \) \(hirta\) below. The Hairy Violet flowers a week later than \(V. \) odorata, and the flowers are not so deep a blue, nor do they smell. They both produce barren spring and fertile autumn flowers.

**Essential Specific Characters:**

43. \(Viola \) \(hirta\), L.—Stoles absent or short, bracts below the middle of flower-stalk, leaves hairy, cordate, petioles with spreading hairs, flowers light blue, scentless, spur linear.

\(^1\) These are pink, fleshy, swollen, and when the flower-stalk lengthens it may bury the ripened capsule in the loose soil. The pendent capsules are due to the practically non-existent stem (which is very short), so that they are not raised up.
Musk Mallow (Malva moschata, L.)

The Musk Mallow is not found fossil in any deposit. It is a member of the flora of the North Temperate Zone, found in Europe eastward to Lithuania, and it has been introduced into the United States. Though fairly widespread in Great Britain it does not grow in West Kent, Radnor, Cardigan, Montgomery, S. Lines, Mid Lancs, S.E. Yorks, Renfrew, Peebles, Selkirk, Linlithgow, Mid Perth, and elsewhere; and in the West Highlands only in Dumbarton, Clyde Isles, and S. Ebrides, and in Sutherland in N. Highlands: but in Mid Scotland Watson held it to be an alien. It is rare in Ireland.

Mountains and hills are the home of the Musk Mallow, which is a rupestral or rock-loving species, delighting to grow on lofty summits where arenaceous or sandstone rocks come to the surface. In the lowlands it may be found in situations where it can command a similar sandy habitat.

The Musk Mallow is a suberect plant, with numerous stems, hairy, tall, and with many branches. The leaves are kidney-shaped at the base, with long leaf-stalks, with 5–7 deep, pinnatifid lobes, divided nearly to the base, with narrow segments, the upper with narrow segments only.
The flowers are rose-pink or white, large, clustered near the summit. The calyx consists of 5 sepals. The outer calyx-teeth are narrow and hairy, the fruit-stalks being erect in fruit, the fruit downy. The 5 petals are nearly blunt at the tip, with veins of deeper colour, branched, fringed with hairs. The carpels are rounded, and covered with coarse hairs on the back.

Often the stem is 2 ft. high. The flowers last and bloom in July and August. The plant is a deciduous, herbaceous perennial.

Musk Mallow is proterandrous. The ends of the anther-stalks curve downwards and unite in a tube round the pistil. When the numerous anthers wither the stigmas spread out above and obviate self-pollination. The visitors are Hymenoptera (Apiidae), *Apis mellifica*, *Chelostoma*, *Andrena*; Diptera (Bombylidae), *Systrechus*; Lepidoptera, *Hesperia sylvannus*.

The seeds are dispersed by the plant's own agency. The capsule, a schizocarp, consists of a number of aggregate carpels which break up when the plant is ripe, and naturally aid in dispersal around the plant, the single seeds remaining in the carpel.

Musk Mallow is a sand plant, requiring a sand soil, and it is found very frequently on such formations as the Middle Lias Marlstone.

A fungus, *Puccinia malvacearum*, the Hollyhock disease, is parasitic on it. The Swift Moth (*Hepialus sylvanus*) and *Enbolia ceromata* live on this food plant, and 3 beetles, *Podagrca fusiceps*, *Crepidodera fusicornis*, *C. rufipes*.

*Malva*, Pliny, is from the Greek *malakos*, soft, and is Latin for Mallow, given because of its emollient characters. *Moschata* (Latin) refers to its musk-like scent. This pretty wild flower is called Musk Mallow because its foliage has a musky odour.
In Germany an ointment was made from the leaves, and used to dispel malicious influences. The carpels called cheeses are termed “fairies’ cheeses”. The Musk Mallow was said to encourage love. Gerarde has the following couplet:

“If that of health you have any special care,
Use French Mallows, that to the body wholesome are.”

The seeds were said to nourish the dead, so the Greeks planted the plant on graves. Like other members of the Mallow tribe Musk Mallow yields fibres of excellent quality. The Chinese use one as food. It is cultivated in gardens, and is easily improved.

**Essential Specific Characters:**

63. *Malva moschata*, L.—Stem erect, radical leaves reniform, crenate, with pinnatifid lobes, upper leaves lobed, flowers large, rose-pink, calyx lobes narrow, fruit hairy.

**Yellow Balsam** (*Impatiens noli-me-tangere*, L.)

A delicate plant and scarce in this country. Touch-me-not has apparently not been preserved in any seed-bearing beds. It is confined to the Northern Cold Temperate Zone, and is distributed sparingly throughout Europe, Siberia, and West Asia. It is recorded in twenty-four vice-counties, but except in Salop, Montgomery, West Lancashire, and Westmorland, all west of the Pennine Chain, it is doubtfully indigenous, and probably an escape. It is found in Ireland.

Yellow Balsam certainly seems to be wild in the dingles of Shropshire, where it grows in moist wooded places adjoining rivers in upland districts. It is associated there with such plants as Elecampane and Dame’s Violet, both equally uncommon, and Water Pepper, Water Mints, amongst more common semi-aquatic species.

This is a tender succulent plant, tall and semi-erect, irregularly branched from a single main stem, the branches opposite, and the nodes swollen. The leaves are thin, egg-shaped to lance-shaped, coarsely toothed, the whole plant smooth, flat, and shining, and the plant grows in extensive beds like Musk, the stems requiring support. The leaves protect the flowers from the rain. They are expanded during the day, but at night they hang down.

The flower-stalks are erect at first, but bend down. The flowers are yellow, with red spots and blotches, large, the large sepal hood-shaped, drooping, the spur curved backwards. The flower-stalks bear numerous clustered flowers, but are themselves solitary. There are
No. 1. Yellow Balsam
\((Impatiens noli-me-tangere, L.)\)

\(a\), Capsule, with valves, twisted tip, showing seed cavity. 
\(b\), Seed. 
\(c\), Capsule before dehiscing. 
\(d\), Upper part of plant, showing stem-leaves, and irregular flowers, 3 coloured sepals, t-spurred, and petals.

No. 2. Rest Harrow
\((Ononis spinosa, L.)\)

\(a\), Pod, with beak and persistent style. 
\(b\), Seed. 
\(c\), Upper part of plant, with stem-leaves, spines, and flowers (papilionaceous) in axils of spines or leaves, in bud and more expanded.

No. 3. Hare's Foot Trefoil
\((Trifolium arvense, L.)\)

\(a\), Calyx, with bristle-like teeth. 
\(b\), Standard of flower. 
\(c\), Keel. 
\(d\), Wing or ala. 
\(e\), Base of plant, with root, rootlets, lower leaves, and stipules. 
\(f\), Upper part of plant with trifoliate leaves, stipules, and flowerheads.

No. 4. Kidney Vetch
\((Anthyllis Vulgaris, L.)\)

\(a\), Calyx. 
\(b\), Keel of flower. 
\(c\), Standard, with auricles. 
\(d\), Wing. 
\(e\), Pod on stalk. 
\(f\), Seed. 
\(g\), Upper part of plant, showing pinnate leaves and head of flowers.
2. Rest Harrow (*Ononis spinosa*, L.).
3. Hare’s Foot Trefoil (*Trifolium arvense*, L.).
two outer opposite sepals, which are flat and oblique. The upper sepal, owing to the twisted pedicel (lowermost) is large, and is spurred; the lower petal (uppermost) is small, but broad and hollow. The two innermost petals are irregular, oblique and irregularly lobed.

Yellow Balsam is from 1 to 2 ft. high. The flowers are in bloom from June to September. It is an annual reproduced by seeds.

The flowers are often cleistogamic. In the allied *I. balsamina* in young flowers the anthers lie on the still closed stigmas, and insects visiting the flower are dusted with pollen while they are inserting their tongue in the long spur. In older flowers when the anthers have withered the stigmas are spread out, and touch the same parts of the bee. The flowers are showy and large, but hidden away. Humble bees visit the flowers.

Touch-me-not has its seeds dispersed by its own mechanism. The capsule\(^1\) is stretched when ripe, which causes it to split and eject the seeds on the slightest touch.

This is a humus-loving plant, which requires a peat or humus soil, being addicted to a wet aquatic habitat, where it finds a peaty soil mixed with alluvium.

The leaves are infested by a cluster-cup fungus, *Puccinia argentata*. The moths Elephant Hawk Moth (*Chorthampha Elpenor*), Large Twin-spot Carpet (*Coremia quadrifasciata*), Netted Carpet (*Cidaria reticulata*), *Lygus birivialis* feed upon it.

*Impatiens*, Dodonaeus, from the Latin, means impatient, because

\(^1\) It is 5 chambered. The partitions are thin and break away, leaving the central pillar in the middle. In drying, the cells below the epidermis become stretched more than those below. The carpels turn somewhat to the right, or corkscrew-wise. When the capsule opens, the valves roll up like a spring (as in Meadow Vetchling), and are jerked away carrying the seeds (cf. *Geranium*).
FLOWERS OF THE HILLS AND DRY PLACES

of the sudden bursting of the capsule if it is touched when ripe. *Noli-me-tangere*, Columna. Latin for touch-me-not, means the same thing.

This handsome and curious plant is called Balsam, Quick-in-hand, Touch-me-not. Coles, in his *Art of Simples*, says: "A plant called *Noli-me-tangere*, near which if you put your hand the seed will spurt forth suddenly, in so much that the unexpectednesse of it made the Valient Lord Fairfax to start, as Mister Robert (Isobart) at the Physick garden in Oxford can tell you". At night the leaves hang pendent, unlike most other plants, whose leaves droop during the day, if at all.

Essential Specific Characters:—

74. *Impatiens noli-me-tangere*, L.—Stem branched, slender, leafy, leaves ovate, serrate, peduncles many-flowered, flowers yellow with orange spots, spur recurved, valves of capsule curling when touched.

**Rest Harrow** (*Ononis spinosa*, L.)

Like most leguminous plants included in this work this is not represented amongst the Early Glacial floras. It is a plant of the North Temperate Zone found in Europe, West Asia, North Africa. In Great Britain it is absent from the counties of Worcester, Brecon, Radnor, Carmarthen, Cardigan, Montgomery, Carnarvon, Anglesea, Renfrew, Lanark, and elsewhere, and in Scotland it only occurs in Berwick, Haddington, Edinburgh, Fife, Stirling, Forfar, and Dumfriesshire, growing on sandy shores and dry pastures.

Rest Harrow is an upland plant which is fond of rough, scrubby pasture, usually indicating rather bare unproductive ground. For this reason it is, like Gorse in some parts, burned and rooted up in order to get rid of it. Hillsides of medium elevation are the usual station for this plant, though it may be found on sandy shores also at a lower level.

It is a shrubby plant, with erect or prostrate then ascending hairy stems, with stolons or trailing shoots, with numerous branches, downy, and bearing long spines, smooth or gummy. The leaves are in threes below,¹ above lance-shaped, coarsely toothed. The hairs may be scattered or lie in two opposite rows.

The solitary rose-coloured and white flowers are borne in the axils or in pairs, either stalkless or shortly stalked. The standard is streaked with red. The corolla exceeds the calyx, the keel and wings

¹ Or the lateral leaflets may be absent.
being equal. The pods are less than the calyx in length, downy, with seeds with raised points.

The plant is from 1 ft. to 18 in. in height. June, July, August are the periods during which the flowers are in bloom. The plant is perennial and increased by division.

The flower is similar to that of Lotus. It has the piston-mechanism. The alae or wings on which the bees alight act as levers to depress the carina or keel, and fold over its upper part, being united by two pro-

jections, directed downwards and upwards, which fit into deep grooves. Two lobes on the upper margin of the alae lie over the column of stamens. The alae do not cohere, but the upper borders of the carina do at first, forming a tube, and leave a small opening only at the tip, where the pollen is pushed through a small gap. The stamens are monadelphous or attached. Honey is not secreted. The stamens are thickened at the end, the outer ones most, but the inner produce more pollen. The visitors are Apis mellifica, Cilissa leporina, Anthophora quadrimaculata, Bombus lapidarius.

In the Rest Harrow the seeds are dispersed by the plant's own mechanism. The pod is 4-celled and 2-valved, and when contracted when dry it expels the seeds for a short distance.
Indicative of barren ground, Rest Harrow is mainly a sand plant, requiring a sand soil derived from older rocks, chiefly arenaceous, or stony ground derived from Precambrian or granitic rocks.


Ononis, Theophrastus, is from the Greek *onos*, an ass (because they are said especially to like it), and *spinosa* refers to its spiny nature.

Rest Harrow is called Whin, Cat Whin, Finweed, Ground Furze, Harrow Rest, Horse’s Breath, Lady-whin, Wild Liquorice, Rassels, &c.

This thorny plant is troublesome in cornfields, having ligneous stems and thick roots. All cattle leave it, but horses eat it freely. It is easily cultivated.

**Essential Specific Characters:**

76. *Ononis spinosa*, L.—Stem erect, spinous, hairy, shrubby, leaflets oblong, flowers rosy-pink, wings less than the keel, pods longer than the calyx, seeds tuberculate.

**Hare’s Foot Trefoil** (*Trifolium arvense*, L.)

Hare’s Foot Trefoil is unknown in any ancient deposits in Britain. A member of the flora of the North Temperate Zone it is found in Europe, N. Africa, N. and W. Asia, and is introduced in America. In Great Britain it is found in ninety-four of the vice-counties. It is common also in Ireland and the Channel Islands.

The occurrence of Hare’s Foot Trefoil, whether wild or otherwise, is an indication of dry soil. It grows in dry pastures inland, or on barren stony ground, in all cases requiring a sandy subsoil. It is also a common plant on waste ground, being often introduced into quarries with fodder, and upon waste ground by building operations through the transfer of materials by railway, &c.

This handsome plant is tall and erect, having a silvery, downy appearance, with a slender trefoil habit. It is branched with short, spreading, alternate, ascending branches. There are three oblong leaflets.
The flowers are in egg-shaped or rounded, terminal, soft, rosy-white heads which lengthen, with soft, hairy calyx-teeth much longer than the corolla, giving the head a soft feathery appearance. The corolla is papilionaceous, shorter than the calyx, and hidden amongst the bristle-like teeth. The inversely egg-shaped fruits are enclosed by the calyx and retained in the head when ripe.

Hare's Foot Trefoil is usually about 1 ft. high. The flowers may be sought in July and August. The plant is annual and increased by seed.

Though the flowers are very small they are visited by a variety of insects. The stamens are united as in other types of papilionaceous flowers. Hare's Foot Trefoil is visited by Hymenoptera (Apidae), *Apis mellifica, Bombus rajaellus, B. lapidarius, Cilissa leporina, Andrena xanthura, Halictus zonulus, H. quadricinctus, Osmia calmentaria, Megachile maritima*; Sphegidae, *Psammophila affinis*; Lepidoptera, Small Skipper (*Adopera thaumas*).

The outer perianth is feathery and persistent, and winged, assisting the fruits to some extent to disperse themselves by aid of the wind, or they lie in the heads and the seeds germinate on the ground.

Hare's Foot Trefoil is most at home on a sand soil, and is thus a sand plant. It also grows on rocky, stony ground, Precambrian and older granitic and metamorphic rocks.
No insect or fungal pests infest this plant. This plant has the specific name *arvense* because it is associated largely with arable land.

It is called Hare's-foot Clover, Dogs-and-cats, Hare's Foot.

**Essential Specific Characters:**


**Kidney Vetch** (*Anthyllis Vulneraria, L.*)

The recent distribution (of which alone anything is known) of this plant is circumscribed by the North Temperate and the Arctic Zones of Arctic Europe, North Africa, Western Asia. It is not found in Great Britain in S. Essex, Hunts, Carmarthen, Flint, Brecon, Radnor, Montgomery, Merioneth, Wigtown, Peebles, Selkirk, Mull, West Ross, northwards towards the Shetlands, but elsewhere generally, and ascends up to 2,400 ft. in the Highlands, and is found in Ireland and the Channel Isles.

The Kidney Vetch is a lover of dry chalky soil or hill-sides, being largely a South of England plant, where also it grows by the sea; but it occurs in many other districts also as a well-established plant, especially in the vicinity of brickyards and similar places, where it is frequently associated with Sainfoin, Lucerne, and Hare's Foot Trefoil.

Herbaceous, tall, and having a silky appearance, this plant has a woody rootstock, suberect stem, with leaflets each side of a common stalk, with a larger terminal leaflet, bluish-white foliage (another English name, Lady's Fingers, may refer to the foliage). Anthyllis, meaning Beard Flower, refers to its silky appearance.

The flowers are yellow, lateral, and in pairs. The calyx is egg-shaped, with pointed teeth, membranous, exceeding the petals, the heads many-flowered, the flowers long-tubed. The pods are on long stalks, acute, smooth, netted, containing one seed.

This strikingly beautiful plant is from 6 in. to 1 ft. in height. It flowers in May right on up to August. It is perennial, and propagated by division.

The flower is like that of *Lotus*, with a long tube, and can only be reached by bees with a long proboscis. When the flower is young the stigma is dry though the keel encloses the pistil, and no pollen adheres, but when the bulk of the pollen has been removed the stigma is clammy, and pollen then adheres to it. The flower is pollinated by aid of the piston mechanism, and the swollen and hairy calyx surrounds
the long claws or stalks, the standard projecting 5–7 mm., and inclined upwards, with a groove on the lower part of the blade for the ake or wings, with two rounded lobes at its base. The wings or ake are, moreover, quite surrounded by the vexillum or standard.

Insects grasp the ake and insert their proboscis under the vexillum or standard. The ake surround the carina or keel, and it is forced down when the former are depressed. Each ake has a deep groove at its base, and the carina has a sharp knob fitting into this groove.

The upper margins of the ake are unfolded, whence they remain close together. By this means the parts return to their place after the insect presses on them, causing pollen to be pressed into the slit, formed by the alar margins, by the thickened end of the stamens, the stigma remaining free from it; but if rubbed it becomes sticky and the pollen adheres. Hence insect visits favour cross-pollination. The pollen-grains are short, six-sided prisms with striated angles. The visitors are Bombus silvarum, B. hortorum, B. muscorum, Osmia, Lycæna.

The pod, enclosed by the dry, swollen calyx, is sometimes dehiscent, splitting open, and if the calyx persists the seed may be thrown to some distance by contraction of the pod.
Kidney Vetch is a lime-loving plant, being addicted to a lime soil, growing as a rule on chalk or other calcareous rocks.

This choice wild flower is infested by a cluster-cup fungus, *Uromyces anthyllidis*. A beetle, *Tychius scheideri*; a butterfly (the Mazarine Blue), a moth, *Gelechia anthyllidella*, and two Heteroptera, *Lupus sulcatus*, *Hopломacliis thunbergi*, feed on it.

*Anthyllis*, Dioscorides, is from the Greek *anthos*, flower, *ioilos*, down, from the silky bristles of the calyx, and *Vulneraria* because it was supposed to be a cure for wounds, from the Latin *vulnus*, wound.

Names applied to this plant include Cat's-claws, Crawnebs, Yellow Crow's-foot, Jupiter's Beard, Kidney Vetch, Lady's Fingers, Luck, Lamb's-toe, Staunch, Woundwort.

Being named Our Lady's Fingers, it was connected with Scriptural things. Gerarde says it "shall prevayle much against the strangury and the payne of the veynes". It has been utilized as a yellow dye. The excellence of South Down mutton has been ascribed to the prevalence of this plant in the pastures where sheep feed in the south, and it is undoubtedly a good fodder plant. The colour of the flower varies considerably according to the nature of the soil.

**Essential Specific Characters:**

83. *Anthyllis Vulneraria*, L.—Stem erect, radical leaves simple, oblong, upper pinnate, leaflets unequal, glauous, terminal leaflet largest, flowers yellow, in a dense head, two on each stalk, calyx inflated, woolly, bracts large.

**Yellow Mountain Oxytropis** (*Oxytropis campestris*)

There is no trace of this plant in early seed-bearing beds. It is a member of the flora of the North Temperate and Arctic Zone, of Arctic and Alpine Europe, Siberia, and America. In Great Britain it is found in Forfar, E. Perth, at altitudes of 2000 ft. It is confined to Scotland.

The silky or Yellow Mountain Vetch is found only on the moist mountain heights of Clova, where Oak-leaved Mountain Avens and other plants, such as Yellow Balsam, Winter Green, Butterwort, and other alpine or subalpine species, delight to grow.

It has much the same habit as Astragalus, but the stems are prostrate or the plant may have no aerial stem. The plant is silky or softly hairy. The leaves have the leaflets arranged each side of a common stalk, with lance-shaped acute leaflets, in about twelve pairs, with a terminal leaflet exceeding the flowering stems.
No. 1. Yellow Mountain Oxytropis
(Oxytropis campestris, D.C.)

a, Pod, with curved beard. b, Calyx, with awl-like unequal teeth. c, Plant, with radical pinnate leaves and lance-shaped stipules, flowers in head on long flower-stalk.

No. 2. Sanfoin
(Onobrychis vicicifolia, Scop.)

a, Standard or vexillum. b, Wings or alae. c, Keel or carina. d, Pod, with calyx. e, Seed. f, Leaf (pinnate), with membranous stipules. g, Flowers in head, with bracts, on long stalk.

No. 3. Dropwort
(Spiranthes filifolia, L.)

a, Group of follicles. b, Stan-leaf (pinnate) and toothed stipules. c, Rootstock, with root-fibres and tubers. d, Inflorescence, a paniced cyme, with flowers in various stages, showing follicles below, flowers expanded in the middle, and buds above, pink externally.

No. 4. Oak-leaved Mountain Avens
(Dryas octopetala, L.)

a, Flower, with petals removed, showing stamens and pistil, with calyx with black hairs. b, Achenes, with long awns. c, Head of achenes, with long awns. d, Plant, with creeping rootstock and stipules, with leaves, and flowers on long stalks, with bracts low down, flowers from front showing 8 petals, and back view with 8 sepals.
1. Yellow Mountain Oxytropis (Oxytropis campestris, D.C.).
2. Sainfoin (Onobrychis vicicifolia, Scop.).
3. Dropwort (Filipendula ulmaria, L.).
4. Oak-leaved Mountain Avens (Dryas octopetala, L.).
The flowers are pale-yellow (hence the first part of the English name), in paired and crowded terminal heads, tinged with purple. The bracts equal the calyx, and the keel is acute (hence the generic name, from the Greek). The pods are finely hairy, with six or more joints, netted, and imperfectly 2-celled.

This plant is dwarf, at most 6 in. The flowers appear in June and July. The plant is perennial.

The flower is conspicuous, yellow and purple, with a tubular calyx, and a general arrangement of parts much as in *Lotus*, but the petals have long claws or stalks, the carina or keel is erect and has a recurved tooth at the tip, and the upper tenth stamen is free for insertion of the insect’s proboscis. The stigma is minute, and the ovule is stalkless.

Seeds of this plant are dispersed by the plant’s own mechanism. The pod is 2-celled, and by contraction the seeds are thrown from it to short distances by an explosive motion.

Being a rock plant, this plant grows on a rock soil derived from older barren schistose or granitic rocks.


The name *Oxytropis* is from the Greek, *oxys*, sharp, *tropis*, keel, in allusion to the narrow keel. The second Latin name refers to the habitat, in fields.

Essential Specific Characters:

85. *Oxytropis campestris*, D.C.—Stem woody, leaflets lanceolate, leaves as long as flower-stalks, erect, downy, flowers yellow, purplish, pods hairy.
Sainfoin (Onobrychis vicifolia, Scop.)

The distribution of this plant in the North Temperate Zone is West and S. Europe and Northern Asia, and it is unknown before this period in early beds. In Great Britain it is found in Somerset, Wilts, Dorset, Hants, and in the Thames district; it is absent from S. Kent, but occurs throughout Anglia except in Hunts, and not in West Gloucestershire, Monmouth, or Stafford, in the Severn district; in Wales it is found only in Glamorgan, and elsewhere is introduced. Watson regards it as doubtfully indigenous in Mid and S.-E. England, and it is usually a relic of cultivation. It is a plant of hilly, rocky ground, and is a feature of the south country and the eastern counties, dispersed by farming operations, but as a fodder plant turns up, or is likely to do so, wherever quarrying is in progress.

The stems are long, subereect, rather rigid, with numerous leaves, with leaflets each side of a common stalk, consisting of 3-12 oblong or linear lance-shaped leaflets, shortly stalked, and with a blunt point, entire, practically smooth, dark-green, with an odd or terminal one.

The flowers are in close racemes, rose-red, with dark veins. The tube of the calyx is silky, and it is short with awl-like teeth. The wings of the flowers are very short. The pods are dark-brown, netted, rough, roughly semicircular, downy, and contain one seed.

The Sainfoin grows to a height of 18 in. It flowers during June, July, and August. It is a most beautiful perennial which is quite worthy of cultivation by the horticulturist.

The flower resembles those of *Melilotus* and *Trifolium repens*, but in the Sainfoin the carina or keel does what the alae or wings did with it in the latter case, springing back after being pressed down. The alae are reduced and just cover the claw of the carina, not allowing the removal of honey laterally. The insect settles on the carina, which is a lever for downward rotation, and its elasticity causes it later to recoil. The stigma is prominent and when the flower is visited by a bee it touches the bee's abdomen, in older flowers protruding 1½ mm. beyond the carina. Cross-pollination is accomplished, the flowers being attractive, and the calyx tube is short (2-3 mm.). The vexillum is broad and ascends obliquely, being a fulcrum or lever for the bee's head when pushing back the carina with its legs. Honey and pollen are both accessible to short-lipped bees. The visitors are *Hymenoptera* (Apidae), *Diptera* (Syrphidae); *Lepidoptera*, Green-veined White Butterfly (*Pieris napi*), *Lycaena*, *Zygina*, *Euclidia glyptica*, *Plusia gamma*. 
The pod is winged and crested, spiny, and may be dispersed by aid of the wind or animals, or merely by dehiscence or falling when ripe. Sainfoin is a chalk plant indulging in a lime soil, and found also on oolitic rock soils, or where fodder has been grown, where it may, when on cold clay soil, &c., persist for a short period.

The fungi, *Rhytisma onobrychidis*, *Ramularia onobrychidis*, Sainfoin leaf-spot, infest it, and it is galled by *Cecidomyia onobrychidis*; whilst a beetle, *Bruchus canus*, also lives on it.
Onobrychis. Dioscorides, is from the Greek, onos, ass, and brucha, bray, the animal being said to bray for it. The specific name viciafolia means vetch-leaved.

Sainfoin is from the French, sain, wholesome, foin, hay. Cinquefoil, Cock's-comb, Cock's-head, Lasting Grass, Meadow Fatch, Medick Fitch, French Grass, Hen's Bill, Lucerne are the only names.

To expatiate on the value of this plant a pamphlet was published upon it in 1671, when it was spelt Saint Foine. It was said to be found among the herbs and grass in the manger where our Lord was born. It suddenly opened its flower to form a wreath around His head. This gave rise to the practice of decking mangers at Christmas with moss, sowthistle, cypress, and holly. It was introduced into this country as a fodder plant in the seventeenth century from the Continent, where it had long been cultivated, and excellent hay is made from it.

Essential Specific Characters:

88. Onobrychis viciafolia, Scop.—Stem tall, erect, leaves paired, pinnate, leaflets entire, 12-15; flowers crimson, in a raceme, with pink and white lines, on long peduncles, calyx woolly, pod twice as long as the latter.

Dropwort (Spiraea filipendula, L.)

This plant is quite unrepresented at present in early deposits. It is found to-day in the Northern Temperate Zone in Europe, North Africa, North Asia. In Great Britain it is absent in N. Devon, S. Somerset; it occurs in the whole of the Channel, Thames, and Anglia provinces, and in the Severn province, except in Monmouth; in Wales, only in Carnarvon, Flint, and Anglesea, but in the whole of the Trent province; in W. Lancs and throughout the Humber and Tyne provinces, but not in the Isle of Man; in Scotland and Berwick, Edinburgh, Fife, Mid Perth, and Forfar, from Caithness it ranges southward, up to 1200 ft. in Yorkshire. It is found in the West of Ireland.

The Dropwort is a much more xerophilous plant than the Meadow Sweet, and grows most luxuriantly in upland pastures on the sides of dry hills, where it can shelter beside the protecting branches of shrubs and hedge-plants. Dropwort has the same sort of habit as Meadow Sweet, but the foliage is different, and is much divided, coarsely toothed, the leaflets being numerous, oblong, and deeply cut, giving them the appearance rather of Milfoil. It is dark-green in colour.

The flowers are in corymbs, not so numerous or crowded as in the Meadow Sweet. The petals are cream-colour and in bud externally rose-coloured. The capsule is not spirally twisted, but straight.
This beautiful plant is usually 2 ft. in height. It is in flower in June, July, and onwards up to October. It is perennial and is reproduced by division.

No honey is secreted, but only pollen. The insects alight on the stigma and cross-pollinate the plant. The petals are bent backwards and downwards during the expansion of the flower, and are attached by very narrow stalks so that they hang down under their own weight and a bee's weight when visited. Before they open, the stamens are bent outwards, and 9–12 broad styles spread out in the centre into a horizontal plane forming a disk around which the stigmas stand directed upwards and outwards. As the inner stamens remain directed upwards till they open, this causes the plant to be self-pollinated. It is visited by Halictus zonatus, H. sexuatus, Eristalis arbustorum, E. nemorum, Helophilus florens, Syritta pipiens, Trichius fasciatus.

The seeds are few and contained in a follicle, and may be dispersed around the parent plant by the wind or by browsing animals.

Dropwort is a lime-loving plant, preferring a lime soil, and may
be found upon chalk or calcareous rocks as well as upon stiff clayey beds on Boulder Clay or Upper Lias containing much lime.

The fungus *Triphragmium filipendula* develops on it, and the winter spores are beautiful objects under the microscope. A moth, *Paramesia aspersana*, lives on it.

*Filipendula*, Dodonaeus, is from *filum* (Latin), thread, *pendula*, hanging, because the knob-like roots or tubers hang from fine thread-like fibres. *Spirea* is the Greek name of the Meadow Sweet, a plant of the same genus.

This lovely wildflower is called Dropwort, Fillyfindillan, Lady's Ruffles, Meadow Sweet, Walwort. The name Dropwort was applied to it because it was used in cases of strangury. The tubers have been used in times of scarcity as food. It was supposed to cure stone in the Middle Ages. By the Doctrine of Signatures it was used because it is hard, with Gromwell seeds, which were beaten up together.

**Essential Specific Characters:**—

94. *Spirea filipendula*, L.—Root tuberous, stem erect, leaves pinnate, alternate, smaller deeply serrate, flowers white in a cyme, petals pink externally, large, not crowded.

**Oak-leaved Mountain Avens (Dryas octopetala, L.)**

Remains of this rare but interesting plant are found in Late Glacial beds in Edinburgh and Perth. It is found in the Arctic and Alpine regions of the North Temperate and Arctic Zones. In Great Britain it occurs in Stafford, Carnarvon, York (Mid, W., and N.W.), Westmorland, Mid and East Perth, Forfar, South Aberdeen, Easternness, Argyle, Cantire, North Ebdudes, West Ross, Sutherland, Orkney, that is from Carnarvon and Stafford to Orkney, ascending to 2700 ft. and descending to the sea-level in N. and W. Ireland.

The Oak-leaved Mountain Avens is a local plant, which is restricted in England and Scotland to the mountain ridges of the Pennine and Highland groups, where it grows on rocky heights, mainly limestone rocks. The Gentians, Saxifrages, and other rare alpine and subalpine species are found in the same spots.

This rare alpine flower, like many others that adorn the hills, is dwarf but delicate and has a large and beautiful flower. From the resemblance of the leaves to those of the Oak, on a small scale, Linnaeus gave it the first Latin name. The leaves are stalked, oblong, toothed irregularly near the base of the stem, and woolly.
The flowers are large, with white petals, and, as indicated by the second Latin name, these are eight in number. The sepals are long, and covered with black, glandular hairs, like the scapes, which are also hairy and glandular.

This choice little plant is never more than 9 in. in height. It is in flower in June, July, and August. It is a perennial and propagated by division. One may find it in many rock-beds in the garden.

The Mountain Avens is androdioecious. The hermaphrodite flowers are usually feebly proterogynous like Avens, the stigmas maturing first. The stigmas rise when the flower opens, are sometimes covered over by the inner stamens even for some time after the outer anthers have opened,¹ and these flowers are proterandrous, the anthers ripening first. The flowers are large and contain honey, which is concealed.

Long hairs are developed on the fruit as a feathery down to aid in dispersal by the wind. The carpels are numerous.

This handsome species is a rock plant, being found only on limestone rocks, and is therefore a lime-loving plant.

A moth, *Grapholitha complana*, is the only insect which infests it.

*Dryas*, Linnaeus, is from the Greek, *drus*, oak, to which its leaves have a resemblance. The second Latin name refers to a characteristic of the flower, which has 8 petals.

The plant is called Mountain Avens and Wild Betony.

Essential Specific Characters:—

96. *Dryas octopetala*, L.—Stem decumbent, woody, leaves stalked, downy white below, oblong, crenate, flowers white, petals 8, sepals equal 8, achenes with feathery awn.

¹ The outer open first, and insect visitors touch the stigmas and anthers on either side, and establish crossing. When no visitors occur, the styles bend outwards and touch the inner anthers, and self-pollination occurs from this cause and the later pendent position of the flower.
Salad Burnet (Poterium Sanguisorba, L.)

Those who have searched for this plant have failed as yet to meet with seeds in Glacial or other beds. The distribution to-day shows that it is a plant of the N. Temperate Zone found in Europe, N. Africa, N. and W. Asia, and the Himalayas. It is widely dispersed, but local in Great Britain; thus it is found in the whole of the Channel, Thames, Anglia, and Severn provinces. It is only found in N. Wales in Denbigh, Flint, and Anglesea, but throughout the Trent, Mersey, Humber, and Tyne provinces, though not in the Isle of Man; and in Scotland, not in Ayr in the W. Lowlands, Selkirk and Berwick in E. Lowlands; in E. and W. Highlands it occurs generally except in Mid Ebudes; in the N. Highlands, except in W. Ross and W. Sutherland. It is not found in the Orkneys in the Northern Isles. It ascends to 1600 ft. in Yorks, and in E. Scotland extends from Perth to Berwick. It is rare in Ireland and the Channel Islands.

Salad Burnet is a hill-side plant, fond especially of chalky districts, but growing elsewhere where lime abounds with Dyer's Weed, Musk Mallow, Dropwort, Field Scabious, Cotton Thistle, Wild Thyme, Sheep's Sorrel, Box, Musk Orchis, &c.

Suberect and branched, the stems are numerous, subangular, and reddish, with leaves, with leaflets each side of a common stalk, which when bruised smell and taste like cucumber. The stipules or leaflike organs are toothed.

In the upper part of the flowerhead are female florets, in the lower male, and in the centre both, the upper pistils being crimson, the stamens below pendulous, and red with yellow anthers. The calyx is square with membraneous sepals. The florets are in small, green, rounded heads. The fruit is an achene.

The height of the plant is about 2 ft. Flowers can be found in July. It is a perennial plant, and increased by root division.

This is one of the anemophilous flowers whose pollen is wind-dispersed. There are some male florets below, some female above, some hermaphrodite in the centre. There is no honey. The stamens are numerous. The numerous, long, thread-like stigmas and anthers project from the flower, the anthers on long, thin, white, yellow, or red pendulous anther-stalks. Oedynurus parietum and some few flies settle on it.

The 1-seeded achenes or fruits, 1–3, are enclosed in the hollow,
No. 1. Salad Burnet
(Poterium Sanguisorba, L.)
a. Vertical section of flower (enlarged), showing disk lining the calyx-tube, ovary, perigynous stamens, and tufted stigmas, with 3 sepals. b. Flower, with sepals and stamens exerted. c. Flower, with stigmas exerted. d. Achene (stipitate). e. Upper part of plant, with pinnate stem-leaves and flowers in various stages pistillate above, staminate around the margin.

No. 3. Ploughman's Spikenard
(Inula squarrosa, Bernh.)
a. Achene, with pappus and ligulate floret from ray. b. Inner scale of involucre. c. Outer scale of involucre. d. Tubular or disk floret. e. Inflorescence, with upper stem leaves below, showing flowerheads with involucral bracts in various stages.

No. 2. Field Scabious
(Succisa pratensis, L.)
a. Floret enlarged, with cup-shaped involucre, and bristle-like teeth of calyx crowning the latter. b. Section of floret, with epipetalous stamens. c. Involute and calyx, with pistil with bristles and style, with corolla removed. d. Section of involucel enclosing ovary, crowned by calyx with bristle-like teeth (enlarged). e. Upper part of plant, with pinnate leaves, and flowerheads axillary and terminal in bud and with flowers in staminate condition.

No. 4. Cotton Thistle
(Onopordum Acanthium, L.)
a. Tubular floret, with pappus and achene below, and style above the lobed corolla. b. Achene crowned by pappus in many series. c. Flowerhead, with bracts of involucre cut back showing disc. d. Upper part of plant, with cottony stem-leaves, winged stem, and flowerhead with bracts below in a spinoz involucel.
2. Field Scabious (*Sambucus arvensis* L.).
3. Ploughman’s Spikenard (*Aconitum panarum* Berth.).
4-winged calyx-tube or winged receptacle, and are thus dispersed by the wind. When there are 3 achenes they are triangular.

Salad Burnet is distinctly a lime-loving plant, requiring a lime soil, but may be found commonly on such rock soils as those of the Rock-

bed of the Middle Lias, which is mainly arenaceous, though it undergoes changes which make it largely calcareous in part.

Two fungi grow on this plant, Phragmidium sanguisorbae and Ecidium poterii. It is galled by Eriophyes sanguisorbae.

The moths, the Reddish Buff Moth (Acosmectia caliginosa), Guophos pullata, Paramesia aspersana, Nepticula poterii, Selenia tetratunaria, Essex Emerald (Geometra smaragdaria), feed on it.

Poterium, Linnaeus, is Greek, poterion, for a drinking-cup, as it was used in wine, Pliny tells us. Burnet is from Brunette, brown, from
the colours of the flowers, especially in Great Burnet. Sanguisorba
(sanguis, blood, sorbere, to absorb) is Latin for blood-stanching.

This plant is called Burnet, Pimpernel, Pimpinell, Salad Burnet.

"Of pympermalle to speke tenky net,
And Englysch y-called is Burnet."

It was formerly used in tankards. It was put in a preparation made
for festering wounds, and was one of the herbs used in "Save", of
Chaucer's time. It is nutritious and very astringent. Sheep are said
to thrive on it. It has been sown with clover. The bruised leaves
smell like cucumber and taste like the skin.

Essential Specific Characters:—

102. Poterium Sanguisorba, L.—Stem erect, angular, leaves pin-
nate, leaflets ovate serrate, flowers apetalous, in heads, crimson above,
calyx 4-cleft, smooth, stamens below, with drooping filaments, fruit
quadrangular, veined.

Field Scabious (Scabiosa arvensis, L.)

Though found at the present day in the Northern Temperate and
Arctic Zones, in Arctic Europe, Siberia, North Africa, there is no
earlier trace of this plant as there is in the case of Devil's Bit Scabious.
In Great Britain it is not found in Cardigan, Mid Perth, Westerness,
Main Argyle, Cantire, the Ebudes, West Ross, E. Sutherland, Caith-
ness, Hebrides, Orkneys, or the Shetlands.

The Field Scabious is not so often found in the valleys and low-
lands generally as its near ally, Devil's Bit Scabious, being addicted to
a much drier habitat. It is a plant of the mountains and hills, growing
very often on dry banks in the open fields, but generally only in upland
districts. It is occasionally to be found, however, in the cornfield,
where it grows gregariously.

Field Scabious is taller than Devil's Bit Scabious, but it has much
the same habit, though it grows in clumps, and is not scattered across
the meadows as the latter often is. The stem is simple or branched,
rough, leafless above, and hairy at the base. The lower leaves are
simple, entire, opposite, roughly hairy,\(^1\) egg-shaped, coarsely toothed,
the upper stalkless, clasping, with the lobes divided nearly to the base
into four.

The flowerheads are blue, terminal, and borne on stalks. The

\(^1\)The hairs are long and simple, long and dark glands, and numerous.
Field Scabious

The calyx is cup-shaped, and made up of radiate teeth edged with hairs. The receptacle is tubular, as long as the calyx.

The plant is often 2 ft. high. It blooms from July to October. The plant is perennial and propagated by seed.

The flowers are conspicuous, and in fine weather this plant is visited by many insects, and one is kept quite busy on a summer day within sight or smell of this delightful flower in noting the visitors that come and go in quick succession. It is cross-pollinated owing to its proterandrous and dichogamous flowers, while in the absence of insects it is self-pollinated.

There are 5 florets in each head, making a hemispherical head, and they become larger from the centre to the margin. The tube is long, but the honey at the base is accessible to insects because it is widened above. The anthers become ripe slowly, occupying several days in the process from the margin to the centre. They project 4-5 mm. above the corolla, and in spite of this not a single stigma ripens till they have all opened; but when they do they do so rapidly and simultaneously, and occupy the place of the anthers, and bees, &c., can cross-pollinate them at a single visit. The whole head is first male, then female. In other flowers the florets are female only, the stamens rudimentary. Self-pollination usually is impossible, but in some flowers the females are less numerous. The flowers are visited by Hymenoptera, Diptera, Lepidoptera, Coleoptera.

The fruits are beaked, and to a great extent may be dispersed by animals.

Field Scabious is a sand plant, delighting in a dry sand soil.
Several small fungi may be found infesting this Scabious, as *Peronospora violacea*, *Bremia lactucae*, *Ustilago scabiosa*, *U. flosculorum*. A Hymenopterous insect, *Andrena hattorfiana*, and the Lepidoptera, Narrow-bordered Bee Hawk Moth (*Sesiia bombiliformis*), *Parasemia sannio*, *Grapholitha quadraana*, *Nematois scabiosellis*, feed on it.

The generic name is a Latin word denoting scurf or scabby, the plant having been thought useful in curing scaly eruptions. The second Latin name refers to its preference for cultivated land.

This gay-flowered species is called Bachelor’s Buttons, Billy Button, Black Soap, Blue Buttons, Bluecaps, Blue Men, Broadweed, Cardies, Clodweed, Clogweed, Curl-doddy, Egyptian Rose, Gipsy Flower, Gipsy Rose, Lady’s Cushion, Pincushion, Black-Soap, Blue Buttons, Bluecaps, Blue Men, Broadweed, Cardies, Clodweed, Clogweed, Curl-doddy, Egyptian Rose, Gipsy Flower, Gipsy Rose, Lady’s Cushion, Pincushion, Seabridge, Seabridge, Seadbridge, Scebrid. Lyte says it was named Scabious “of old tyme because it is given in drynke to heale scabbes”.

Field Scabious is astringent, and has been used for coughs, asthma, fevers, epilepsy, &c.

**Essential Specific Characters:**

149. *Scabiosa arvensis*, L.—Stem erect, branched, leaves at base simple, serrate, downy, stem-leaves pinnatifid, flowers lilac, outer larger, unequal, 2-lipped.

**Ploughman’s Spikenard** (*Inula squarrosa*, Bernh.)

Local but well dispersed, Ploughman’s Spikenard is found at the present day in Europe from Denmark southwards and Western Asia, but not in any early deposits. In Great Britain it is found in the Peninsula, Channel, and Thames provinces, and in Anglia generally, except in Hunts; in the Severn province; in S. Wales, except in Brecon; in N. Wales, except in Montgomery; in the Trent province; in the Mersey province, except in Cheshire; in the Humber, except in S.E. and N.W. Yorks; and in Westmorland.

Ploughman’s Spikenard is a plant of the uplands, especially common in the western counties, where there are hilly regions generally. It grows on the open hill-side, as well as in woods and copses where there are stony banks, with Hawkweed and other Composites, such as Wall Hawkweed.

This is an erect, rigid, tall, and simple-stemmed plant, growing in scattered clumps. The stem is herbaceous and leafy. The leaves are downy below, with coarsely-toothed margin, lance-shaped to egg-shaped, dark-green. The upper leaves are entire.

The flowerheads are yellow, in corymbs. The phyllaries or whorl
of leaflike organs on the outside are lance-shaped, the inner ones linear, acute. They are bent back. The rays of the flowerheads are small, and not much longer than the involucres or whorls of bracts, which are unequal. The pappus or hair is red, and the fruit is hairy. The ray florets are divided and in a single row.

The height of this plant is about 2 ft. It is in flower in July and August. It is a deciduous, herbaceous perennial, propagated by seeds.

The ray florets may be female or neuter, ligulate, with slender style lobes, while the florets of the disk are tubular and bisexual, with the lobes of the style short.

This plant is visited by many insects, Apidae, *Halicinus leucozonius, II. cylindrius, II. maculatus, II. albipes, Nomada solidaginis, Sphegidae, Serecris.*

The fruits are provided with pappus, which is rough and in one row, and they are thus adapted for dispersal by the wind.

Ploughman's Spikenard is a rock plant, growing on barren, rocky ground on rock soil, or on sand derived from the rocks of chiefly older date, or on calcareous soils.

Two moths, *Gelechia bifractella, Pterophorus lithodactylus*, feed on it.

*Inula*, horace, is derived from the Greek *Helenion*, a plant supposed to have been the elecampane, and the second Latin name refers to the squarrose nature of the leaves and bracts of the involucre.

This plant is called Cinnamon Root, Fleawort, Ploughman's Spike-
FLOWERS OF THE HILLS AND DRY PLACES

nard. Gerarde says of the first: "In English it may be called the cinnamon roote . . . by reason of that sweete and aromaticall savour which his roote conteimeth and yieldeth". It was supposed when hung up in a room to drive away gnats and fleas.

Essential Specific Characters:—

154. *Inula squarrosa*, Bernh.—Stem tall, downy, leaves dull-green, ovate, lanceolate, downy, dentate, flowerheads yellow, terminal, in a corymb, scales of the involucre reflexed, pappus red.

Cotton Thistle (*Onopordon Acanthium*, L.)

The present distribution of this plant is Europe and Siberia, and it is merely an introduction in N. America. There is no evidence as to its occurrence in early deposits. In Great Britain in the Peninsula province it is absent from S. Somerset, in the Channel province from W. Sussex; it occurs throughout the Thames and Anglia provinces; in the Severn province not in Gloucs; whilst in Wales it is found in Carmarthen, Pembroke, Montgomery, Carnarvon, Denbigh, and Flint, and it is found in the Trent province generally, except in Derby, not in Mid Lancs in the Mersey province, in the Humber province not in S.E. or S.W. Yorks, in the Isle of Man, in Lanark, Roxburgh, Berwick, Haddington, Edinburgh, Fife, Stirling, E. Ross. Elsewhere it is probably not native, and is an alien or denizen.

The Cotton Thistle, where it is a native, is a plant of dry places, and elsewhere it is merely a casual found in waste places, in gardens, and where it has been sown by man consciously or unconsciously, like many other plants which now have a sort of temporary home with us but whose native origin is under suspicion.

While not a true thistle, the Cotton Thistle is even taller than the Marsh Thistle, and with its fine heads of bloom and whitish foliage and stems it is far more imposing.

With spreading branches it thus forms quite a magnificent ornament for gardens. The woody stems are freely continuously winged. The leaves are egg-shaped, oblong, stalkless, wavy, decurrent, toothed, covered both sides with woolly down, and very spinous.

The flowerheads are numerous, terminal, purple, upright, in a nearly round involucre, with spreading awl-like phyllaries or whorls of bracts. The receptacle bears scales. The tubular florets are complete. It is 4 to 10 ft. in height. The flowers bloom in July and August. The plant is biennial, reproduced by seeds.

The flowerhead is much like that of *Carduus* but does not bear
chaffy bristles. The tube is 10-12 mm., and honey rises in the cylindrical throat 3-4 mm. This is divided above into 5 linear segments 6-8 mm., which continue to be straight. The length of tube does not prevent honey being reached, and is due to the development of the involucre which protects the buds, and makes the heads conspicuous. They bend outwards more and more. The branches of the style are closely parallel 3-4 mm., and have wart-like knobs on the outer margin. In the second stage (hermaphrodite) they turn outwards and are accessible to insects. There is a ring of short hairs 1 mm. below the
FLOWERS OF THE HILLS AND DRY PLACES

point where they fork, pointing upwards, and they sweep the pollen out of the cylinder, which is 8 to 10 mm. long, 1/2 mm. wide. Pollen lines the cylinder in the first stage, and in the second the style projects with 2 rows of papillae 5-7 mm. above the corolla divisions. The filaments are sensitive, protecting the pollen. When an insect touches them they contract and the anthers do so also, so that pollen is squeezed out upon the stigma, which does not lengthen.

Many flowerheads are pollinated by bees' visits simultaneously. The visitors are Hymenoptera, Megachile, Osmia, Colletes, Stelis, Andrena, Halictus, Bombus, Psammophila; Lepidoptera, Vanessa, Satyrus, Macroglossa; a beetle, Cocinella, and a Hemipterous insect Capsus.

The fruit is provided with several rows of barbed and toothed pappus or hair, which assist in dispersing the fruits by aid of the wind.

This handsome thistle is a sand-loving plant, addicted to a dry sand soil.

A beetle, Apion onopordi, and the flies, Trypeta lappae, Urophora macrura, Ensina sonchi, Acidia heraclei, are to be discovered on it.

Onopordon, Pliny, is Greek from osos, ass, and perdo, break wind; and Acanthium from acanthos, spine.

Cotton Thistle is called Argentine Thistle, Asses' Cotton, Down, Oat, Queen Mary's, Scotch, and Silver Thistle. It is called Queen Mary's Thistle because her attendants brought it to Fotheringhay, and Down Thistle because it is covered with wool or down.

Essential Specific Characters:—

172. Onopordon Acanthium, L.—Stem tall, winged, leaves rough, cottony both sides, oblong, flowerhead large, purple, involucre sub-globose, phyllaries spreading, imbricate, spinose.

Autumn Gentian (Gentiana Amarella, L.)

One of the Arctic types of plants, there is, nevertheless, no evidence of the occurrence of this plant in early deposits. Its present distribution is the North Temperate and Arctic Zones in Arctic Europe, Siberia, Dahuria. In Great Britain it is found in the Peninsula, Channel, and Thames provinces, except in W. Kent, E. Essex; in Anglia, except in Hunts; in the Severn province; in S. Wales only in Pembroke; in the whole of N. Wales; in the Trent province, and in the Mersey, Humber, Tyne, and Lakes provinces, except in the Isle of Man; in the E. Lowlands, except in Peebles, Selkirk, and
No. 1. Autumn Gentian
(Gentiana Amarella, L.)
a, Section of 5-lobed corolla, with epipetalous stamens. 
b, Calyx (5-lobed), with pistil (corolla removed), and 2 bent-back stigmas. 
c, Upper part of plant, with upper stem-leaves and flowers in terminal and axillary racemes, flowers in various stages.

No. 2. Field Gentian
(Gentiana campestris, L.)
a, Vertical section (enlarged) of corolla 4-fid with epipetalous stamens. 
b, Pistil with calyx (4-fid), with 2 outer larger, 2 inner inrolled lobes, and recurved stigmas. 
c, Upper part of plant, with stem-leaves, and flowers in various stages with 4-fid corolla.

No. 3. Wild Thyme
(Thymus Serpyllum, L.)
a, Corolla (enlarged), cut open, with 3-fid lower lip, and epipetalous stamens, 2 long, 2 short. 
b, Calyx-tube enclosing ovary with 2-fid stigma on long style; calyx teeth with 3-toothed upper 2-fid lower lip. 
c, Nutlet. 
d, Plant, showing creeping habit with rootlets from below, and aerial stem with opposite stalked leaves, and flowers in terminal whorls, in bud and expanded.

No. 4. Clary
(Salvia Veracae, L.)
a, Section of corolla, with 2-jointed stamens, and one anther cell on one. 
b, Calyx-tube, with corolla removed, and exserted bent style. 
c, Radical leaf, with wrinkled surface, on long stalk, with irregular teeth. 
d, Inflorescence, with flowers in whorls in various stages.
No. 7. M. F. Thompson

Not a well-illuminated scene, but still clear and visible. The
actors, now more in their own setting, continue their actions
and expressions. A few words of dialogue continue to
emerge, adding to the flow of the performance. The
atmosphere remains intense, with emotions running high.
FLOWERS OF THE MOUNTAINS, HILLS, AND DRY PLACES

1. Autumn Gentian (Gentiana Amarilla, L.).
2. Field Gentian (Gentiana campestris, L.).
3. Wild Thyme (Thymus Serpyllum, L.).
4. Clary (Salvia Verbenaca, L.).
Linlithgow; in the E. Highlands, except in Fife, Stirling, S. Perth, Kincardine, Easterness; in the W. Highlands only in Clyde Isles, S. Ebudes; in the N. Highlands, Orkneys, and Shetlands. It ascends to 2100 ft. in Yorks.

One of the typical upland plants, the autumnal Gentian delights in

![Autumn Gentian (Gentiana Amarella, L.)](Photo: Flatters & Garnett)

the free and open nature of dry pastures on the hill-side, or the very summits of the hills in most parts of the country where Field Plough man's Spikenard, Musk Mallow, and many other plants adorn the hills, and where Wild Thyme scatters its odour to the breezes far and wide.

The stems are erect, simple below, branched above. The leaves
are lance-shaped and hold water absorbed by club-shaped hairs. The branches are shorter than the joints. The plant is many-flowered. The sap is bitter and this may preserve the flower from being browsed by animals.

The flowers are purplish-blue, opening in the sun, and have a purplish stalk. The corolla is salver-shaped, 5-cleft, bearded, with lance-shaped segments, fringed in the throat. The stamens lie in the tube-forming ridges, and thus make 4 or 5 tubes.

This Gentian is about 6 in. in height. It is in flower between August and September. The plant is perennial and propagated by seeds.

The flowers are homogamous, anthers and pistil ripening together, but the style is longer than the anthers, so that an insect touches the stigma first. The honey, accessible to humble bees and Lepidoptera, is secreted by five green, fleshy glands at the base of the corolla or ovary, alternate with the stamens. The honey is protected from rain by the closing of the flower in dull weather. Long erect hairs inside the corolla protect the honey from flies where the tube and limb meet. The tube also contracts. The former is 16–18 mm. long, and 6 mm. wide, allowing an insect to insert its whole head and reach the honey with a proboscis of 10–12 mm. The anthers open when the flower opens, and turn the pollen-bearing side (turned outside in bud) inwards or upwards, so that the bee's head touches it. The style has two terminal stigmatic lobes, already expanded beyond the anthers and papillose. When insects visit the flower it cannot be self-pollinated, as if the insect touches the stigma first it cross-pollinates the plant. After the pollen is shed the anthers are level with the anther-stalks and close to the style. Autumn Gentian is visited by a humble bee, Bombus sylvarum.

The capsule splits up, and breaks up into parts containing numerous seeds, which are dispersed around the parent plant.

Like other heath-plants this Gentian is a humus-loving plant, and requires a humus soil.

A cluster-cup fungus, Puccinia gentiana, attacks the leaves.

Gentiana, Pliny, is derived from Gentins, King of Illyria, who is said to have first discovered it. Anacrella, Linnaeus, is from amarus, bitter.

Baldemoyne, Baldmoney, Bitterwort, Field-wood, Felwort, Field Wort, are some of its names. Coles says of Felwort that it is a "mongrel word mixed of Latine and English together". The roots are bitter, used as an astringent. The Gentians are cultivated and grow in light, but rich, soil.
Essential Specific Characters:


Field Gentian (Gentiana campestris, L.)

This beautiful flower is found on the hillier parts throughout the North Temperate Zone in Europe (but not in Turkey) and W. Siberia. It is unknown so far in early deposits. In Great Britain it does not grow in N. Devon or S. Somerset in the Peninsula province, but in Wilts, Dorset, the Isle of Wight, in the Channel province; in Herts, Berks, Oxford, in the Thames province; W. Suffolk, Norfolk, Bedford, Northants, in Anglia; Monmouth, Hereford, Stafford, Salop, in the Severn province; in South Wales in Glamorgan and Carmarthen, Pembroke, and throughout N. Wales; throughout the Trent province, Mersey province, except Mid Lancs, and in the Humber, Tyne, Lakes, W. Lowlands; in the E. Lowlands province generally, except Selkirk, Linlithgow; in the E. Highlands, except Stirling; W. Highlands; N. Highlands, except W. Ross; and in the Highlands.

The Field Gentian is found in similar habitats to that of the Autumnal Gentian, preferring a less dry station as a rule, but associated with other hillside plants, e.g. Yellow Balsam, Dyer's Weed, &c.

This beautiful little flower has a short, erect stem, which is branched above with inversely egg-shaped, spoon-shaped radical leaves, stem-leaves oblong, lance-shaped, with 3–7 nerves, stalkless, and entire.
The flowers are deep-purple or lilac or white, numerous, with a salver-shaped corolla, which is 4-cleft, and fringed with hairs in the mouth, thicker upwards. The calyx is 4-cleft, the sepals acute, two large or wider, and two small, overlapped by the larger ones. The capsule is nearly stalkless.

The stem is 3-6 in. high. Field Gentian flowers in the autumn in August and September. Being annual it is propagated by seeds. It is worth cultivating in gardens. In alpine regions it is biennial.

The Field Gentian is adapted for pollination by long-lipped insects, such as humble bees, and the flower is similar in general structure to G. Amarella. It is sometimes homogamous, anthers and stigma maturing together; sometimes protandrous, anthers ripening first. In wet weather the plant may also be cleistogamous.

The capsule splits open by septa when ripe, containing numerous seeds, which are liberated and fall out around the parent plant.

As with G. Amarella, this Gentian is a humus-loving plant and requires a humus soil.

A cluster-cup fungus, Puccinia gentiana, attacks the leaves, as in the case of the Autumn Gentian.

The second Latin name refers to its habitat, dry pastures.

The only names by which Field Gentian is known are Baldmoney and Bitterwort. The bitter root is used on account of its astringent properties.

Essential Specific Characters:

244. Gentiana campestris, L.—Stem erect, branched, leaves ovate lanceolate, flowers lilac, calyx 4-cleft, 2 outer lobes larger.

Wild Thyme (Thymus Serpyllum, L.)

Like other Arctic plants, Wild Thyme is an ancient species, found in Late Glacial deposits at Greenock. It is distributed in the Arctic and Temperate regions in Arctic Europe, Siberia, Dahuria, W. Asia as far east as the Himalayas, Greenland, and in N. America it has been introduced only. It is found throughout Great Britain, and if there has been no confusion between this and Th. Chamaedrys, up to 3500 ft. in the Highlands.

So familiar and sweet-scented a flower arrested the attention of the poet of human nature, who recalls—

"I know a bank where the wild thyme blows."

1The stigmas are sometimes at the same level as the anthers or lower, or they may project beyond them. Eventually they bend over and the plant may be self-pollinated.
and it is, in fact, an upland species, addicted to hills and dry places, mountain heights, growing there on hillocks and hummocks, delighting in a sloping aspect wherever it grows.

The stem is woody, shrubby, prostrate, branched, and downy, with turned-back hairs. The leaves are flat, blunt, fringed with hairs below or smooth, on short stalks, dotted with small glands. The flowers are purplish-red, in whorls, and the flowering shoots are suberect, the flowers in heads and subrotund. The corolla has its tubular mouth closed with hairs, with the upper lip with 3 reflexed teeth turned backwards, the lower narrower, ciliate, fringed with hairs at the margin. The tube of the corolla equals the calyx. The upper lip is oblong and notched. The corolla is 2-lipped. The nutlets are nearly smooth, with 4 small brown seeds. It rarely fruits in Britain.

Wild Thyme is 6 in. high. Flowers can be found between June and August. It is an evergreen trailer, propagated by cuttings, and ought to be found in our gardens.

The large flowers are hermaphrodite, the smaller ones pistillate, or female with stamens with functionless anthers, and the one may be a reduction from the other, as the former are much larger than the latter; and the smallest of the former and the largest of the latter are nearly equal in size. The flowers on the same plant are about the
same size, but the hermaphrodite flowers enlarge as they pass from the male to the female stage. It has lost the power of self-pollination, being much visited by insects for its abundant honey.

The base of the ovary is enlarged to secrete the honey and serves to attract insects, which quickly pollinate the flowers, the parts projecting. The tube is smooth at the base, lined with hairs above to keep out rain. It is 2½ mm. long, and thus open to many insects. The style is short, and the anthers are much longer at first, the filaments varying in length, but the former elongates (and both project from the corolla), and then divides and becomes covered with wart-like knobs, the lobes spreading. The female flowers are more fertile than the hermaphrodite. A third type was found by Delpino with hermaphrodite flowers, with stamens and pistil equally developed, and others with highly developed stamens and abortive pistil, and vice versa.

There is a tendency towards the production of purely male flowers in England, the stigma not maturing in some hermaphrodite plants. Wild Thyme is visited by the Honey Bee, Bombus, Saropoda, Andrena, Megachile, Nomada, Celleys, Annophila, Ceraceris, Lindonius, Sistacchus, Eristalis, Sicus, Myopa, Lucilia, Echinomyia, Gymnosoma, Ocyptera, Sarophaga, and the Lepidoptera Satyrs, Argynnis, Lyceana, Sesia.

The nutlets are free at length, and fall out automatically around the parent species.

Being largely a rock plant, Wild Thyme grows on rock soils, either sand or lime, being common on chalk and oolite.

The leaves are attacked by a cluster-cup fungus Puccinia schneideri. Several beetles, Apion alomarium, Meligethes ingubris, Chrysomela ceretailed, Adinonia tanaceti, Longitarsus pulvex, L. pellicidus, Butalis senescens, Plechorphorus tetractylus, Idca straminata, I. rubiginata, I. decorata, Lepidoptera, Dwarf Pug (Eupithecia pusillata), Grapholitha compta, Large Blue (Pleomelepsis Arion), Pemphelia dilutella, Gelechia artemisiella, and a Homopterous insect, Tettigometra impressopunctata, live upon Thyme.

Thymus. Theophrastus, is from the Greek thuo, I excite, or thumos, courage, because of its smell, which revives the spirits. Serpyllum. Pliny, is a Latin name for thyme.

Pliny also says that, when burnt, Wild Thyme put to flight all creeping venomous creatures. It is called Brotherwort, Hill-wort, Horse Thyme, Mother of Thyme, Pella Mountain or Puliall Moun-

1 Delpino found male flowers near Florence. These do not occur in this country apparently.
tain, Penny Mountain, Serpell, Piliol, Thyme, Bank, Creeping or Running Thyme, Shepherd's Wild Thyme.

The fairies are said to be fond of Thyme. On St. Agnes' Eve it has been used as a love charm, when this formula was repeated:

"St. Agnes, that's to lovers kind,
Come, ease the troubles of my mind."

The Greeks used it in their garlands. It was reputed to have formed the bed of the Virgin Mary. It was used as a remedy for depression. Thyme was used for internal disorders. Attica, where Thyme was abundant, was noted for its honey. The essential oil it yields is heating, not so acrid as that of Garden Thyme.

**Essential Specific Characters:**


**Clary** (Salvia Verbenaca, L.)

This rather local plant is one of the southern forms which are found in the North Temperate Zone, in Europe south of Denmark, N. Africa, and Western Asia. It is not found in any ancient deposits. In Great Britain it grows in the Peninsula and Channel provinces, except in W. Sussex; in the Thames, Anglia, Severn provinces; in S. Wales in Glamorgan, Carmarthen, Pembroke; in N. Wales in Carnarvon, Denbigh, Flint, Anglesea; in the Trent province, except in Derby; in the Mersey province, except in S. Lanes; in the Humber and Tyne provinces; and in Scotland in Ayr, Berwick, Edinburgh, Fife, Stirling, Forfar, E. Ross. It is found also in Ireland.

Much used as an eye salve at one time, there is no doubt that Clary is found in some of its localities owing to this former use to which it was put, as it grows in waste places in many cases. But it is also found on dry pastures on hilly ground, where it is much more probably native.

Clary is a tall, erect, square-stemmed, branched plant, growing in small clumps. The leaves are oblong, acute, coarsely toothed, wavy, veined, smooth, and the radical leaves are stalked, the stem-leaves stalkless and oblong. The plant is hairy above, smooth below.

Of a deep-blue colour, the flowers are small, with 6 flowers in a whorl, with long, acute bracts or leaflike organs, shorter than the flowers, turned back. The calyx is equal to the tube of the corolla.
which is small, with an emarginate tube, and a broad lower lip, trifid, or divided into three nearly to the base. The upper, concave, is turned down. The calyx is bell-shaped with recurved edges. The nutlets (4) are black and round.

Clary is usually about 2 ft. high. It flowers in May and June.

The plant is perennial, propagated by division, and quite worth a place in gardens.

To protect the honey from the rain and flies the tube of the corolla is lined with hairs. The upper lip is erect, flattened; the lower, trifid, divided into three nearly to the base, serves as an alighting place, the lateral lobes spreading. There are 2 stamens with short
anther-stalks jointed with the slender swollen connective which carries one perfect, one immature anther-cell. There is a large anterior honey-gland. The style is ascending, swollen, and tri-fid. A bee inserting its head in the mouth of the flower touches the inner end of the anther, and raising it acts as a lever and causes the outer to rub its back with pollen as the stamens stand across the mouth of the flower.

The flower is proterandrous, the anthers ripening first. The style bends down and the stigma is brought within touch of insect visitors. Cleistogamic flowers also occur.

The 3-angled nutlets fall out around the parent plant when ripe, and are aided by the wind in dispersal.

Being a lime-loving plant, Clary grows on lime soil, or is a rock plant on rock soil.

A mould fungus, or Peronospora lamii, attacks it.

Savia, Pliny, is from the Latin for sage, from salvia, safe; Verbena is from Verbena, because it is like verbena in habit.

Clary is also called Christ’s Eye, Wild Clary, Clear-eye, Wild Clear-eye, Eyeseeds, Oculus-Christi. The first name was given because it cures (so it was believed) diseases of the eye. Eyeseeds was a name given because it was “A plant whose seeds if blown into the eye are said to remove bits of dust, cinders, or insects that may be lodged there.”

Gerarde says: “The seede put whole into the eyes clenseth and purgeth them exceedingly from waterish humours, redness, inflammation, and divers other maladies or all that happen unto the cies, and taketh away the pains and smarting thereof, especially being put into the cies one seede at a time, and no more, which is a general medicine, in Cheshire and other Counties there about knoune of all, and used with good successe”. When bruised it is strong-smelling and unpleasant. It is very aromatic. The eye salve is prepared from a mucilage.

Essential Specific Characters:—

252. Salvia Verbenaca, L.—Stem erect, upper leaves cordate, sessile, radical, petioled, sinuous, crenate, wrinkled, flowers small purple, in terminal whorled spikes, 6, tube of corolla equal to calyx, with 2 acute bracts below.
Sheep's Sorrel (Rumex Acetosella, L.)

This sand-loving plant is also Arctic, and finds a place in the Pre-glacial deposits of Norfolk, and Interglacial beds at Hoxne, Suffolk. It is found at the present day in the N. Temperate and Arctic Zones, and has been introduced in the south. Sheep's Sorrel is found everywhere in Great Britain as far north as the Shetlands, and up to

2500 ft. in Yorkshire. It is a native of Ireland and the Channel Islands.

 Whereas the Common Sorrel is frequent enough in most fields and meadows, especially those that are moist and situated on clay soils, Sheep's Sorrel is a sand-loving species, growing on rocky knolls in or near woods, on heaths, and sandy wastes, e.g. warrens, and the seashore, as well as dry pastures at high elevations, and is said to be an indication of dry and poor soil rich in iron.

It is a tall, graceful plant with spear-shaped leaves which give it a characteristic appearance. The stem is single, unbranched, erect, smooth, the lower leaves spear-shaped, with lobes curved backwards,
No. 1. Sheep's Sorrel
(Rumex acetosella, L.)

a, Pistillate flower, with stigmas and coloured perianth-segments (enlarged).  
b, Staminate flower, with stamens (enlarged).  
c, Part of stem, with fruits.  
d, Part of stem, showing arrow-shaped stem-leaves, and staminate inflorescences.

No. 2. Box
(Buxus sempervirens, L.)

a, Flower (enlarged), with 4 perianth segments, 2 inner, 2 outer, 4 stamens, showing intrusive anthers.  
b, Capsule opening by 3 valves, with 3 horns split into 6, and seeds within, with one at the side.  
c, Part of plant, with leaves and capsule unopened; in green stage, with 3 styles.  
d, Part of branch, with opposite thicke leaves, and flowers (staminate) below, upper ones pistillate, in spikes or clusters.

No. 3. Musk Orchid
(Herminium Monorchis, Br.)

a, Lower lip of corolla, with pollinia, anthers, disk, stigmas, column.  
b, Flower, showing absence of spur, and long bracts.  
c, Stem, with single tuber and fleshy fibres new one forming near the end.  
d, Plant, with radical leaves, and flowers in spike.

No. 4. Fragrant Orchid
(Habenaria zonata, Benth.)

a, Flower, showing long spur and 3-lipped lower lip.  
b, Pollen masses in pouches.  
c, Rootstock, with palmate tubers and radical leaves.  
d, Inflorescence, with flowers in a spike, showing lower with ovary developed.

No. 5. Sheep's Fescue
(Festuca ovina, L.)

a, Spikelet, with webbed florets.  
b, Flower, with anthers exerted from glumes.  
c, Plant, showing tufted foliage, and form of panicle, there being no runners.
1. Sheep's Sorrel (Rumex acetosella, L.).
2. Box (Buxus sempervirens, L.).
3. Mask Orchid (Hermiinia Monnichii, Br.).
4. Fragrant Orchis (Habenaria conopsea, Benth.).
5. Sheep's Fescue (Festuca ovina, L.).
the upper ones more stalkless, and with an acid taste. The stipules or leaflike organs are torn and silvery.

The flowers are deciduous, in leafless panicles, drooping, branched. The male flowers exceed the female. The flower-stalks equal the sepals, which are without knob-like points on the midrib. They enclose the seeds, which are yellowish-brown. The 3 sepals are ascending.

Sheep's Sorrel is 18 in. in height. It flowers in May, June, and July. The plant is perennial, reproduced by division of the roots.

Like other Docks with a long stigma it is anemophilous, pollinated by the wind. The early flowers are protogynous, the later ones homogamous. There are complete female flowers, or dioecious plants. Sheep's Sorrel is, however, usually dioecious, the male flowers being very small.

The fruits are winged and wind-dispersed.

This plant is essentially a sand-loving plant, growing on sand soil, such as Marlstone, Glacial sands, &c.

A cluster-cup fungus, *Ustilago Kuhneana*, forms a rust on the leaves.

This Dock is a food plant of several insects, e.g. a beetle, *Alpion humile*, several Lepidoptera, Forrester Moth (*Ino statice*), Autumnal Rustic (*Vocula glarosa*), White-spotted Pinion (*Gelechia diffinis*), *G. velocella*, *Nepitela acetosa*, Light-feathered Rustic (*Agrotis cinerea*), and two Homoptera, *Aphalara exilis*, *A. calthae*.

*Acetosella*, Linnaeus, is from the Latin, *acetus*, acid, sharp.

The names in common use are Bread-and-cheese, Cuckoo's Meat, Cuckoo's Sorrel, Sour Docken, Lammie Sourocks, Sour Leek, Ranty Tanty, Sheep's Sorrel, Sheep's Sourack, Souracks, Soorocks or Souracks.

**Essential Specific Characters:**


**Box (Buxus sempervirens, L.)**

There is no trace of this rare upland shrub in any early deposits in Great Britain. It is found from Belgium southward in Europe and in N. Africa, N. and W. Asia, as far east as the W. Himalayas, in the N. Temperate Zone. In Great Britain it is found only in four counties—Kent, Surrey, Bucks, Gloucs—and elsewhere it is only naturalized, being perhaps not indigenous in the last.

The Box in its native state is confined to hills of chalk, or oolite,
where it grows in thick and lofty masses covering a wide area. Elsewhere it is found planted in woods and plantations, and is frequently used in gardens and elsewhere as a hedgerow shrub, the practice having originated with the Romans, and having been revived under the auspices of Dutch gardening.

This is an erect, arching shrub or tree, with a hard, woody main stem, with soft bark, and numerous drooping branches. The leaves

are egg-shaped-oblong, with a notch at the extremity, with the margins of the leaf-stalks hairy, the leaves opposite, shining, leathery, evergreen. The stomata are immersed with 4 rows of palisade cells.

The flowers are green (the plant is monocious), in spikes in the axils, with 4 bracts below; the female flowers above the male have 4 sepals, which are blunt. The stamens are long, the anther-stalks being strong, the anthers egg-shaped, arrow-shaped. The styles are 3, spreading, not falling. The capsule is egg-shaped, wrinkled, with 6 seeds, 2 in each cell.

1 These may serve to throw off snow in winter in order to prevent the plants from being weighed down and so cause the branches to crack. Many other evergreens, as Holly and Yew, as well as the Ivy, have the same polished surface.
Box grows 8½ ft. high. The flowers are in bloom in April. Box is an evergreen shrub, easy to propagate by cuttings, and useful for edging or Dutch gardening for parterres, &c.

Being a monocious plant the flowers are unisexual, in heads. The female terminal flower with 3 bracts is surrounded by male flowers with 1 bract, and with honey in both sexes. There are 4 hypogynous stamens with stout anther-stalks, and the anthers open towards the centre in the male flowers. The stamens are projecting, the anthers in pairs. In the female there are 3 styles, spreading and grooved. The flowers are crowded. The stigmas mature first. The pollen is dry and dust-like. The hive bee moistens it with honey and brushes it on its hind-legs.

The fruit opens explosively, the inner layer of the pericarp separates from the outer and U-shaped, folded layer, as in the Violet, causing the propulsion, the capsule becoming dry and tense.

Box is a lime-loving plant, and almost limited to the chalk formation, growing on a lime soil.

A cluster-cup fungus, Puccinia huxi, attacks the leaves, and Box is galled by Diplosis huxi.

Two Homopterous insects, Psylla huxi, Pinuspis huxi, and a Heteropterous insect, Gonocerus venator, are found on it.

Buxus, Pliny, is the Latin name for the plant, and the second Latin name refers to its perennial character.

This neat shrub is called Dwarf Box, Box-tree, Bush-tree, Dudgeon. In regard to the last, which is the root or wood of Box, “Turners and cutters, if I mistake not the matter, so call this wood Dudgeon, wherewith they make Dudgen-hafted daggers”, according to Gerarde.

Box was used for hedging, being easy to clip and cut, a practice in vogue since Roman times called topiary work, a friend of Julius Caesar’s inventing the method. The wood is close-grained, and used for wood engraving, mathematical instruments, combs, pipes, flutes, inlay work, as in Evelyn’s day, wheels, swivels, pins, pegs, nut-crackers, button moulds, weavers’ shuttles, rulers, boot-trees, rolling-pins, pestles, tables, chessmen, screws, bobbins, spoons, knife-handles. The Dwarf Box was cut into animal shapes in gardens, &c. It has been used in medicine for colic, fever, madness. Corsican honey was derived from the Box, it is said.

**Essential Specific Characters:**

Musk Orchid (Herminium Monorchis, Br.)

In spite of its distribution to-day as an Arctic plant in Temperate and Arctic Europe, except Spain, Siberia, and the Himalayas, there is no record of this Orchid in early deposits with others of its kind, though, it is true, as a rule chalk plants do not occur. In Great Britain it is found in the Peninsula province only in N. Somerset; in the Channel province it is absent from S. Wilts, Isle of Wight, but occurs generally in the Thames province; in Anglia everywhere except E. Suffolk, E. Norfolk, Bedford, Hunts; in the Severn province in E. Glouces. It is thus distributed in S. and E. England from Norfolk, Cambridge, and Gloucester to Sussex and Kent.

The Musk Orchis, even more than the Bee Orchis and kindred species of the chalk-formation, is restricted to the neighbourhood of those lofty hills or downs of South and East England which form so characteristic a feature of the landscape.

Musk Orchis has a slender flowering stem, with lance-shaped, paired radical leaves, oblong, acute. The stem-leaves are solitary. The bracts equal the ovary, and are green.

The flowers are green, all turned one way, in a slender loose spike, with green egg-shaped sepals, the petals lobed each side, not so broad, but longer. The lip is 3-lobed, narrow, the middle one the longest and narrowest, and entire. There is no spur or rostellum. The tubers are like a bed-post, hence the first Greek name.

Musk Orchis is 6 in. in height. It flowers in June and July. It is perennial, and propagated from tubers.

The floral mechanism is like that of Orchis, but the flowers are smaller, and there is no rostellum. They are pollinated by flies, which
bear away the pollinia or pollen-masses on their legs. There is no honey, but the flower is strong-scented, especially at night. The disks are large, and the stalks of the pollen-masses are short. The pollinia are attached to the joint between the femur and the trochanter of the first pair of legs. The flowers are visited by numerous insects—Hymenoptera, Terastichus, Diptera, Coleoptera, Malthodes, Braconida, Pteromalidae. During the day it is visited by ichneumons and flies and small beetles.

The seeds are numerous, small and light, and the dispersal is effected by the agency of the wind.

This sweetly-fragrant Orchid is a lime-loving plant, and found on lime soil, growing chiefly on limestone or oolite, especially the chalk.

*Herminium*, R. Brown, is from the Greek hermin, knob of a bed-post, from the shape of the tubers. *Monorchis* is from the Greek monos, and orchis, so called from the single tuber.

**Essential Specific Characters:**

294. *Herminium Monorchis*, Br.—Stem erect, radical leaves lanceolate, 2; flowers green, musk-scented, in a slender spike; sepals green, ovate; petals longer, no spur.

**Fragrant Orchis** (*Habenaria conopsea*, Benth.)

This pleasant-scented Orchid is another Arctic plant, also a member of the chalk flora in England, of which no early record appears. It is found to-day in N. Temperate and Arctic Europe, in Siberia, Dahuria, and W. Asia. In Great Britain it does not grow in N. Devon, S. Somerset, Hunts, Glamorgan, Carmarthen, Pembroke, Carnarvon, Flint, Isle of Man, Haddington, Westerness, E. Sutherland, or the Hebrides, but is found up to 2000 ft. in the Highlands.

Mountainous districts as a whole constitute the favourite habitat of the Fragrant Orchis, and it is frequent on dry pastures in most parts of Great Britain. It occurs also in wet places, even in marshes or bogs in some places; but is perhaps more at home on the gently rolling slopes of a mountain range, where it obtains the humid and moist conditions it needs.

This is a very tall, graceful, erect Orchid. The leaves are closely-sheathing. The tubers are spread out from a centre. The leaves are lance-shaped, oblong, keeled, acute.

The flowers are pink or purple or white,¹ and very fragrant. The lip is trifid, divided into three nearly to the base, entire. The flowers

¹ Butterflies may be attracted by the red flowers, moths by the white forms.
are in long, narrow spikes, dense or loose. The spur is bristle-like, and twice as long as the ovary. The bracts are equal in length to the ovary, green, 3-nerved. The sepals are spreading.

Fragrant Orchis is 18 in. in height. Flowers may be found in June and July. It is a perennial, propagated by division of the tubers.

In the group Gymnadenia the spur is wavy, the lip broad, 3-lobed, rounded. The anther cells are parallel, confluent with the column, the pollen masses distant, and the rostellum placed between them, produced. The stigma is bilobed, swollen, and lateral. The spur is so slender and narrow that honey, though it rises half-way up the tube, is only reached by the long proboscis of Lepidoptera, the Burnished Brass Moth (Plusia Chrysitis), Silver Y (P. gamma), Treble-bar (Anaitis plagiata), Large-yellow Underwing (Tryphena pronuba). The flower is very sweet-scented.

The seeds are light and small, and are thus dispersed by the wind.

Fragrant Orchid is a humus-loving plant, growing in peat soil or humus soil.

Habenaria, R. Brown, is from the Latin habena, thong, strap, from the shape of the tip, and conopsea is from the Greek conops, gnat, because it grows in situations where gnats are common.

This plant is known as Long Tails, Lover's Wanton, as well as Fragrant Orchid.
Sheep's Fescue
(Festuca ovina, L.)

This upland grass is widespread, occurring at the present day in the N. Temperate Zone in Europe, N. Africa, Siberia, Himalayas, N. and S. America, and the mountains of Australasia. Sheep's Fescue grows in every county in Great Britain, as far north as the Shetlands, at all elevations, and in Ireland and the Channel Islands.

This is a grass which is more or less confined to a sandy habitat, and though it will grow in the lowlands as in silty deposits of rivers, it shuns clayey formations, but grows on dry pastures and other spots where it can satisfy its sand-loving tendency.

The stem is erect, growing in dense tufts with curved, bristle-like leaves, the upper ones narrow, flat, rough, with smooth sheaths, and a bilobed ligule. It is a tufted plant, forming a fine and durable turf. The whole plant is bluish-white.
The panicle is narrow, one-sided, or all turned one way, with egg-shaped spikelets, 4-12-flowered, smooth, hairy, and purple. The flowering glumes are rounded, blunt, terminated with a sharp point, with short awns, viviparous, the awn shorter than the palea. The flowers have 3 stamens. There are hairs on the top of the ovary. Sheep's Fescue is 1 ft. in height. Flowers are at their best in June and July. It is a perennial grass, propagated by division.

The floral symmetry is similar to that of Sand Fescue, the flowers being triandrous and 3-12 flowered, pollinated by the wind.

The fruit is light, and adapted for wind dispersal in spite of the short awn.

This is a sand plant, growing on sand soil or on barren rock soil, which is derived from granitic or arenaceous rocks. It is also characteristic of chalk soils.

Barley-leaf Stripe, *Pyrocaena trichostoma*, is found to attack it, also a gall, *Enura depressa*, caused by a Hymenopterous insect. The Mountain Ringlet, *Erebia epiphron*, is found on it, also *Aenestria lotyra*.

*Festuca* is Latin for stalk, stem, or straw. The second Latin name means pertaining to sheep, because they will eat it, with the exception of the flowering stems. It is called Black Twitch, Fescue Grass. It is a suitable grass for lawns, forming short, thick turf, but is not a valuable meadow grass.

**Essential Specific Characters:**

341. *Festuca ovina*, L.—Stem erect, leaves setaceous, tufted, curved, radical leaves narrow, glaucous, panicle unilateral, awn shorter than palea, spikelets purple, glabrous.
Section VIII

FLOWERS OF THE LAKES, RIVERS, DITCHES, AND WET PLACES
FLOWERS OF THE LAKES, RIVERS, DITCHES, AND WET PLACES

The vegetation of the land is of one type, that of the water of another. This physical distinction, indeed, has a marked influence upon the forms of plants. Those that grow in water are aquatic or Hydrophytes. While land plants are directly exposed to the air, water plants are not, and the air dissolved in water sometimes contains a larger proportion of oxygen and carbon dioxide than has atmospheric air. This is important, because plants respire by aid of the former and assimilate by aid of the latter under the action of light upon the chlorophyll, manufacturing their carbohydrates by its means. Obviously some waters contain more or less oxygen than others, and some stagnant waters are devoid of any aerating agent.

The influence of water upon light, also essential to plants containing chlorophyll, is great. This influence is least in clear, greatest in dirty water. Depth here is of importance, and is connected with the absorption of different rays of light, red rays being absorbed at the surface, ultra-violet in the lower layers. Water is more uniform in temperature than a land surface, but the different depths of water have different temperatures, hence the zonal distribution as in the case of light.

The constituent salts and nature of water have a great influence on the flora of an aquatic formation. This, again, is dependent on the basin which is drained or the soil of the bed. Some water has lime-salts in solution, the carbonic acid in water dissolving the calcium carbonate, and so on. Then, lastly, the movement of water is a great factor in deciding its constituent flora. For some plants are floating, some submerged or attached, and some are attached to rock, some to a soil. If water is in a state of rapid motion it abounds in oxygen, if slowly moving it contains less, if still or stagnant still less. It is a means of dispersal of the seeds and the plants, and as the first plants,
like the first animals, undoubtedly arose from a liquid solution, plants have been largely spread over the earth by water.

There are certain plants like Hydrocharis, giving its name to this type of flora, which float on the surface, unattached, in fresh water, swamp-plants, in still water, sailing about, and with erect stems and leaves. Here, besides Frogbit, we may further include Bladderwort, Duckweed, &c., and Water Violet. These plants have the same specific gravity as the water.

The shoots have long internodes, thin stems, stalkless or stalked leaves, with threadlike segments, as in Bladderwort and Water Violet, when submerged. Floating leaves are shield-shaped, egg-shaped, heart-shaped, as in Hydrocharis, Lemma, and the division is well shown in different types of Water Buttercup which have both types of leaves. The plant is secured by its root. Nutriment is largely absorbed by the stem and leaves.

Many plants growing in water reproduce by division vegetatively, as Frogbit and Duckweed. The pollination of the Frogbit, Water Violet, and Bladderwort is effected by insects, and the Hornwort opens its flowers under water. Frogbit and others are perennial, and survive the winter by forming winter-buds or hibernacula, which sink in the autumn and rise again in the spring.

The plants that grow on the loose soil of aquatic formations where the soil is quartz-sand are differentiated by the movement and salinity of the water, and chiefly flowering plants grow upon it. The roots are chiefly attachments, and the Mare's Tail has few or no root hairs, nor has the Water Violet. Zostera forms meadows on account of its long, creeping rhizomes or underground stems in purely saline waters, forming maritime vegetation. Most maritime aquatic plants are Algae.

Belonging to what is called the Enhalid formation are the colonies of Zostera growing in salt water, and with Naias, unique amongst the flowering plants, Ruppia and Zannichellia are found in brackish water. In Zostera the leaves are ribbon-like and long, and the roots rhizome-like. Along some shores it forms a regular zone. In brackish water Chara, Water Buttercup, Potamogeton, and Myriophyllum grow.

The chief aquatic formations of flowering plants are known as the Limnea formation, so called from the prevalence of the fresh-water pond snail in it, and are submerged or have floating leaves. The chief types belong to the Pondweed, Water Pepper, Bur-reed, Water Lilies, Water Buttercup, Starwort, Water Celery, &c. The Hydrophytes altogether number some 700, of which we describe 41, and of the Hydrophytes some 120 are lacustral. Here we include littoral, of
which there are 20, and we have also included many riparian species which form a link between Hydrophytes and marsh plants and are hygrophilous.

Most are herbaceous perennials. The majority have creeping stems, and are of clustered, crowded growth, as Mare’s Tail, Water Lily, Water Buttercup, Starwort, with creeping stems. A few, such as _Naias_, are annual. There are three types of plant-shoots, the rosette type, as in Lobelia; the _Nymphaea_ type, as in Water Lilies, with long-stalked, floating leaves; the long-stemmed type with erect stem and internodes, completely submerged, as in Pondweeds, with floating leaves, as in Starwort (_Callitriche verna_).

The leaf type is floating, as in Water Lilies, _Polygonum amphibium_, Pondweeds, with broad entire leaves and bent margin, pores on the upper surface; and the Bulrush has current leaves half a yard in length. The elodioid leaf is narrow, flat, stalkless, entire, as in Elodea, Mare’s Tail, &c. The isoëtoid leaf is linear, undivided, rounded, and tubular, as in _Isoëtes_. The myriophylloid leaf is whorled, as in Water Milfoil, or consists of leaves divided into thread-like or linear segments, as in Dropwort and _Sium_.

Most aquatics are pollinated above water. Water Lilies and Water Violet are pollinated by insects; Mare’s Tail, Water Milfoil, and Pondweed by the wind or water, and by water in the case of _Zannichellia_, Starwort, _Naias_, _Subularia_, _Limosella_, and some Batrachian or Water Buttercups, &c., are cleistogamic. The fruits or seeds are dispersed by the water. Reproduction is largely vegetative. Many plants develop hibernacula, as Pondweeds, Starwort, &c.

Associations arranged in zones may be recognized as Algae, Characeta, Nymphaeta, Nupharetta, Batrachieta, _Limnnea_, rosette forms, _Lobelia_, &c. The _Hydrocharis_ and _Limnnea_ formations merge into each other, and the case with which water plants become helophilous is shown by the amphibious _Polygonum amphibium_, by Water Cress, and the Water Plantain.

Along the margins of the rivers tall clumps of sulphur blooms of Meadow Rue line the waterway. Water Fennel dangles its lace-like...
form in the water. The white and yellow Water Lilies lend their floating tables to the nymphs of the pool. Water Cress grows in the smaller streams and ditches, in clear running water. Here Great Yellow Cress rears its tall, erect heads of yellow bloom in the canal or river. There Great Water Chickweed, late in the year, fills up the ditches with its brittle stems. Down by the banks of the river-side the Purple Loosestrife, with its trimorphic blooms, gives honey and pollen to the bees. Where the Great Hairy Willow Herb fills the bed of the stream with its tall stems with purple blooms comes the scent of apple-pie or lemon curd, delicious on a sweltering summer’s day. Water Bedstraw makes a lovely show of white flowers by the pond-margins. The Hemp Agrimony grows in the wet copses or by the water-side, tall and fleecey-flowered. The Common Fleabane and Three-lobed Butterbur up and down the country line many a river-side close to the bank. Butterbur makes dense brakes with ample cover, where the streams have meandered and formed hollows along their course. Coltsfoot, too, grows on the clay banks, being equally proter-androus. Water Ragwort, with its handsome and large-rayed flowers, is scattered over most water meadows where the purple lances of the Marsh Thistle tower, in close rank, on the lower ground. Great Yellow Loosestrife and Moneywort, their golden-yellow blooms large and brilliant, are both Hygrophytes.

Scorpion Grass hangs its pretty blue-and-yellow spotted flowers above the watery mirror of the pool, surveying its own rich beauty. Water Figwort, less striking in colour, towers by its side. Here and there the straggling clumps of Musk have their wide, yellow, trumpet-mouthed blossoms adorned with rose-pink honey-guides. Brook Lime with light-blue flowers, Water Mint with whorls of lavender-like bloom, and the shy Gipsy Wort adorn the marshy strips by the water-side or grow half-submerged, and close by is the dainty Skull-cap, blue-flowered and neat. Amphibious Knotgrass in the water yields a bright-pink flower, but on land is roughly hairy, long-rooted, and difficult to dispose of. Alder and Crack Willow give grateful shade by the water-side.

Frogbit floats in the still pools and rarely blooms, its margin, rustics tell one, nipped by frogs! Flanking the sides of the pool the mellow Yellow Flag forms a fair girdle almost everywhere. In the water meadows Snake’s Head Fritillary is found in dainty clumps with chequered flowers of a rare purple or white tint. Along the borders of the river Reedmace, Bur-reed, Sweet Flag (how sweet the leaves smell crushed in the hand!), form a thick avenue.
No. 1. Meadow Rue
(Thalictrum flavum, L.)

a, Achene, ribbed, with persistent style. b, Leaf, 3-ternate (leaflet 3-ternate). c, Upper part of plant, with leaf, and raceme with petaloid sepals and many stamens.

No. 2. Water Fennel
(Ranunculus trichophyllus, Chaix.)

a, Flower-stalk, with head of achenes (hairy). b, Upper part of plant, with submerged narrow, rigid leaves, and floating leaves 3-lobed (as in R. heterophyllus, Weber= R. radicans, Rev.), and flowers with short sepals, 5 petals, and stamens and pistil.

No. 3. White Water Lily
(Castalia alba, Wood.)

a, Petaloid stamens. b, Berry, with rays of stigma. c, Leaf, falsely peltate. d, Flowers in bud, showing sepals, petaloid petals, petaloid stamens, and stigma.

No. 4. Yellow Water Lily
(Nymphoides lutea, L.)

a, Petal, smaller than yellow sepals. b, Stamen, with petaloid filament. c, Berry, with rayed stigma. d, Leaf. e, Flower, with petaloid sepals, petals, petaloid stamens, and pistil.

No. 5. Water Cress
(Radicularia Nasturtium-aquaticum, R. & B.)

a, Androecium, with stamens, 4 long, 2 short, honey glands between, and pistil. b, Siliqua, with valves opening from below upwards, and seeds on replum. c, Rootstock, with radical, lyrate leaf. d, Upper part of stem, with pinnate leaf, flowers in racemes, and lower ones in fruit.

No. 6. Great Yellow Water Cress
(Radicularia amphibia, Druce)

a, Androecium, with stamens, 4 long, 2 short, and honey glands, and gynoecium, with pistil (ovary, style, and stigma). b, Pod, with style and stigma. c, Stem, with leaf. d, Upper part of plant, with stem leaves and raceme of flowers, in various stages, with pods below, on long stalks and beaks.
1. Meadow Rue (Thalictrum flavum, L.)
2. Water Fennel (Ranunculus triphyllus, Chaix)
3. White Water Lily (Nuphar lutea, Wood)
4. Yellow Water Lily (Nuphar lutea, L.)
5. Water Cress (Radicula amphibia, Drue)
The surface is strewn with Duckweed as with confetti. Water Plantain rises out of the water with its panicle of soft-tinted flowers. The broad arrow of the waterway is marked by Arrowhead, and the tall, graceful umbels of the Flowering Rush make the artist feign to use his brush to catch their tints. Waving majestically in midstream, Bulrushes hide the nest of coot or water-hen. Down there in the wet copse by the river bank is the Wood Clubrush half hidden by thickets of reeds.

**Meadow Rue (Thalictrum flavum, L.)**

This species is found in the Cromer Forest Bed (Preglacial), in Interglacial beds, as well as in Roman deposits at Silchester. At the present day it is found in Arctic Europe, Northern Asia, that is to say, the Arctic Cold Temperate Zone. In the Peninsula province it occurs only in N. Somerset, and in Wales in Radnor, Pembroke, Cardigan, Montgomery, Merioneth. In North England it is not found in Cheviotland. It occurs in Scotland only in Kirkcudbright, Wigton, Lanark, Berwick, Edinburgh, Fife, Argyle, Dumbarton, Clyde Islands, Caithness, and is rare, being local also in Ireland.

Meadow Rue grows by the sides of rivers, streams, and lakes, and is therefore a hygrophile and a plant of the lowlands. It is hardly a marsh plant in the usual sense, though it needs moisture; but it grows on banks where the soil is firm and never waterlogged. It grows above the line of Bur-reed, Flag, and Iris, with which it is associated, usually forming clumps, where the great Yellow Cress runs riot.

It is an erect plant, branched, with furrowed stems, having much the appearance of *Clematis*, but it is more compact in the distribution of the leaves and branches. It has a tufted habit, and grows in clumps of 2 or 3 ft. in area, in a more or less shrub-like manner. The leaves have the leaflets arranged each side of a common stalk.

Except *Clematis* this plant cannot be confused with any other British plant, and it differs from the Traveller's Joy in having no feathery appendage to its fruit, and in the absence of tendrils. The flower, sulphur-yellow, is made up of numerous feathery stamens and anthers. The leaves are smaller and closer.

Meadow Rue is 4 ft. high, flowering from May to July or August, and is a perennial, deciduous, herbaceous plant.

No honey is produced by the flowers, but abundant pollen; but though there are no petals and the sepals are very small, the stamens are many and conspicuous, and the plant is visited by pollen-seeking insects, Diptera (Syrphidae, Muscidae), Hymenoptera (Honey Bee).
The anthers open in the sun, closing in wet weather. The plant is autochorous, that is to say the achenes are dispersed by the plant's own agency. The achenes or fruit fall immediately around the parent stems.

This graceful plant is a sand-loving plant, growing on sandy soil, derived from sandy or silty beds, rarely mixed with clay or marl, chiefly alluvium.

Two species of cluster-cup fungus, or *Puccinia*, *P. persistens* and *P. thalictrii*, grow on this plant, and it is galled by *Cecidomyia thalictrii*. Caterpillars of the moths, the Setaceous Hebrew character *Noctua c-nigrum*, and Red Sword-grass (*Calocampa venusta*), feed on it.

The name *Thalictrum* is derived from the Greek *thallos*, a shoot, and was bestowed by Dioscorides. The specific name *flavum* is Latin for yellow. The English name Meadow Rue refers to its rue-like leaves.

This fine species is called False Rhubarb, Fen Rue, Meadow Rue, and Meadow Rhubarb. The last name is bestowed because of its laxative properties, so Lyte says, and because the roots are yellow, like rhubarb.

When used with honey the leaves were said by Pliny to cure ulcers. A dye has been made from the roots for dyeing wool, of a yellow colour. The shoots have been used by country people in Bucks to boil in ale.

**Essential Specific Characters:**

2. *Thalictrum flavum*, L.—Leaves radical, alternate, no involucre, panicle corymbose, flowers erect, sepals imbricate, 4-5, achenes with 1 pendulous seed, carpels awnless.
Water Fennel (Ranunculus trichophyllus, Chaix.)

Seeds of Batrachian Ranunculi, which come under the old aggregate *Ranunculus aquatilis*, have been found in some deposits, such as Pre-glacial, Early Glacial, Interglacial, Late Glacial, and Neolithic beds. To-day the distribution of this aggregate extends over Europe, West Asia, the Himalayas, N. America, or the Warm Temperate Zone. In occurrence it is absent from Cornwall in the Peninsula, South Hants and E. Sussex in the Channel province, but occurs throughout the Thames province; in Anglia it is absent from Northampton, but present in the whole of the Severn province, and absent from Notts in the Trent province, occurring in Carnarvon and Denbigh only in Wales, in S.W. and N.E. Yorks, Tyne province, and in Scotland in Dumfries, Kirkcudbright, Haddington, Edinburgh, Fife, Stirling, Perth, Forfar, Clyde Islands, Sutherland, and the Hebrides. It is also found in Ireland.

In all the Water Buttercups the leaves are much divided. There are two types. Those that float are rounded with 3-6 wedge-shaped lobes, which are inversely egg-shaped or rounded. The submerged leaves, on the other hand, are linear, much divided, with numerous fine segments. There are other modifications of this type, some, as *R. fluitans*, having no floating leaves, but very long hair-like leaves (submerged) only when growing in quickly-flowing water. At the other extreme are plants, as *R. hederaceus*, with few if any submerged or thread-like leaves, and only the rounded floating types of leaf. The types with two kinds of leaves may become stranded on land and then adapt themselves to such conditions, though as a rule the submerged-leaf type cannot succeed on land or the floating leaf under water.

This species is an aquatic like other Batrachian Ranunculi, with thread-like submerged leaves, hydrophilous, preferring the still water of a pond or lake to that of running water, thus differing from *Ranunculus penicillatus*. It forms clusters and groups growing in the centre of the pond, and is associated with Water Cress, Water Persicaria, Pondweeds, Duckweed, Water Plantain, and the semi-submerged Celery-leaved Water Crowfoot.

Water Fennel is adapted, like all aquatic plants, to growth in water, with linear leaves and slender stems which float readily in the water.

Water Fennel is distinguished from other Water Buttercups by its small flowers, its rigid leaves which do not collapse when removed from the water, and the short compact flower-stalk.
When floating, the flowers do not rise at the utmost more than 2 in. from the surface. It is in flower from April to August, and is perennial.

In the aggregate *R. aquatilis* the yellow base of each petal acts as a honey-guide, and on it stands an oblique tubercle or wart-like projection, with a honey-secreting depression, which serves as a gland and receptacle for nectar. There are few anthers (8-20 stamens), which open in succession when the flower opens, being turned to the centre.\(^1\) The anther-stalks later, twisting over the honey-glands, become immersed in pollen, the stigmas developing, and coming in contact with the pollen on the anthers. Visitors alight on the middle of the flower or on its edge, and cause self-pollination or cross-pollination. When the surface of the water rises the flowers remain submerged, and are self-pollinated. The visitors are Diptera, Syrphidae, *Eristalis*, *Helophilus*, *Chrysogaster*, Muscidae, *Scatophaga*, Hymenoptera, Apidae, *Apis*, *Bombus*, Coleoptera, Chrysomelidae, *Helodes*. The flower is scented.

\(^1\) Next day the outer stamens move outwards and another whorl takes their place, and so on till all have opened.
The plant is dispersed by the agency of water or by animals. The achenes when ripe either fall to the bottom or float about on the surface of the water. The stems, &c., are likely to be dispersed by wading- and swimming-birds.

Water Fennel is a Hydrophyte and aquatic belonging to the submerged and floating-leaf associations.

No fungi infest the plant, nor do insects feed upon it.

Pliny invented the name *Ranunculus*, which is a diminutive of the Latin *rana*, a frog, and so a little frog, the Ranunculus affording a habitat for little frogs in early spring; while *trichophyllus* is from Greek *thrís*, hair, *phyllós*, leaf. In Buttercup or Buttercop, cop means a head. Water Fennel, in allusion to its leaves resembling Fennel, is the only vernacular name.

Unlike the terrestrial buttercups, which cause blistering, this plant is innocuous. Cattle have been fed on these Water Crowfoots by the Avon banks, and when freshly taken from the river cows enjoy it. In reference to the amphibious forms as a whole, Dr. Pulteney (a Leicestershire botanist) showed that they are highly nutritious.

**Essential Specific Characters:**

5. *Ranunculus trichophyllus*, Chaix.—Submerged leaves not collapsing, petals 7-veined, buds globose, flowers white, with a yellow centre, carpels compressed.

**White Water Lily** (*Castalia alba*, Wood)

Seeds of the White Water Lily occur in Interglacial beds and recent alluvium. It is found in the Arctic and North Temperate Zone in Arctic Europe, N. Africa, N. and W. Asia to Kashmir, and it is found in North America. This plant is absent from Devon, the Isle of Wight, N. Hants, Essex, W. Glouces, Monmouth, Hereford, Pembroke, Montgomery, Denbigh, N.W. Yorks, Durham, S. Northumberland, Cheviotland, Isle of Man, occurring only in E. Lowlands in Edinburgh, Linlithgow, not in Stirling, Banfi, Mid Ebudes, Caithness, and Orkneys, and up to 1000 ft. in the Lake district. It is found in Ireland.

The White Water Lily is found in similar habitats to the Yellow Water Lily, but whilst the latter is often found in rivers, as well as ponds and lakes, the former is much more common in still waters. It has doubtless been planted here and there on account of its choice beauty, but in most localities is native. With the Yellow Water Lily, though they seldom grow intermixed, it forms a striking contrast.
Aquatic like the Yellow Water Lily it has much the same habit. It has too the same habit of opening and expanding its flowers, expanding at 7 a.m. or in the middle of the day, and letting them rest on the surface closed up about 4 p.m. or in the evening. The leaves are smaller, longer, incumbent or overlapping at the base, and less heart-shaped; 5-10 in. across; the stomata, contrary to the usual rule in terrestrial types, are on the upper surface.

The flower has a double appearance, having a lance-shaped outline, the parts spirally arranged, the sepals, petals, and stamens passing into each other. The ovary contains many ovules, and the stigma lies above it. The embryo is small, the cotyledons remaining in the seed when the latter germinates. The seeds are heart-shaped, smooth, shiny, grey, and embedded in a slimy material after the capsule rots. There is a glandular pore at the base of the petals, and the stalkless rays of the stigma also extend beyond the margin.

This plant lifts its flowers above the surface about 3-4 in. It flowers from July to August. The White Water Lily is a herbaceous perennial.

The carpels, which are embedded in a thick receptacle, are arranged in a radiate manner. The anthers open as soon as the flower unfolds, or the next day. As they stand above the pistil and bend over it the pollen falls upon the stigma, and when no insects visit them the plant is self-pollinated. The flowers are sweet-scented, and a honey-like liquid is produced by the stigma. There is no nectary. Owing to the aquatic habit, creeping insects cannot enter the flower. It is pollinated by beetles of the genus *Cetonia* and by *Glaphyridae*. The stamens are inserted on the ovary.

The fruit of the White Water Lily is dispersed both by water and by its own agency. After the expansion of the flower at the surface it recoils to the bottom, allowing the seed to germinate in the mud, and so is dispersed much like seeds of *Vallisneria*. The carpels possess air-cells facilitating the floating of the seeds. The capsules are edible.

The plant is a Hydrophyte and aquatic, helping to form a certain type of water association—the floating-leaf association.

The beetles that feed upon it are *Donacia mevranthidis*, the moths *Hydrocampia potamogeti* and *H. nymphicata*, and the Homopteron *Rhophalosiphina nymphae*. The name *Castalia* is that of a sacred fountain on Mount Parnassus, and *alba* means white, in allusion to the flowers.

The English names are Alau, Bobbins, Cambie-leaf, Candock.
A TYPICAL FLOATING-LEAF ASSOCIATION

WHITE WATER LILY (*Nymphaea alba*, Wood), WITH WATER BUTTERCUP

Note how the flower is raised above the surface of the water, and how the leaves have the margin turned up.
Can-leaves, Flatter-clock, Water Lily, Nenuphar, Water Bells, Water Blob, Water-can, Water Socks, Water Rose. In reference to the name Candock it is called Water-can at Tamworth in allusion to the half-unfolded leaves floating on the water, which are thought to resemble cans. The leaf surface close to the stalks is raised, and the surface is generally convex, so that raindrops collecting run off at the margin, especially as the surface is waxy, which assists transpiration. The underside is purple, due to the presence of anthocyan, which turns the light rays into heat.

The flowers of the White Water Lily are very beautiful, and the petals being numerous are apparently double, and sweet-smelling. They open at seven o'clock in the morning, and close again, when they lie on the surface, about 4 p.m., or relatively later in each case.

The roots are astringent, and have been used in Ireland and Scotland as a dye, dark-brown or chestnut in colour. Both flowers and root were once used medicinally, but are not now employed. All animals except pigs refuse it as food.

**Essential Specific Characters:**

17. *Castalia alba*, Wood.—Leaves orbicular, 2-lobed, entire, flower white, floating, rising above the surface, sepals 4, adnate, green at back, petals numerous, stigma yellow, stigmatic rays 15–20, fruit a berry, globose.

**Yellow Water Lily (Nymphaea lutea, L.)**

Fruits of the Yellow Water Lily are known from deposits of Pre-glacial, Interglacial, Neolithic, and Postglacial age. The Warm Temperate Zone is the limit of its distribution in Europe, Temperate Asia, and North America. It is absent from E. Cornwall, N. Devon, Isle of Wight, Radnor, Montgomery, Mid Lancs, Isle of Man, Peebles, Selkirk, Linlithgow, Stirling, Banff, Easterness, Westerness, Cantire, Mid and E. Ebudes, in W. Ross, E. Sutherland. It is found at 1000 ft. in Yorks, and occurs in Ireland.

In most parts of the British Isles the Yellow Water Lily graces most pools and wide stretches of open still water. It is entirely aquatic and so a Hydrophyte, associated with Pondweeds, Arrowhead, Flowering Rush, and numerous other common water plants, such as Amphibious Knotgrass, Great Yellow Cress, and Water Crowfoot. Its broad leaves afford a resting-place in many a secluded pool for minute shell-fish, and shade the fish from the rays of the sun. They are of two kinds, one floating and thick, the other submerged and membranous.
As an aquatic this plant has floating leaves, with slender, long, rope-like rhizomes or stems, which are in reality little more than branches. The flowers rise up above the level of the water, and open during the sunshine and the daytime, and close at night and are submerged. The parts, which are numerous and merge into each other—e.g. petals, sepals, stamens—are spirally arranged.

The shape of the carpellary organs, like a brandy bottle, has pro-
vided an English name for this plant, whose stigma has numerous rays which do not extend to the margin. The flowers smell like brandy. The sepals and petals stand upon a fleshy disk surrounding the ovary with many ovules. The petals are small, the stamens inserted below the ovary. There is a nectary.

The Yellow Water Lily is aquatic, and the flowers rise above the water level but 2–3 in. during the day. It flowers from June to August, and is a herbaceous perennial.

The 5–6 yellow sepals have taken on the function of petals, the outer or underside secreting honey between them and the petals. The pistil is large and the stamens are numerous, but pollination by insects is accidental. The flowers are scented. The stigma matures first, then the anthers, commencing outwards.

The visitors are beetles, Meligethes, various flies, and other beetles, Onesia (Muscidae), Donacia dentata (Chrysomelidae). The pollen-grains are large, rough, elliptical.

The fruits are dispersed by the agency of water and the plant's own methods. After the flower has expanded at the surface it retires to the bottom to allow the seed to germinate when mature, in the mud at the bottom, being thus dispersed by an automatic, almost psychic, motion of the plant itself (cf. Vallisneria in some respects). See also Nymphaea (Castalia) alba. It is a Hydrophyte and aquatic, growing in the floating-leaf association.

No fungi attack it. Galerucia nymphaea, Donacia crassipes (beetles), and the moth Hydrocantha potamogelis visit it.

The name Nymphaea was given by Theophrastus, being from the Greek nympha, water nymph, lutca meaning yellow.

The English names are Blob, Bobbins, Brandy-bottle, Butter Churn, Butter-pumps, Cambie-leaf, Candock, Churn, Clot, Clove-leaf, Water Colt's-foot, Flutter-dock, Yellow or Water Lily, Lily-can, Nymphar, Water Blob, Water-can, Water Rose.

The name Brandy-bottle alludes to the odour of the flower, or the shape of the ovary more probably, so also Butter Churn; and Candock is given from its broad leaves and the shape of the ovary, like a silver can or flagon.

The Water Lily was considered inimical to sorcery, and in the Rhine district used with a certain formula. Pliny says it was used as an antidote for a love-philtre. The smoke of it burnt in a house was said to drive out crickets, and cockroaches also are killed by partaking of the roots bruised and rubbed in milk; but pigs are fond of the leaves and the root, though other animals will not touch it.
Essential Specific Characters:—

16. *Nymphaea lutea* L.—Leaves submerged, wavy, transparent, floating leaves coriaceous, flower yellow, globose, sepals 5, stigmas rayed, not reaching the margin, petals numerous, anthers hypogynous, linear, the fruit a berry.

**Water Cress** (Radicula Nasturtium aquaticum, Rendle and Britten) (= *Nasturtium officinale*)

Common and widespread as this plant is, it is not found in any deposits in which seeds of recent plants are preserved. It is almost cosmopolitan, occurring in Europe, West Asia, North Africa, and it has been introduced into North America, and the colonies of the British Empire, even to the extent of choking some rivers in New Zealand. In the British Isles it is ubiquitous, growing in every vice-county of Great Britain, in Ireland, and the Channel Islands. In the North of England it grows at an altitude of 1000 ft.

Water Cress, as a rule, is a Hydrophyte growing submerged, with its roots alone fixed in the mud along the margin of its habitat. But it may also be found growing as a hygrophilous or moisture-loving plant, out of the water on damp mud, at the margin, gravitating, like many so-called truly aquatic plants, between a life on land and a life in the water. It is to be found not only in ditches, ponds, and pools, but also in rivers and lakes. But, as a rule, it is most luxuriant and at its best in shallow running water.

Water Cress is a large plant when allowed to grow rank, the stem being long but wavy and hollow, and it is seldom or never erect, but like all aquatic plants, when submerged grows lengthwise in, or in this case upon, the water, floating on account of its lightness. At the base it is creeping, and attains a semi-erect habit only at the upper extremity, where the flowering stems rise above the water. At other times it is dwarf, floating, or growing prostrate upon damp mud.

It may be recognized by its leaves, with lobes each side of a common stalk, egg-shaped, oblong, leaflets slightly toothed, and nearly heart-shaped at the base, the white flower often finally purple, with petals twice as long as the calyx, with round pods with swollen valves, beaded, the pod upturned, and the stigma small. The pods are longer than the flower-stalks, and the seeds are in two rows and flattened lengthwise.

Water Cress is often as much as 4 ft. long or high. The flowering
GREAT YELLOW WATERCRESS (*Ranunculus amphibius*, Druce)

This illustration shows well how the marginal reed swamp may encroach on the centre of a shallow pool and gradually fill it up.
stage lasts from May to July and August. It is a herbaceous perennial, increasing by seeds as well as by division.

Two green, fleshy honey-glands are hidden on the inner side of the base of each short stamen. The shorter anthers open towards the stigma, which overtops them. The taller stamens stand at first on a level with the stigma, but are afterwards overtopped by it, and open towards the shorter stamens. The bee visiting the flower touches the stigma and the pollen-covered faces of 3 of the anthers (1 short, 2 long).

When the weather is adverse, self-pollination is effected by the longer anthers.

Water Cress is one of the numerous plants dispersed by its own agency. The seeds are dispersed by tension of the valves, the seeds being rounded and flattened lengthwise.

It is a Hydrophyte and aquatic, and when growing on land prefers a sand soil, or sandy loam, or river-valley alluvium, free from peat. It may grow in the reed swamp in the submerged or half-submerged leaf-association.

Water Cress is galled by Cecidomyia sisymbrii. No fungi infest it
so far as is known, nor any insects. Water snails are fond of it, e.g. *Limuca*, *Planorbus*, *Succinia*, &c.

The old generic name *Nasturtium*, given by Pliny, is derived from *nasus*, nose, *tortus*, twisted, in reference to the hot character of the plant.


The plant was said to drive warts away if laid on them. The Greeks used it as a salad and as a medicine. Pliny says it was used for brain troubles. In England it was first cultivated in 1801 or 1808. An aromatic oil which it contains renders it nutritive. The mineral salts which the plant contains render it nutritive.

Water Cress requires running water, and, when cultivated, plants are bedded at intervals, in rows in the direction of the current. The beds should be kept free from mud and other plants, and occasionally thinned out.

**Essential Specific Characters:**

24. *Radicula Nasturtium aquaticum*, Rendle and Britten.—Stem branched, erect, succulent, leaves bipinnate, lower larger, leaflets rounded, dentate, flowers white, twice as long as calyx, pod linear, curved.

**Great Yellow Water Cress** (*Radicula amphibia*, Druce)

This has not been found in a fossil condition. It is a native of the Warm Temperate Zone, found in Europe, North Africa, and Temperate Asia. In England it is found in Somerset, Wilts, Dorset, Sussex, the whole of the Thames province, as well as in Anglia, throughout the Severn and Trent provinces, in Montgomery in Wales, but not in Mid Lancashire. It is found in the Mersey district, throughout the Humber district, and in Durham. It is naturalized in a few parts of Scotland, as in Dumfries, and occurs in Ireland.

Like its congener the Water Cress, the Great Yellow Cress is an aquatic plant, half hydrophyte, half a land plant, being amphibious, as the Latin specific name indicates. It is fond of damp watery places, and very often grows luxuriantly and tall in rivers and canals, or in lakes. It has been united with Horse Radish, a plant which, likewise, though terrestrial enough in our gardens, where it is difficult to eradicate it, is found more or less wild by water.

The habit of this plant is much more like that of Water Cress than any other plant which grows in water, but it is more rigid, more erect.
and being taller it makes a greater show above water than Water Cress. It has almost entire broadly lance-shaped, sometimes coarsely-toothed, dark-green foliage, and being deeply rooted by means of long stringy roots, like a Water Dropwort, it spreads out from the banks for some distance in deep water, forming a fringe along a canal bank, or in shallow streams filling the channel entirely.

It may be recognized by its Nasturtium habit, combined with the yellow flowers, the petals twice as long as the calyx, the flower-stalks spreading or turned down; the pouch is egg-shaped, with a stigma with a pin-head, and the seeds are small, the silicules being ellipsoid and swollen, the pods being shorter than the flower-stalks, and there is no vein on the pouch.

This plant grows to a length of 4 ft. It is in flower from June to September. It is a herbaceous perennial, and reproduced by seeds or by division. The structure of the flower is similar to that of N. sylvestre, in which at the base of the flower between every 2 stamens there is a green, fleshy honey-gland. In this there are 6 nectaries in a ring at the base. The anthers of the 4 longer stamens are nearly on a level with the stigma, the other 2 are deeper, and all are turned towards the centre. The anthers spread out when the flower is open, and open towards the stigma. Or they may make a half-turn and so avoid possible self-pollination. Visitors insert the head between the stigma and stamens, and each side of the head is dusted; while the insect remains in the same flower the same side touches the stigma, but if it visits others the opposite side may touch the stigma, and cross-pollination will follow, while if the same insect inserts its head into the same flower several times it may cause self-pollination. In wet weather the anthers of the long stamens touch the stigma and the plant is self-pollinated. It is visited by Hymenoptera (Tenthredinidae, Tenthredo), Diptera (Empidæ, Empis, Syrphidae, Rhingia, Syritta, Eristalis).

Great Yellow Water Cress is dispersed by the plant's own agency. The seeds are small, and are dispersed after the tension of the oblong pods, when dry, has caused the pod to open lengthwise, and scatter the seeds to a distance.

It is a hydrophyte and aquatic, rooted in the alluvium of the river- or lake-bed in the reed swamp.

There are apparently no fungal or insect pests that infest this plant. The second name amphibia (Latin) alludes to its amphibious habit. This plant is called Bellragges, Water Charlock, Laver.
Essential Specific Characters:—

25. *Radicula amphibia*, Druce.—Stem erect, tall, leaves pinnatifid, entire or dentate, flowers yellow, petals twice as long as calyx, pod straight, ovoid, shorter than pedicels.

Great Chickweed (*Stellaria aquatica*, Scop.)

Remains of this plant have been found in the Preglacial beds in Norfolk and Interglacial beds in Sussex, testifying to its antiquity. It is to-day found in the Temperate Northern Zone in Europe, North Africa, Siberia, Western Asia. In the Peninsula province it is absent from West Cornwall, and North Hants and E. Sussex in the Channel province. In S. Wales it is absent from Glamorgan, Pembrok, and Cardigan, and it occurs in N. Wales only in Flint and Denbigh, and not in Mid Lanes, but south of this it is general. It is uncertain whether it occurs in North England or Scotland, north of York, except in Stirling.

The Great Chickweed is a good index of wet soil, for it cannot grow away from water. The plant is a hygrophone, without being a marsh or bog plant. It is found growing in tall clumps along a shaded ditch-side on the roadside, or lining the margin of pool or lake, or more extensively by the side of a stream or river. Here, itself white-flowered, it vies with the large puce flowers of the Great Hairy Willow Herb, or perchance with Water Bedstraw or Water Figwort.

This is the largest and finest of the Stitchworts, being tall and leafy, but slender, brittle, and prostrate below, then ascending. The leaves are heart-shaped, with a long point, the lower stalked, the upper stalkless, and hairy along the margin. The branches are alternate, and the plant supports itself by aid of the surrounding vegetation.

The flowers are large, white, in the axils, single, and distant; the petals are divided to the base, longer than the calyx. The capsule is larger than the calyx, on turned-back flower-stalks, and opens by five clefts. The seeds are reddish-brown and rough, about sixty in each capsule.

The Great Chickweed is often as much as 3 ft. high. The flowers are in bloom in July and August. It is perennial, and may be increased by division. The flowers are larger than in *Cerastium triviale*, but of the same size as in *Cerastium arvense* and *Stellaria Holostea*. The number of insect visitors and the arrangement of stamens and pistil is intermediate, and as favourable to cross- as self-pollination. The flowers are proterandrous, the anthers ripening first. When no
No. 1. Great Chickweed

(*Stellaria aquatica*, Scop.)

a. Capsule, opening by valves above, with seeds.  b. Upper part of plant, with glandular stem, opposite leaves with flowers in the axils on long stalks, showing free sepals (side view), 5 petals (2-fid), 10 stamens, and pistil.

No. 2. Purple Loosestrife

(*Lythrum Salicaria*, L.)

a. Flower in section, showing gamosepalous cylindrical calyx, stamens (12) in 2 series, and style (short).  b. Pollen.  c. Section of flower (as in a), showing long-styled form with medium stamens.  d. Section of flower (as in a and b), showing medium-sized style with long stamens.  e. Raceme, with flowers in glomerate cymes, with small bracts, showing 6 petals, medium style, and long stamens.

No. 3. Great Hairy Willow Herb

(*Ephialium hirsutum*, L.)

a. Androecium, with 4 long, 4 short stamens, and pistil with 4-fid stigma, with calyx (superior) below.  b. Seed, with tuft of hairs.  c. Capsule, opening by 4 valves, with seeds.  d. Upper part of plant, with hairy stem, upper stem leaves, and flowers showing inferior long ovary below calyx, and 4 petals, with stamens and pistil within.

No. 4. Marsh Bedstraw

(*Galium palustre*, L.)

a. Flower, showing 4 corolla-lobes and 4 stamens.  b. Fruit (didymous), showing two 1-seeded cocci.  c. Upper part of plant, with 4 leaves in a whorl and flowers in terminal and axillary cymes.

No. 5. Hemp Agrimony

(*Eupatorium cannabinum*, L.)

a. Tubular floret, with exerted style arms.  b. Cluster of florets, with involucral bracts below.  c. Achene, with pappus.  d. Upper part of plant, with 3-foliolate leaves and flowerheads in terminal corymb.

No. 6. Flea Bane

(*Pulicaria dysenterica*, Gray)

a. Ligulate or ray floret.  b. Tubular disk floret.  c. Achene, with pappus.  d. Upper part of plant, with sagittate stem-leaves, and terminal flowerheads.
Flowers of the Lakes and Wet Places

1. Great Chickweed (Stellaria nematocarpa, Scop.).
2. Purple Loosestrife (Lythrum Salicaria, L.).
5. Hemp Agrimony (Eupatorium cannabinum, L.).
6. Fleabane (Pulicaria dysenterica, Gray).
insects visit the flowers the stigmatic lobes spread out and become covered with pollen from the anthers. There are usually five styles, sometimes three. The insects that visit it are Diptera (Syrphidae, Muscidae), Coleoptera (Nitidulidae), Thysanoptera (Thrips), Hymenoptera (Apidae).

The plant is autochorous, dispersed by the plant's own agency.

The capsule splits into unequal valves in several parts and causes the dispersal of seeds around the parent plant.

This species is a humus-loving plant, and grows chiefly on humus soil, or is a sand plant, requiring a sand soil. It is frequent on recent alluvium.

The micro-fungi, *Peronospora arenariae, Puccinia arenariae*, Pink Rust, grow on it. The moths, Cream-spot Tiger *Chelonia (Arctia) villica*, Stout Dart (*Agrotis rasina*), feed upon it as a food plant.

*Stellaria*, of Brunfels, is derived from the Latin *stella*, star, in allusion to the star-like flower, and *aquatica* refers to its habitat.

This plant is called Chickweed or Water Chickweed. The larger flowers distinguish this from other chickweeds. The Common Chickweed (*S. media*) was employed in plaster used for broken bones and
swellings, as it was supposed to be binding and cooling. It would be a suitable plant for use as spinach, for it is to be found all the year round.

Essential Specific Characters:——

54. *Stellaria aquatica*, Scop.—Stems tall, brittle, glandular, lower leaves stalked, upper sessile, cordate, ovate, flowers large, white, in the axils of the leaves, petals narrow, divided, longer than the calyx, capsule with 5 bifid teeth.

**Purple Loosestrife** (*Lythrum Salicaria, L.*)

This choice and gay-flowered plant is found to-day (not earlier) in the Temperate, Northern, and Arctic regions, Arctic Europe, and in Australia. It is found in Great Britain throughout the Peninsula, Channel, Thames, Anglia, and Severn provinces, and in S. Wales generally except in Radnor and Cardigan; in N. Wales only in Denbigh and Anglesey; and throughout the Trent, Mersey, Humber, Tyne, and Lakes provinces. In Scotland it is found throughout the West Lowlands; only in Berwick and Haddington in the E. Lowlands; in the Eastern Highlands only in Fife, Stirling, West Perth; in N. Aberdeen, Easterness, Argyle, Dumbarton, Clyde Islands, Cantire, S. Ebudes, and the Hebrides.

The Purple Loosestrife is a common riverside flower, associated with Great Yellow Cress, Great Hairy Willow Herb, Scorpion Grass, Gipsywort, Blue Skullcap, Amphibious Knotweed, Yellow Flag, Reed Mace, Sweet Flag, Flowering Rush, &c. It is hygrophilous, and grows along the margins of most watery places, preferring especially rivers, but frequenting ditches, lakes, and similar spots.

Tall and erect, this handsome riverside flower at once attracts attention. The stems are winged, or angular and branched, but never widely spreading. The leaves are lance-shaped with a heart-shaped base, and are either in whorls or opposite. They may be smooth and very narrow, as in the long-styled form, the leaves in the short-styled forms being large and more downy. The uppermost bracts are not as long as the flower. As the English name and first Greek name indicate, the flowers are purple. They are in long, tapering spikes, in whorls, with or without bracts, with a calyx with 12 ribs and awl-shaped teeth. The petals are narrow. There are 12 stamens. The three lengths of style have from Darwin's researches contributed to render the plant famous from the interest they have for us in their connection with pollination.
The plant is 2–3 ft. high. It flowers in July and August. It is a herbaceous perennial, reproduced by division, and often cultivated. The flowers are trimorphic, as noticed by Darwin or earlier by Vaucher. The stamens are in two groups, and in the one case the stigma is projecting, in the other it is shorter or included, whilst in the third case it is intermediate, and lies between the two groups of anthers, and they may thus be called long-, short-, and mid-styled forms. The ratio of size of the seeds is as 100, 142, 121. The pollen grains also differ, the largest being green, belonging to the stamens of the long-styled forms, the medium to those of the mid-styled, and those of the short-styled forms have small pollen-grains, which are yellow. The anther-stalks are pink in the longer stamens and uncoloured in the shorter.

If insects do not visit it the plant is sterile. But it is visited by numerous bees, humble bees, and flies, which settle on the stamens and pistil on the upper side. Pollen to be fertile must be transferred to a plant with flowers at the level of the stamens from which the pollen came, and when long- and short-styled plants are crossed, the result is fertile seed. A single flower can be pollinated legitimately in two ways, and illegitimately in four ways; and there are 18 modes of union, 6 legitimate, 12 illegitimate, in the union of three forms. Trimorphism may be advantageous. The chances are 2 to 1 in favour of forms being different and incapable of self-pollination.
The capsule, which is egg-shaped and 1–2-celled, is divided by septa and opens along the centre of each valve irregularly, allowing the numerous small yellow seeds to be thrown out to some distance. When blown or cast up on the water they are able to float.

Purple Loosestrife is a peat- or humus-loving plant, growing in wet peaty ground close to water, and is often submerged.

The beetles, Gallerina calmariensis, Hallicia lythri, Aphthona lutescens, Ochrosis salicaria, and Psyllodes picina, Alpin vernalis, feed on it, and the Lepidoptera, Small Elephant Hawk Moth (Charocampa elpenor), and the V Pug (Eupithecia coronata).

*Lythrum*, Linnaeus, is from the Greek *lythron*, gore, from the purple colour of the flowers, and *Salicaria*, Tournefort, is from *salix*, willow, from the shape of the leaves.

Purple Loosestrife is called Purple Grass, Herb Willow, Long Purples, Purple Loose-strife, Red Sally, Soldiers, Spiked Willow Herb. This plant is called Red Sally in Lancashire, where it is much gathered for medicinal use. In Clare’s “Village Minstrel” it is called Long Purples:

"Gay long-purples with its tufty spike  
She’d wade o’er shoes to reach it in the dyke”.

The plant is astringent and tonic, and is much used in Ireland on account of those properties. It has also been used in tanning.

**Essential Specific Characters:**

117. *Lythrum Salicaria*. L.—Stem tall, erect, leaves lanceolate, cordate below, opposite, flowers purple, in whorls in spikes, stamens 12, long and short, calyx teeth alternately long and spreading.

**Great Hairy Willow Herb** (*Epilobium hirsutum*, L.)

The present distribution of this plant, which is the limit of our knowledge so far as to its antiquity and range, is the North Temperate Zone, where it is found in Europe, N. Africa, Siberia, W. Asia, and it has been introduced into N. America. In Great Britain it is abundant in all the counties except Cardigan, Carnarvon, Stirling, Mid Perth, S. Aberdeen, Banff, Elgin, Easternness, W. and N. Highlands, West Sutherland, and the Northern Isles.

The Great Hairy Willow Herb grows wherever there is a moist ditch, or by pond-sides, along the margins of lakes and rivers, and in marshes and pools. It is a gregarious plant, needing constant moisture at the roots, but may rarely be found on dry land. With it grow
other Willow Herbs, Flags, Reeds, Sedges, and a host of other hygrophytes in the reed swamp.

Though without so conspicuous a flower as the Rosebay, it is a taller, more abundantgregarious plant, and has so delicious a scent that it is equally popular. It is tall, erect, branched, with underground stolons or creeping shoots, with the upper leaves lance-shaped, alternate, clasping, very woolly, like the stem (hence the second Latin and the English names), and slightly bordered with small teeth.

Numerous and large, the flowers are purple, bell-shaped, and partly drooping. The white anthers are long and awl-shaped. The calyx is deeply divided, angular, erect, finely hairy inside below. The petals are inversely heart-shaped, white at the base, and twice as long as the calyx. The flowers are regular, with erect style and stamens. The tuberculate pale-brown seeds, downy one side, enclosed in a pod, are acute below.

The Great Hairy Willow Herb forms dense brakes 6 ft. high. The flowers are in bloom during July and August. The plant is a herbaceous perennial, and freely reproduced by roots or stolos. The flowers are large, being 25–30 mm. across, and make a good show when growing in a clump. The stigmas and anthers ripen together, and the plant is capable of self-pollination. But cross-pollination is
ensured by insect visitors by the more prominent position of the stigmas. In the absence of insects the stigmas curl back and touch the pollen of the longer stamens. Insect visitors are not very numerous.

Other forms occur in which there are large flowers in which the anthers are mature first. The pistil is long and pendent, and self-pollination is out of the question. In still others the flower is of a medium size, and the anthers may ripen slightly in advance of the stigma, or simultaneously with the latter. There are also flowers of a third type, which are small, and in which the stigma and anthers mature at the same time, and in this case the plant is usually self-pollinated. There are pistillate plants with no pollen on the anthers. The seeds, as in the Rosebay, are provided with a tuft of hairs which aid in wind dispersal.

The Great Hairy Willow Herb is essentially arenophilous, addicted to a sand soil. But it grows largely in alluvium, which is sandy loam with some humus.

A rust fungus, *Puccinia pulverulenta*, is the chief fungal pest, but *Sphaerotheca humuli* attacks Willow-herbs generally.

The Lepidoptera, Bedstraw Hawk-moth (*Deilephila gali*), *Sericoris urticae*, *Lacerna lactella*, *L. propinquella*, *L. ochracella*, *L. epilobiella*. 
the Gothic (\textit{Vicia typica}), Small Elephant Hawkmoth (\textit{Charocampa elpenor}). \textit{Lygris lugubrata}, feed on this sweet-scented flower.

The second Latin name \textit{hirsutum} refers to the downy\footnote{The hairs are either long and spreading or glandular.} stem and foliage.

It is called Coddled Apple, Apple-pie, Blooming Sally, Cherry-pie, Codlings, Codlings-and-cream, Custard-cups, Fiddle-grass, Gooseberry Pie, Plum-pudding, Sod-apple, Son-before-the-Father, Wild Willow, Willow Herb, Red Withy-herb.

From its smell it is called Plum-pudding, Apple-pie, Cherry-pie, Gooseberry Pie, and Sod-apple. As to the name Son-before-the-Father, Lyte says: "It is called of some, in Latine, \textit{Filius ante Patrem}, that is to say, the sonne before the father, bycause y\textsuperscript{e} has long huskes in which the seede is coteined do come forth, and waxe great, before that the flower openeth".

\textbf{Essential Specific Characters:—}

119. \textit{Epilobium hirsutum}, \textit{L.}— Root creeping, stem tall, branched, leaves opposite, downy, lanceolate, serrate, clasping, flowers puce, regular, stamens and style erect, stigma 4-cleft.

\textbf{Marsh Bedstraw (Galium palustre, \textit{L.})}

Found in the Neolithic deposits in Renfrewshire, Marsh Bedstraw is distributed to-day throughout the North Temperate and Arctic Zones in Arctic Europe, N. Africa, Siberia, Persia, Greenland. Water Bedstraw also occurs in every part of Great Britain, ascending to about 2000 ft. in Northumberland.

This Bedstraw is a typical hygrophyte, occurring in all damp hollows or areas where moist conditions are perennial. It is a familiar sight to see it encircling the margin of a pond. It is also widely spread in marshes, in ditches, by river-sides, and by the lake-side, indeed wherever water is present, usually in the reed swamp.

A feature of Marsh Bedstraw not noticed in the Heath Bedstraw is the downwardly placed bristles of the stem. The stems are spreading, tall, erect, fairly stout, but weak, and associating in clusters for support. The stems are angular, the leaves in a whorl are 4–6, oblong-lance-shaped, or inversely egg-shaped, unequal, blunt, with a slender midrib. Usually the lower whorls have six leaves, the upper four. They are shining and short.

The flowers are handsome, white, in large cymes, exceeding the leaves, or in rather loose and spreading panicles. The cymes are
borne in the axils as well as terminally. The fruit is small, smooth, and globular, and when ripe the fruit-stalks are turned back or at right angles to the stem.

The height varies from 1 to 2 ft. Flowers are found in July and August. The plant is perennial, being a deciduous, herbaceous plant, which is multiplied by division.

The flowers are honeyed, proterandrous, white, conspicuous, and numerous, and grow in the open, rearing their heads above the aquatic herbage; and being scented they are attractive to insects, which are able to cross-pollinate them. Insects may frequently carry pollen to the stigma with their feet. The stamens and pistil are close together. The capsules are smooth and break off at the fruit-stalks to fall around the parent plant.

This handsome Bedstraw is a semi-aquatic and a peat-loving plant, growing in moist peaty soil, or in the silt of ditches in which much vegetable matter is distributed.

If examined carefully it will often be found to be infested with a little fungus, *Puccinia galii*, one of the cluster-cups. The same beetle, moths, and fly that seek out the Heath Bedstraw as a food plant feed on this one.

The second Latin name refers to its habitat, a marsh.

The Bedstraws have been used for curdling milk.

**Essential Specific Characters:**

**141. Galium palustre, L.**—Stem loose, straggly, rough, with reflexed prickles, leaves 6-8 in a whorl, linear-lanceolate, with bristle point, rough margins, flowers in loose panicle, fruit-stalks at right angles, fruit smooth.
**Hemp Agrimony** *(Eupatorium cannabinum, L.)*

Hemp Agrimony can lay good claim to being a native British species if only from its discovery in Interglacial, Late Glacial, and Neolithic beds. To-day it is found throughout the Temperate Northern Zone in Europe, Siberia, as far east as Japan, Western Asia, as far as the Himalayas, and in North Africa. In Great Britain it is not found in Cardigan, Mid Lanes, Linlithgow, Stirling, Mid Perth, N. Perth, N. Aberdeen, Banff, E. Sutherland, and in North Wales.

Hemp Agrimony is usually a hygrophyte, preferring the damp surroundings of a hollow near a lake or stream, often seeking further the shelter and humid atmosphere of a damp copse. But it is to be found in hedgerows at a distance from water occasionally, on the borders of cornfields.

This is a tall, handsome species, growing usually in clumps. The stems are reddish, erect, and the leaves opposite, shortly stalked, 3- or 5-lobed, with lance-shaped segments which are deeply and coarsely toothed. The radical leaves are stalked, the stem-leaves nearly stalkless.

The whitish-lilac flowerheads are in terminal corymbs, tufted, containing few (5-6) crowded flowers. The phyllaries or involucral bracts are short and blunt. The florets exceed the involucre in length. The pappus or hair is roughish, white. The fruit or achene is angled.

The plant grows to a height of 3 ft. or more. It is a late-flowering species, blooming in August and September. It is a deciduous, herbaceous perennial, which is multiplied by division.

The flowerhead is a capitulum of 4 or 5 or 6 florets. The tube is $2\frac{1}{2}$ mm. long, with a wider throat or bell. Though each capitulum is small, as they are numerous they together form a large head. The bracts of the corolla are red-bordered, and the corolla red, with white projecting stigmas. The corolla is 5 mm., and the style divided its whole length, with rows of stigmatic wart-like projections along the margin a quarter of the length, and for the rest clothed with hairs. The anthers ripen first on the inside, and pollen fills the tube. In the first stage the lower part of the branches of the style remains enclosed in the cylinder formed by the anthers, which does not project beyond the corolla. The ends of the style with hairs project beyond it, and carry pollen with them, spreading so much that insects touch them all round, and carry off on their coats pollen entangled in the hairs of the
II. WORKS, LAKES, RIVERS, ETC.

style. After the lower papillae emerge from the cylinder and the root of the corolla they spread so far apart that an insect must touch them in visiting the flower. If sufficient insects have visited them to clear the pollen away before the stigmas are exposed or receptive, the plant is cross-pollinated, but if pollen is left when the stigmas are exposed an insect may self-pollinate it. Even if no insects visit it cross-pollina-

Habit and Habitat

Hemp Agrimony (Eupatorium cannabinum, L.)

Fruits are provided with a pappus, and the fruit is angled and adapted for wind dispersal.

Hemp Agrimony is a semi-aquatic plant, which is partly a humus-or peat-loving plant, and requires humus, and partly a clay-loving
FLEABANE

plant living on a clay soil, the moisture requirements regulating the rock-soil habitat.

Two beetles, *Anaspis frontalis*, *Longitarsus flavicornis*, and the Lepidoptera, Burnished Brass (*Plusia chrysitis*), *Botys lancealis*, *Conchylis rupicola*, *Coleophora troglodytella*, *Pterophora microductylus*, *Dictopteryx shepherdana*, and the flies, *Chromatomyia albiceps* and *Trypetta zoe*, can be found on it.

*Eupatorium*, Dioscorides, is from Eupator, a name of Mithridates, King of Pontus, and *cannabinum* means hemp.

It is called Bastard Agrimony, Dutch, Hemp, and Water Agrimony, Andurion, Filaira, Hemp, Bastard and Water Hemp, Hempweed, Raspberries and Cream.

**Essential Specific Characters:**—

150. *Eupatorium cannabinum*, L. — Stem erect, rough, reddish, leaves downy, opposite, leaflets 3-5-cleft, lanceolate, serrate, flowerheads lilac or reddish, in a terminal corymb, with long, deep, divided styles, pubescent, pappus pilose.

**Fleabane** (*Pulicaria dysenterica*, Gray)

The present distribution of this plant, which is common, is Europe from Denmark southwards, and North Africa, but it is not known in deposits earlier than the present day. In Great Britain it is found in the Peninsula, Channel, Thames, Anglia, and Severn provinces generally, in S. Wales except in Cardigan, in North Wales except in Montgomery and Merioneth, and in the Trent, Mersey, Humber, Tyne, and Lakes provinces. In Scotland it is found in the W. Lowlands except in Renfrew, Lanark, in Berwick, Haddington, Stirling, Clyde Islands, Cantire, S. Ebudes, E. Ross. It is rare in Scotland, but common in Ireland.

Fleabane is a common hygrophyte, delighting in all damp places, such as the vicinity of ponds, lakes, and meres. It grows frequently beside brooks, rivers, and ditches, and in the reed-swamp. It is also a common member of marsh and bog formations.

Growing in extensive patches in damp places this common autumn wild flower has an erect, much-branched stem, rigid and downy or cottony. The leaves are alternate, close, oblong, lance-shaped, heart-shaped, or arrow-shaped at the base, and clasping the stem, rough above, downy or cottony below. The numerous branches are erect, the upper ones longer than those below.

The flowerheads are yellow, conspicuous, large in proportion to the
size of the plant, numerous, in flat corymbose heads, terminal and axillary. The 100 ray florets in a single row are much longer than those in the disk, which are complete and 600 in number. The involucral scales or phyllaries are bristle-like. The fruit is angular, the pappus is hairy, and the outer pappus is minutely scalloped and dirty-white.

The stems are usually 18 in. high. The flowers are late, opening in August and continuing through September onward. Fleabane is a herbaceous perennial increased by division.

There are more than 600 florets in the disk containing both stamens and pistil, the tube being 4 mm. long, narrow below, enlarged at the mouth, with 5 triangular teeth. The honey can be reached by insects with a moderately-sized proboscis. The stigmatic lobes project beyond the cylinder, and spread horizontally and close above the corolla, where the pollen lies in the first stage. Many florets can be pollinated at one visit. The style is covered with stigmatic papillae on the inside, and the upper part (one-third) with hairs (directed obliquely upwards along the edges of the triangular valves of the upper end of the anther cylinder), which are unicellular, longer and thicker than the sweeping hairs of the style, and serve to hold the pollen swept out of the anther cylinder. The ray florets are nearly 100 in number, and possess a pistil only, exactly like that of the disk florets. They do not contain pollen and do not set seeds. They have an outer golden lobe 5-7 mm., with a tube 2-3 mm., and the style protrudes as in the disk with sweeping hairs. The visitors belong to Hymenoptera, Heriades, Halictus; Diptera, Eristalis, Melithreptes; Lepidoptera, Polygonumatus, Lycæna, Small Skipper, Hesperia thauenas; Coleoptera, Cassida. Such flowers having both female and complete florets are termed gynomonecious.

The pappus is short and unequal, but the achenes by its means are entirely adapted for dispersal by the wind.
Fleabane is essentially a peat-loving plant growing in wet ground which is more or less peaty, or else it is a clay-loving plant and grows on a clay soil. It is common, in fact, on clay and boulder clay.

A cluster-cup fungus, Cronycea juncei, intests the leaves.

The beetles, Meligethes tumbaris, Cassida fastuosa, feed upon it.

It is a food plant for several moths, Eubaeæ crocalis, Chloris viridans, Halonota inopiana, Sericoris fuligana, Eupacilia griscana, Gelechia bifractella, B. paupella, B. inopella, Acroleia granitella, Coleophora troglodytella, Pleurophorus lithodactylus.

Pulicaria was given it from the Latin "pulicis", a flea (like the English Fleabane), because it was said to drive away these pests, and the second Latin name refers to another supposed property, namely, the cure of dysentery.

It is called Cammock, Herb Christopher, Fleabane Millet. Gerard says as to the second name: “In Cheape side the herbewomen call it Herbe Christopher, and sell it to empericks, who with it (as they say) make medicines for the eyes, but against what effect of them, or with what successse, I know not”. It is called Job's Tears in Arabic, because Job was supposed to have cured his ulcers with this herb. The specific name alludes to the so-called curing of dysentery amongst the Russian soldiers by its aid. Like Ploughman's Spikenard, if burnt, our forefathers said it drove away fleas and other insects. It was once also employed to cure the itch. Cattle will not touch it. It is very astringent, and the juice is saltish.

**Essential Specific Characters:**

155. *Pulicaria dysenterica*, Gray.—Stem woolly, branched, leaves oblong, downy, wrinkled, flowerheads yellow, in a corymb, ray florets wider than disk, pappus crenulate.

**Three-lobed Butterbur (Bidens tripartita, L.)**

This common aquatic plant, like other members of pratal and paunal formations, is found in Preglacial, Interglacial, and Late Glacial beds. In Arctic Europe, North Africa, West Asia, N.W. India, N. America it is found in the North Temperate and Arctic Zones. In Great Britain it is found in the Peninsula province, in the Channel, Thames, and Anglia provinces, except in Hunts; in the Severn province; in S. Wales, except in Radnor and Pembroke; in N. Wales, except in Montgomery and Merioneth; in the Trent, in the Mersey province, Humber, Tyne, and Lakes provinces. In the West Lowlands it is found generally, except in Kirkcudbright; in Edinburgh,
Linlithgow, and in the E. Highlands, except in Fife, Stirling, Perth, and Elgin.

Three-lobed Butterbur is found by the sides of most rivers and even by streams, but always in moist places: often overgrown by the wealth of Willow-herbs, Bur Reed, Flag, or Horsetail, which vie with each other for the guardianship of the waterway. The stem is erect, with opposite, rather spreading branches, giving it a somewhat characteristic appearance. The leaves, as implied in the second Latin name, are 3-lobed, opposite, stalked, united below, with coarsely toothed segments.

The flowerheads are erect, with terminal, nearly erect, not nodding, yellowish florets, which are solitary. The fruit is provided with 2-5 bristles or awns, a feature intended to be noted in the first Latin name.

The plant is usually 2-3 ft. high. The flowers are in bloom between July and September. Three-lobed Butterbur is deciduous, herbaceous, and perennial.

The flowerheads are inconspicuous, not always possessing a ray (in which the florets are female, ligulate), with bell-shaped disk florets. The lobes of the style are linear, and tipped with papille. The plant grows amongst herbage, where it is unlikely to be visited by insects to any extent, and must therefore rely on self-pollination for the most part.

It is provided with pappus or awns, covered with turned-down
No. 1. Three-lobed Butter-bur
(Bidens tripartita, L.)

a. Tubular or disk floret, with achene below, and barbed pappus bristles, with scale. b. Receptacle, with outer leafy involucral bracts and inner acute bracts. c. Upper part of plant, with tripartite leaves, and flowerheads.

No. 2. Coltsfoot
(Tussilago Farfara, L.)

a. Ligulate or ray floret, with achene and pappus below. b. Tubular or disk floret. c. Achene, with pappus. d. Leaf. e. Flowerhead closed and drooping and expanded, on scape with leafy scales. f. Scape, with flowerhead in fruit showing pappus, forming a spike-like panicle.

No. 3. Butterbur
(Petasites hybridus, Hill = officinalis, Mornich.)

a. Tubular floret, with achene and pappus. b. Leaf. c. Scape, with bracts and flowerhead (female) forming a spike-like panicle.

No. 4. Marsh Ragwort
(Senecio aquaticus, Hill.)

a. Ligulate or ray floret. b. Tubular or disk floret. c. Achene, with pappus. d. Upper part of plant, with pinnate leaves, and flowerheads in a corymb.

No. 5. Marsh Thistle
(Cirsium palustre, Wild.)

a. Tubular floret, with achene and pappus. b. Feathery pappus. c. Achene, with pappus. d. Upper part of plant, with winged bristly stem and leaves, and flowerheads in leaf-cluster.

No. 6. Great Yellow Loosestrife
(Lysimachia vulgaris, L.)

a. b. Corolla (rotate), with stamens with filaments connate below, large and small form. c. Upper part of plant, with upper opposite stem-leaves, and flowers in a panicked cyme, showing various stages, with stamens exerted in some.
5. Marsh Thistle (*Cirsium palustre*, Willd.).
prickles, for wind dispersal of its achenes. It is also furnished with hooks, which aid in dispersing the seeds by means of animals, the burs catching in the wool of sheep, &c.

The plant is aquatic or semi-aquatic, and a peat-loving plant requiring a peaty soil, growing in the reed swamp.

Two flies, *Tephrilis elongatula, Chromatomyia albiceps*, are found on it.

*Bidens*, Linnaeus, is from the Latin *bis*, twice, *dens*, a tooth, in allusion to the two or more teeth or awns crowning the fruit, and the second Latin name refers to the 3-lobed leaf characters.

Water Agrimony and Bur Marigold Double-tooth are the common names in most general use.

It has been used to dye linen and wool a yellow colour, yarn and flax being first steeped in alum water, dried, and steeped in a preparation of this plant, and then boiled in it.

Essential Specific Characters:—

156. *Bidens tripartita*, L.—Stem branched, branches opposite, leaves petiolate, trifid, flowerheads small, yellow, suberect, solitary, terminal.

**Coltsfoot (Tussilago Farfara, L.)**

This is an ancient plant, having been met with at Edinburgh in beds of Neolithic age. It is found in the North Temperate and Arctic Zones in Arctic Europe, N. Africa, N. and W. Asia, as far east as the Himalayas. In America it is an introduction. It is found in every part of Great Britain also, as far north as the Shetland Islands, and it ascends to 2700 ft. in the Highlands. It is native in Ireland and the Channel Islands.

Coltsfoot is a pelophilous plant which grows on clay soils in damp situations, on banks in clay pits, on railway banks, by the sides of streams, and other places where there is a steady flow of water in the spring.

The plant is prostrate in habit. The plant is soboliferous, with many long underground shoots, ending in suckers. It has burrowing stolons, by which it spreads extensively. The only aerial stem is the 1-flowered scape. The leaves are broad, round to heart-shaped, angular, or lobed, downy or woolly-felted below, toothed. The stomata on the under surface are no doubt protected by the woolly felt. The upper surface is glossy or cobwebby, with the veins prominently hollow, and below they stand out under the felt. The leaves do not appear until after the scapes.
The scapes are downy, one or more, the flowerheads bright yellow, and erect in bloom and in fruit, drooping in bud and after flowering. The scapes are covered by numerous oblong, closely pressed, smooth scales or bracts. The involucral bracts are in one row, with few outer shorter ones. The ray florets are in many rows, narrow, ligulate, the disk florets being bell-shaped, with 5 teeth. The stigmas is club-shaped, the arms united below, papillose, with 2 small cones. The anthers have no tails. In the ray florets the fruit is nearly cylindrical, that of the disk florets imperfect, with pappus in one row. The pappus is snowy-white, soft, forming a globular clock when fully expanded, and readily dispersed when ripe. The hairs are slender, rough.

Coltsfoot is scarcely more than 6 in. in height in flower. The flowers bloom in March and April. The Coltsfoot is a herbaceous perennial plant, propagated by division.

The solitary yellow flowerheads or capitula are very conspicuous in the spring, being 20–25 mm. across when outspread, and have a distinct and strong smell, which with the honey they contain renders them especially attractive to early flying insects at a time when few flowers,
save the Sallow, are in bloom. The plant is monoeccious. In the ray
the florets are female (hence the fully-developed achenes at a later
stage only in the ray). The disk florets are male. Both disk and ray
florets are golden-yellow, and there is little to distinguish them at first
sight, but those in the ray are ligulate, those in the disk bell-shaped.
In the ray florets, which are numerous, over 300, there is a pollen
brush which is not of any use in female florets, and it may be that
there were originally male florets also, but this provision is not usual in
female florets in this order. The disk florets are much fewer, about
40 in number, and alone contain the honey. The flowerheads close at
night, and when there is rain, as a protection for the honey and pollen.
When the ray florets have been visited and pollinated they do not
wither as is usual at once, but remain fresh till the anthers have opened
some days after. Insect visitors are numerous. The disk florets retain
a rudimentary pistil. In the ordinary course the flowers are cross-
pollinated, the proterogynous flowerheads ensuring this.

Self-pollination without insects is impossible. The flowers are
visited by the Honey Bee, Andrena, Halictus, Diptera (Bombylus
major, Eristalis tenax), Coleoptera (Meligethes).

The plant is provided with white silky pappus to aid the fruit in
dispersal by the wind.

Coltsfoot is a clay-loving plant, being confined to a clay soil.

The leaves on the upper side are covered with a large "cluster-
cup" fungus, Coleosporium sonchi, which is a beautiful object under the
lens. The stomata lie below covered with felted down, which is
greyish-white.

A Hymenopterous insect, Mellinus sabulosus, Lepidoptera, Glauces-
Shears (Hadena glauca), Halonota brunichiana, Scopula lutalis, Ptero-
phorus trigonodactylus, are to be met with on this food plant.

Tussilage, Pliny, is from tussis, a cough, with reference to its
use in curing coughs. Farfara, Pliny, is a Latin name for the
plant.

The name Colt's-foot is given because of the shape of the leaf. It
is called Ass's-foot, Bull-foot, Clatter-clogs, Clayt, Clayweed, Cleats,
Clot, Colt-herb, Colt's-foot, Coughwort, Cout-fit, Cow-heave, Dishalaga,
Dove-dock, Dummy Weed, Foalfoot, Foilefoot, Tushy-lucky Gowan,
Hog-weed, Hoofs, Horse-hoof, Horse-hove, Son-before-the-Father,
Sow Foot, Tushalan. The name Son-before-the-Father is the name
given because the flowers appear before the leaves. Wine made from
it is called Clayt wine, and beer made from it Cleats, and these with
the name Clayweed refer to its clay habitat. Colt's-foot, Cow-heave
(a cow hoof). Hoofs, Horse-hove, refer to the same resemblance between the leaf outline and an ungulate hoof.

On Easter Day in Bavaria the peasants made garlands of it and threw them into the fire. It has been considered a demulcent and pectoral, the leaves being mucilaginous. The plant has long been used for coughs. In Chaucer’s day it was used in all stomachic complaints, for broken bones and the drye colw (cough). The leaves are held to be expectorant. The leaves have been used since the days of Dioscorides to smoke through a reed to remove the mucus in the chest for catarrh, asthma, phthisis, but it is little used to-day. The cotton of the leaves wrapped in rag dipped in salpetre has been employed as tinder. For coughs also a tea or syrup was made. The root dried and burnt has been used to keep away gnats.

When the florets have done blooming, and the achenes with pappus enclosed in the involucre are moist, the heads hang down, as at night, but in the day and when it is dry they become light, and the scape is again erect and the pappus expanded as in the Dandelion.

**Essential Specific Characters:—**

163. **Tussilago Farfara.** L.—Soboliferous, leaves large, cordate, angular, with dark teeth, cottony beneath, leaves appearing after the flowerheads, which are on scapes with scales, disk florets tubular, ray florets ligulate, drooping before and after flowering.

**Butterbur** (Petasites officinalis, Moench)

Unlike its near neighbour Coltsfoot, Butterbur is not found in early deposits. It is found in the North Temperate Zone to-day in Europe, North Africa, N. and W. Asia. It is found in every part also of Great Britain except the Isle of Wight, Glamorgan, West Sutherland, as far north as the Shetlands; but it is local, and ascends to 1000 ft. in Northumberland; and in Ireland it is also native.

Butterbur is a paludal species, which grows in very similar places to Coltsfoot. It, however, frequents the near neighbourhood of water more consistently than the latter, and is found on the borders of rivers, streams, and lakes, forming dense brakes with its huge rhubarb-like leaves.

Like Coltsfoot, the Butterbur is soboliferous, with creeping underground stems. The stems are woolly scapes. The leaves¹ are flat, large, kidney-shaped or heart-shaped, toothed along the margin.

¹ Perfectly adapted to a habitat where moisture is abundant, water copiously supplied, and the shade considerable.
smooth, reddish, covered with a felt at the base, downy beneath, and very large. The leaf-stalks are long, round, finely-furrowed, sheathed below, channelled, and purple. They are usually softly and loosely hairy.

The plant is dioecious, with male florets and female on different plants, the male florets being rarest, and in a dense egg-shaped panicle, the female ones loose and longer, the styles of the first being egg-shaped and stout, the female with the mouth obliquely blunt above. The flowerheads are carried on erect, stout scapes, white and woolly, with lance-shaped scales, purple and ribbed.

The plant is often several feet high, the flowering being about 1 ft. The flowers bloom in March and April. The plant is a herbaceous perennial propagated by division.

In Petasites albus the plant is dioecious, and the male flowerheads are more conspicuous. In the female capitula there are two kinds of florets. Only some in the centre produce honey, and the stamens (usually absent) and pistil (with stigma with short hairs) are functionless, and around these are tubular female florets without honey or stamens. The male flowerheads are loose and of one sort of floret only, and possess honey, and a pistil with no stigma, but a style whose branches sweep the pollen out from the cylinder by means of the hairs, but they possess no papilke. The male capitula, with florets which are tubular below and bell-shaped above, also possess some functionless florets occupying the same place as the pistillate florets in the female flowerheads, which they resemble in not possessing a nectary or stamens, and in having a style and a narrow tubular corolla. There are also abortive female florets which, in reduced number and functionless condition, correspond in primitive
hermaphrodite flowerheads or gynomonecious florets to the functional female florets. The pappus of the female florets is abundant, and adapts the achenes for wind dispersal.

Butterbur is a clay-loving plant addicted to clay soil in moist hollows or sandy loam.

It is covered with the same pretty fungus as Coltsfoot, Colcosporium souchi.

The moths, Botys alpinalis, the Butterbur, Hydracina petasitis, Halonota turbidana, live on it.

Petasites, Dioscorides, is from the Greek petasos, a large, broad-brimmed hat, alluding to the foliage, and the second Latin name refers to its medicinal use.

It is called Batter Dock, Bog Rhubarb, Bogs Horns, Burn-blades, Butter-bur, Cap Dockin, Cleats, Kettle Dock, Water Docken, Dummies, Eldin, Eldin-docken, Ell-docken, Flapper Dock, Flea-dock, Gallon, Gaun, Lagwort, Pestilence Wort, Poison Rhubarb, Son-before-the-Father, Umbrella Leaves. It was called Pestilence Wort from a supposed remedy it formed for pestilential fevers. The name Son-before-the-Father is given because the flowers appear before the leaves. The name Bog Rhubarb is applied because the leaves are like rhubarb. It is called Bogs Horns because children use the hollow stalks as horns or trumpets. The name Batter-bur is given because people in the country wrapped butter in the large leaves. Eldin is a name given because it was used as elden or fuel.

Essential Specific Characters:—
164. Petasites officinalis, Moench.—Soboliferous, leaves large, on long furrowed stalks appearing after flowerheads, downy, orbicular, reniform, flowerheads, lilac, in spike, plants dioecious.

Marsh Ragwort (Senecio aquaticus, Hill)

Fruits of this common paludal type have been found amongst others in Interglacial deposits at West Wittering, Sussex. It is found in the North Temperate Zone to-day in Europe and Siberia. It grows in every part of Great Britain except N. Aberdeen, ascending to 1500 ft. in the Lake district.

Water Ragwort is a marsh plant, growing commonly in wet meadows that are continually submerged. But it also grows by the sides of lakes and rivers, and wherever there is water of a permanent nature. In similar spots grow Great Water Chickweed, Marsh Thistle, Water Mint, Alder, Crack Willow, and other hygrophytes.
The stems are not so stout as in some other species of Ragwort, but several small ones grow out of a short, often prostrate one, or the plant may be tall and erect, like Common Ragwort. The radical leaves are oval-oblong, entire, or rarely toothed, clasping, simple below, and smooth. The stem-leaves have the lobes larger upwards and deeply divided.

The flowerheads are rayed and spreading, with elliptical florets, borne on slender flower-stalks in a corymb. The corymb is very loose and variable in the number and arrangement of the florets. The fruit is smooth and ribbed.

The plant is 2-3 ft. high. It blooms in July and August. It is a herbaceous perennial and propagated by division.
The flowerheads are large and as conspicuous as in the Hoary Ragwort, and the same arrangement of the flower holds good. The ray florets are female or absent, the disk florets being complete. The achenes are furnished with abundant silky pappus and adapted for wind dispersal.

Marsh Ragwort is a peat-loving plant, and requires a more or less damp and peaty soil, such as that which is obtained in a marsh or bog.

Marsh Ragwort is infested by a cluster-cup fungus, _Puccinia senecionis_. A moth, the Wormwood Pug (_Euptethecia absythiata_), feeds upon it.

The second Latin name refers to its aquatic habitat.

Ragwort is known in Ireland as “Fairies’ Horse”, and was said to have been sought for by witches when taking their midnight journeys. Burns in his “Address to the Deil” makes his witches “skim the muirs and dizzy crags on ragweed hags” with “wicked speed”. A similar legendary belief prevails in Cornwall in connection with the Castle Peak, a high rock south of the Logan Stone. “Here”, Mr. Hunt writes, “many a man, and woman too, now quietly sleeping in the churchyard of St. Levan would, had they power, attest to have seen the witches flying into the Castle Peak on moonlight nights, mounted on the stems of the Ragwort.” “Fairies’ Horse” was applied because fairies were supposed in Ireland to ride to their scenes of merry-making on Ragwort. It was a Manx preservative against all infectious diseases.

_Esential Specific Characters:—_

167. _Senecio aquaticus_, Hill.—Stem tall, radical leaves petiolate, subentire, glabrous, flowerheads large, yellow, in loose corymbs, rays spreading, fruit glabrous.

**Marsh Thistle** (_Cnicus palustris_, Willd.)

As in the case of other typical marsh plants this plant has been found in Interglacial and Neolithic deposits. It is found to-day in Arctic Europe and Siberia. The Marsh Thistle is known in all parts of Great Britain, even ascending to 2,400 ft. in the Highlands.

The name Marsh Thistle indicates to some extent the range of this species, which is so familiar a member of all marsh floras, with its tall tufted heads of purple bloom. But it is really common to all wet ground, growing in damp hollows in meadows and along the margins of lakes, rivers, and pools of all descriptions.

The Marsh Thistle is one of the tallest thistles, erect, branched at
the top and angular, clothed with white hairs and with numerous spines. It has usually one main stem, which is purple and green. The leaves run down the stem, and are rough, deeply divided to the base, and beset with numerous brownish prickles, stalkless and turned down, lance-shaped, with blunt broad teeth, and a palish-green midrib. The margins of the leaves bear the spines, which are purple at the base.
The stem is winged with interrupted, spinous, rudimentary leaves, which serve to protect it.

The flowerheads are violet in an egg-shaped involucre, with egg-shaped to lance-shaped phyllaries, which terminate in a point and overlap. The florets are tufted and clustered, and rather small, and the involucre is slightly webbed. The limb of the corolla is 5-lobed to the middle.

This graceful plant may be 3 ft. high. It is rarely in flower before July. Biennial, it is herbaceous and propagated by seeds.

Marsh Thistle has a capitulum intermediate between C. arvensis and C. lanceolatus, in so far as it is possible to reach the honey, and in the variety of visitors. The throat of the corolla is 2½ mm. The florets are tubular and complete.

It is visited by Apis mellifica, Bombus, Andrena, Halictus, Megachile, Lindenius, Eristalis, Volucella, Syrphus, Sicas, Pieris, Hesperia, Satyrus, Plusta, Agrotis, Strangalia.

The achene is narrow, and provided with a feathery pappus for wind dispersal.

This fine composite is a peat-loving plant, requiring a humus soil, and growing in peaty bogs, &c.

Two fungi, Puccinia hieracii, P. dioica, infest it. Two beetles, Psylliodes piceina, Larinus carline, a moth, Coleophora therinella, are to be found upon it.

The second Latin name refers to its habitat. It is called Bog-thrisel, Moss-thistle, Red and Water Thistle. It was said to counteract the powers of darkness, and in Estonia they place it in ripening corn to drive away malignant demons. Elf lock, a disease in Poland amongst the poor, said to be due to evil spirits, disappears when one buries thistle seeds. If thistles are seen in a dream it is a good omen. "If the down flieth off Coltsfoot, Dandelion, and thistles when there is no wind it is a sign of rain ", and " Chaff, leaves, thistle down, or such light things whisking about and twining round foreshows tempestuous winds ". In Suffolk—

"Cut your thistles before St. John,
You will have two instead of one ".

The tender stalks, if peeled, are eatable when boiled.

Essential Specific Characters:

171. Cnicus palustris, Willd.—Stem tall, erect, purple, hollow, branched above, spinose, winged, leaves not hairy above, decurrent, thorny, brownish, flowerheads purple, small, terminal heads in a cluster, bracts purplish-green, ovate-lanceolate, corolla limb 5-fid to middle.
Great Yellow Loosestrife (Lysimachia vulgaris, L.)

This is a marsh plant, not yet found in Glacial plant beds in the Northern Temperate and Arctic Zones in Arctic Europe, North Africa, N. Asia, and it is represented in Australia by a nearly allied species. In Great Britain it is not found in the Peninsula province in N. Devon, but is general in the Channel, Thames, and Anglia provinces, and in the Severn province generally; in S. Wales not in Radnor; in N. Wales not in Montgomery, Denbigh, or Anglesea; throughout the Trent and Mersey provinces, except Mid Lancs; in the Humber and Tyne provinces, except in Cheviotland; and in the Lakes province, except in the Isle of Man. It occurs throughout the whole of the W. Lowlands; only in Berwick, Edinburgh, Linlithgow in the E. Lowlands; in the E. Highlands, only in Fife, Stirling, W. Perth, Kincardine, S. Aberdeen; in the W. Highlands, in Dumbarton and Mid Ebudes. It is rare in Scotland and local in Ireland.

The Common or Yellow Loosestrife, not so common really as the Wood Loosestrife and Creeping Jenny, is found here and there throughout the country by the sides of rivers and other tracts of running water, but owing to the drainage of the country it is less common than formerly. Other plants of this type are Frogbit, Snakeshead, Fritillary, and we may add the introduced Musk, which, once on the increase, is now again decreasing. It is also a plant of peaty woodland swamps, and grows frequently in ditches.

The plant is erect in habit. Usually it is downy. The rootstock is creeping, and the plant is stoloniferous. The stem is erect, rather square in section. The leaves vary greatly in size, shape, and the amount of down. In one form there are 3 leaves in a whorl, in another 4. They are, if not whorled, opposite, egg-shaped or lance-shaped, dotted. As with most verticillate leaves there are no leaf-stalks. There may be black glands on the leaves below, or they may be hairless or downy.

The flowers are golden-yellow with red spots at the base, in terminal or axillary panicked cymes, which are simple or compound. The corolla is more or less bell-shaped, the 5 lobes entire, egg-shaped, not fringed with hairs, without alternating teeth. The lobes of the calyx are lance-shaped, fringed with hairs, with red margins. The 5 anther-stalks are united below, and the stamens included. The capsule is round. The seeds are rough with a border, 3-angled.

Great Yellow Loosestrife is about 3 ft. in height. The flowers
bloom from July to September. It is a perennial, propagated by division, and is worth cultivating.

There are three types of plant which have been found on the Continent. In one the flower is conspicuous, and is rarely if ever self-pollinated. This is a sun plant, occurring on embankments. In a second less conspicuous shade form self-pollination regularly occurs. In places of an intermediate character, as ditch banks, there are transitional types. None of these forms contain honey. The petals in the sun plant are dark-yellow and have red spots at the base, like honey-guides, and are expanded or bent back at the tip, the petals being 12 mm. long and 6 mm. wide. The anther-stalks are also red-tipped. The anthers are included, and the style is much longer, well projecting. If an insect visits the flower it touches the stigma first and cross-pollinates the flower. In the absence of insects seed is not set, as the anthers are not level with the stigma and the flower is erect.

The petals in the shade plant are of a lighter yellow. There are no red spots below. They are not so long or wide, being 10 mm. and 5 mm. respectively, nor do they expand so far, but are oblique. The anther-stalks are greenish-yellow. Here the style and the two longer inferior stamens are of equal length. Hence if the flower is not visited and cross-pollinated by insects, self-pollination may occur. In the third type the anther-stalks may be red, or the petals may be larger, or red and large. Further, the corolla may be slightly reddish at the base, and in a fifth case the style may be longer than the longer stamens. The flowers are visited by pollen-seeking insects. An insect that is especially abundant where these plants are found is *Macropis*.
MONEYWORT

labiata: where it does not occur the plants are absent. The females are abundant on the sun plant.

The flower is visited by Macropis, Halictus, Andrena, Odynerus, and a fly, Syrilla pippicus. Macropis labiata is the chief visitor.

The capsule being 5-valved and many-seeded, the seeds are shaken out by the wind at the top.

Yellow Loosestrife is largely a peat-loving plant, requiring a moist peaty soil, either sandy or clayey.

Two beetles, Crepidodera salicaria, Galcrula sagittaria, two Hymenoptera, Macropis labiata, Selandria luteola, two moths, Detented Pug (Collix sparsata), Powdered Quaker (Tenioicampa gracilis), are found on it.

*Lysimachia*, Dioscorides, is from the Greek *luo*, loose, *mache*, battle, or loose-strife; and the second Latin name suggests that it is common, but this is a mistake.

Golden Loosestrife, Herb Willow, Yellow Loosestrife, Willow Herb, Golden or Yellow Willow Herb, Willow Wort, Yellow Rocket, are some of its English synonyms. The name is thus explained by Gerard: "An adaptation of the last name Lysimachia, which, as Dioscorides and Plinie doe write, tooke his name of a speciall vertue that it hath in appeasing the strife and unrulinesse which falleth out among oxen at the plough, if it be put about their yokes, but it rather retaineth and keepeth the name lysimachia of King Lysimachus, the son of Agathodes, the first finder out of the nature and vertues of this herbe, as Plinie saith ".

The plant is cultivated, and is more deserving of notice than many others that are more popular at present.

**Essential Specific Characters:**

201. *Lysimachia vulgaris*, L. — Stem erect, branched, leaves lanceolate, acute, sub-sessile, in whorls, opposite, flowers yellow, in terminal panicle, or axillary, stamens united.

**Moneywort** (*Lysimachia Nummularia*, L.)

Common in damp places, and known as Creeping Jenny in the garden, Moneywort is a plant of the Northern Temperate Zone, found in Europe generally, and a garden escape only in the Northern United States. It is unknown earlier than in the present-day flora. In Great Britain it is absent from Cornwall in the Peninsular province, occurring in the Channel province; in the Thames, Anglia, Severn provinces generally, but in S. Wales not in Radnor, and in N. Wales in
Merioneth, Montgomery, Carnarvon, and Denbigh only; and throughout the Trent and Mersey provinces, except in Mid Lanes in the Humber; Tyne provinces, except in Cheviotland; in the Lakes province, except the Isle of Man; in the W. Lowlands, except in Kirkcudbright, and it is found in Stirling. Watson considers that it is not native in Scotland, or beyond York and Durham in England, and it is introduced in E. Lowlands. It is not native in Ireland, and rare.

Moneywort is a more or less common plant in damp places, such as marshy tracts bordering a river or lake, where there is some shade and shelter from trees, and it is also characteristic of moist woodlands, carpeting the banks of ditches and banks where natural glades or artificial rides allow daylight to enter unhindered.

The habit of this species is very different to that of the Common Loosestrife, being trailing or creeping. It has numerous simple stems, branched, jointed, and channelled each side, or square. The leaves are roundish, opposite, heart-shaped, smooth, shortly-stalked, and decurrent.

The flowers are large, yellow, solitary, axillary, and wheel-shaped. The sepals are egg-shaped to heart-shaped, bent back, and keeled underneath. The corolla is deeply divided. The anther-stalks are united at the base. Fruit is rarely produced. Being prostrate it is scarcely more than 3 in. in height. Flowers are found in June and July. It is a herbaceous perennial, reproduced by division.

The flowers are conspicuous but prostrate, and though homogamous they do not set good seed, because the flowers of the same neighbourhood are usually from the same stock. Otherwise the flowers are as in
No. 1. Moneywort
(Lysimachia Nemorum, L.)
Upper part of plant, with ovoid leaves, in opposite pairs, flowers in the axils, with capsules with the calyx, calyx lobes, and flowers with rotate corolla and 5 stamens, and pistil with long style.

No. 2. Scorpion Grass
(Myosotis scorpioides, L.)
1, Salver-shaped corolla, cut open, showing inside, with epipetalous stamens. 2, Ovary, with style, and capsule stigma. 3, Nutlets, with style. 4, Upper part of plant, with alternate stem-leaves and scorpioid cyme, with flowers in various stages, and gamosepalous calyx enclosing fruit below.

No. 3. Water Figwort
(Scrophularia aquatica, L.)
a, Vertical section of flower showing ventricose corolla, upper lobes erect, sepals below, and within 2 of 4 stamens (declinate) and pistil with 2-fid stigma, and long style. b, Capsule, with persistent style, opening by valves. c, Section of winged stem. d, Stem-leaf, oblong, with teeth larger upwards. e, Inflorescence, with flowers in thyrsoid cyme.

No. 4. Musk
(Mimulus Langsdorffii, Donn.)
a, Portion of corolla to show 4 stamens. b, Stigma, with 2 equal lamellae. c, Upper portion of plant, with paired ovate sessile leaves, flowers in the axils, with 2-lipped corolla, and capsule in tubular 5-angled calyx, with long persistent style.

No. 5. Brooklime
(Veronica Beccabunga, L.)
a, Corolla (rotate), with 4 corolla-lobes, and 2 stamens exserted. b, Pistil, with long style, within 4-fid calyx. c, Capsule, with style, within calyx. d, Upper part of plant with opposite leaves and flowers in axillary racemes, some in fruit, with long stalks in axils of bracts.

No. 6. Water Mint
(Mentha aquatica, L.)
a, Corolla, opened to show 4 epipetalous stamens with long filaments, exserted. b, Ovary, with long style, and 2-fid stigma. c, Flower, with gamosepalous hairy calyx, bell-shaped, 4-lobed corolla, and stamens and style, exserted. d, Stamen, with white filament, and 2 parallel anther cells. e, Upper part of plant, with opposite stalked leaves, and flowers in axillary whorls and terminal spikes.

6. Water Mint (Mentha aquatica, L.)
4. Musk (*Mimulus ringens*, Donn.).
Yellow Loosestrife. Pollen may fall on the stigma and self-pollination may result. The capsule splits up into five valves, and the seeds are thrown out from the fruit by the wind.

Creeping Jenny is more or less a clay-loving plant, and addicted to a clay soil in which there is some humus. Though it grows largely in woods it is also found in marshy tracts.

There are no insect or fungal pests.

Nummularia, Dodonaeus, is from the Latin nummus, coin, from the shape of the leaves.

This graceful plant is known by the name of Creeping Jenny, Twopenny Grass, Herb Twopence, Meadow-runagates, Money-wort, Motherwort, Strings of Sovereigns, Twopence, Wandering Jenny, Wandering Sailor. Turner invented the name Herb Twopence, "because it hath two and two leaves standing together of ech syde of the stalke lyke pence".

Fable has it that it attracted serpents, and they were said to heal themselves with it when wounded, perhaps because of its trailing serpentine growth (by Doctrine of Signatures). It is commonly cultivated in gardens but seldom produces seed. The leaves have a slightly astringent taste or are slightly acid. They used to be recommended for scurvy and other diseases of the blood.

Essential Specific Characters:

202. Lysimachia Nummularia, L.—Stem prostrate, creeping, leaves shiny, orbicular, shortly petioled, flowers large, yellow, solitary, axillary, filaments connected at the base, glandular.

Scorpion Grass (Myosotis scorpioides, L.)

Though this is one of the Arctic types it has not been found in association with those found in ancient deposits so far. In the North Temperate and Arctic Zones it is found in Arctic Europe, Siberia, Dahuria, and has been introduced in N. America. In Great Britain it is found in the Peninsula, Channel, Thames, Anglia, and Severn provinces. In S. Wales it is not found in Radnor or Cardigan; in N. Wales only in Carnarvon, Flint, Anglesea; throughout the Trent, Mersey, Humber, Tyne, and Lakes provinces, and in W. Lowlands; in E. Lowlands, except Peebles, Selkirk; in the E. Highlands, except in Stirling, Banff, Elgin; in the W. Highlands, not in Cantire, Mid or N. Ebudes; in E. Ross and Caithness, in N. Highlands; or from Aberdeen southwards. In the North, Myosotis reptens has been confused with this, which is there rare.
The Scorpion Grass is an aquatic plant, which is common by the sides of rivers, margins of lakes, pools, and ponds; and it may also be found growing on wet ground of a more or less marshy or boggy character caused by an overflow of any of the former.

The Marsh Forget-me-not, as it is also called, has long roots and is stoloniferous, then erect, with branched, smooth or hairy, rounded, solid stem, with spreading hairs. The leaves are stalkless, lance-shaped, blunt, smooth, and the first Latin name refers to their shape or texture, being like a mouse's ear.

The flowers are blue or violet, stalked, and form a scorioid cyme, with a smooth 5-lobed calyx covered with closely-pressed bristles or hairs, with sub-equal, short, blunt teeth, nearly as long as the corolla, and the limb of the corolla twice as long. The style equals the calyx, and the lobes of the corolla are notched at the end.

The stem is 2 ft. high at most, and flowers are in bloom between April and August. The plant is a herbaceous perennial and propagated by division, being worth cultivating.

The pistil and stamens in the different species vary in position, but the floral mechanism is similar to that of *M. intermedia*, in the length of the tube, which is 3 mm. long. The corolla is salver-shaped with a flat limb, and the mouth is closed by 5 scales or glands. The anther-stalks are fixed in the neck of the tube; the anthers are oblong, yellow, with a club-shaped tip, and are included. The style is as long as the tube, and the stigma blunt. It is visited by the Common Blue Butterfly (*Lycaena Icarus*), and a fly, *Empis*.

The fruits are hooked and may catch in the coats of animals and
be thus dispersed, or they may fall into the water in the first place and be dispersed by water.

Marsh Forget-me-not is a peat-loving plant requiring a peaty soil, or a clay-loving plant growing on clay soil.


*Myosotis*, Dioscorides, is from the Greek *mus*, mouse, and *eus*, ear, because the leaves resemble a mouse's ear; and the second Latin name refers to the scorpionoid type of cyme.

Marsh Forget-me-not is also known by the names Bird's-eye, Catterpillars, Forget-me-not, Snake Grass, Love-me, Mouse-ear Scorpion-grass. The origin of the name is so described by Shiraz: “It was in the golden morning of the early world when an angel sat weeping outside the closed gates of Eden. He had fallen from his high estate through loving a daughter of Earth, nor was he permitted to enter again until she whom he loved had planted the flowers of the forget-me-not in every corner of the world. He returned to Earth and assisted her, and they went hand-in-hand over the world planting the forget-me-not. When their task was ended they entered Paradise together; for the fair woman, without tasting the bitterness of death, became immortal like the angel, whose love her beauty had won when she sat by the river twining the forget-me-not in her hair.” Another explanation is that a lover when trying to pick some blossoms of the *Myosotis* for his lady-love was drowned, his last words as he threw the flowers on the bank being Forget-me-not.

**Essential Specific Characters:**

216. *Myosotis scorpioides*, L.—Root creeping, stem suberect, leaves rough, with spreading hairs, shining, blunt, flowers bright blue, with yellow eye, and small ray at base of corolla, in a raceme or scorpionoid cyme, teeth short, style equalling the calyx, hairs on calyx straight, appressed.

**Water Figwort** (*Scrophularia aquatica*, L.)

South of Denmark in Europe, N. Africa, N. and W. Asia, eastward to the Himalayas, marks the present range of this species in the N. Temperate Zone. It has not been found in any early deposits. In Great Britain it is found in the Peninsula, Channel, Thames, Anglia, and Severn provinces except in Monmouth, and in S. Wales not in Brecon or Radnor, but throughout the whole of N. Wales; and in the
Trent and Mersey provinces, except in Mid Lanes; in the Humber, Tyne, Lakes provinces (in the last only in Westmorland); in W. Lowlands, except Renfrew and Lanark; and in Berwick and Edinburgh. It is found in Ireland and the Channel Islands.

![Water Figwort (Scrophularia aquatica, L.)](image)

Water Figwort is typically an aquatic plant growing by the side of tracts of water, being rooted in the mud, and a thorough hygrophyte. It is to be found by the sides of most rivers, streams, and other types of running water. It also frequents still waters, such as lakes, ponds, pools, and even ditches by the roadside. It is seldom found away from water.
Fond of moist conditions, the plant has a tall, erect stem, square in section, and winged, branched, smooth, and purplish. The leaves are stalked, opposite, running down the stem, heart-shaped below, scalloped, the teeth larger upwards. The branches are opposite, with bracts below the flower-stalks, which are lateral.

The flowers are brownish-red, and in panicles or corymbose cymes, which are terminal, dense, and bear numerous flowers. The lobes of the calyx are less than the corolla, and edged with a membrane, brown and torn. The corolla is large and inflated, the upper lip divided into two nearly to the base, and green below. The flower is scented and attractive to wasps. The capsule is bilocular, subrotund, with many brownish seeds.

Water Figwort grows to a height of 4 ft. It flowers in May, June, July. The plant is a herbaceous perennial propagated by division, the roots being white and fibrous.

The floral mechanism resembles that of *S. nodosa*, and it is chiefly visited by wasps. The anthers touch the abdomen of the insect. The fifth stamen is useless, with no anther, and is like a small black scale-like appendage on the upper wall or lip of the corolla, and probably indicates a reversion to an ancestral type, or a primitive structure. The corolla is short (5 mm.) but wide and globular, and at its base on the superior side two large drops of honey may be seen secreted at the yellow base of the ovary. The stigma at first projects, and is mature before the anthers. Each stage lasts two days. Both lie on the lower side of the flower. Wasps cling to the outside below the flower, and insert the head between the upper and lower lobes of the corolla. In young flowers they touch the stigma with the front, in older flowers with the underside of the head, and pollen of young plants is transferred to stigmas of older flowers. The style bends down after flowering and pollination. Wasps are the chief visitors in this country. Bees also visit it in Illinois. The corolla in colour resembles the wasp's markings. The capsule opens by dividing into two valves, and the seed then falls around the parent plant.

Water Betony is a sand plant and a clay-loving plant, being found on sand soil or clay soil or sandy loam.

A fungus, *Peronospora sordida*, attacks the leaves.

Two beetles, *Longilarsus agilis*, *L. rutillus*; a wasp, *Vespa sylvester*, and *Allantus scrophularia*; and three moths, Frosted Orange (*Gortyna flacage*), *Depressaria niturella*, Water Betony (*Cucullia scrophulariae*), are found upon Figwort.

*Scrophularia*. Brunfels, is from *serofula* or *serofula*, for which it
was a reputed cure; and the second Latin name refers to its semi-aquatic habitat. Figwort was applied because it was supposed to be a cure for the disease *ficus* by the Doctrine of Signatures.

Brook or Water Betony, Bishop-leaves, Broomwort, Brownwort, Bullwort, Stinking Christopher, Cressel, Cressil, Crowdy-Kit, Fiddles, Fiddlewood, Figwort, Huntsman's Cap, Poor Man's Salve, Stinking Roger, are the common names for this handsome semi-aquatic plant.

Because the stalks are coloured it was called Brownwort. It is called Fiddlewood because the stems are stripped by children of their leaves and scraped across each other fiddle-fashion to produce a squeaking sound.

The plant is purgative in action. It was from the tuberous roots of *S. nodosa* that the notion arose that this plant (like the other) was a cure for scrofula. At the siege of Rochelle (1628) the French were reduced to eating the roots.

**Essential Specific Characters:**

231. *Scrophularia aquatica*, L. Stem tall, erect, quadrangular, 4-winged, leaves cordate, oblong, crenate, serrate, bracts linear, blunt, flowers, 1-15, purple, in a corymbose cyme, with reniform staminodes, calyx with 5 rounded lobes.

**Musk** (*Mimus Langsdorffii*, Donn.)

This is an American plant of comparatively recent introduction into Europe (1812), and a member of the N. Temperate flora. Like *Elodea canadensis*, also introduced from America, it is now found in all parts of the country. In Skye it ascends to 1000 ft. It is found also in Ireland.

Musk grows by the waterside in most damp places, by the margins of streams, in reservoirs, and other natural or artificial pieces of water. Associated with it are Purple Loosestrife, Three-lobed Butterbur, Scorpion Grass, Gipsy Wort, Blue Skull-cap, Yellow Flag, Flowering Rush, &c.

The habit is compact, the stems rather trailing or creeping, and the whole plant is more or less bushy. The lower leaves are stalked, the upper clasping, heart-shaped, egg-shaped, smooth, shiny, veined, with six or more nerves. The stalks of the upper leaves are occasionally lobed.

The first Latin name has reference to some supposed resemblance between the seeds and the expression of a monkey when grinning. The flower is bright-yellow with carmine spots, borne on slender
flower-stalks which exceed the leaves. The teeth of the calyx are short and unequal. The corolla is 2-lipped, the upper one bilobed, turned back, the lower one spreading and 3-lobed. The petals have 2 swellings. The capsules are 2-valved and many-seeded.

Wild Musk is 2 ft. high. The flowers are in bloom from June to September. This plant is a perennial, increased by division. There is no reason why it should not be more often seen in our gardens.

In *M. Langsdorffii* bees first touch the inferior lobes of the stigma which lie over and cover up the anthers. The lobes are sensitive and immediately fold up and close over the pollen, and if none is enclosed
they open again to receive it, and expose the anthers to the touch of
the bee, which is dusted with fresh pollen. The upper lip of the
corolla is turned back and 2-lobed, and the lower spreading and 3-
lobed. The petals have 2 swellings on them, and they are spotted, the
spots acting as honey-guides. There are 4 stamens. The stigma has
2 lamellae, which are sensitive, and close when touched on the inner
side. The capsule when ripe opens for the dispersal of the seeds
around the parent plant.

This gorgeous wild-flower is a peat-loving plant growing in wet
peat soil.

There are apparently no fungal or insect pests.

*Mimulus*, Linnaeus, is a diminutive of the Greek *minus*, a mimic,
from the shape of the corolla, and the second name commemorates
Langsdorff.

**Essential Specific Characters:**

232. *Mimulus Langsdorffii*, Donn.—Stem erect or creeping, leaves
ovate, lower petioled, dentate, upper amplexicaul, flowers yellow, with
purple spots, in the axils, solitary.

**Brooklime (Veronica Beccabunga, L.)**

The Northern Temperate Zone in Europe, North Africa, N. and
W. Asia, and the Himalayas is the home of this plant, which is not
known in any early deposits. Brooklime is found in all parts of Great
Britain, as far north as the Shetlands, and in the Highlands ascends
up to 2800 ft. It is found in Ireland and the Channel Islands.

Brooklime is a common aquatic species which grows in a submerged
state in brooks, rivers, ponds, lakes, &c., and is thus a hydrophyte.
With it grow Water Cress, Water Ranunculus, White and Yellow
Water Lily, Water Mint, Amphibious Knotweed, Arrow Head,
Flowering Rush, &c.

Half aquatic, the stem of this plant is prostrate, ascending at the
tip, giving off roots at intervals. The whole plant is smooth and suc-
culent, reddish, branched. The leaves are oval, blunt, coarsely toothed,
smooth, fleshy, opposite; the teeth are terminated by stalked glands.

The flowers are blue, in racemes, with a white eye, axillary, opposite.
The sepals are oval acute, not so long as the corolla. The flower-
stalks are spreading. The corolla is striped at the base with deep
veins, and may be pink, the petals oval and unequal. The capsule is
round, flat, slightly larger than the sepals, notched, swollen. The
seeds are winged, flattened, and smooth.
Brooklime grows to a height of 2 ft. Flowers are at their best in May and June. The plant is a herbaceous perennial, propagated by division.

The flowers are protogynous, the stigma ripening first, and like *V. Chamadrys* in the position of nectaries and contrivance for sheltering and indicating pollen. The position of the stamens and pistil regulates the pollination and possibility of self-pollination. The stigma is mature before the flower opens, and has long papillae, which adhere to the pollen, but the anthers have not yet opened. The stamens and style project from the flower and form an alighting place for insects. They are only partly expanded in dull weather, and the anthers are quite close to the stigma, and this leads to self-pollination.

The petals are wide open in the sun, in one plane more or less. The stamens become widely spreading, and the anthers are far from the stigma before they open. The plant is much visited by insects, especially a fly, *Syrilla pipiens*. The fly touches the anthers and stigma with different parts of its body, and both cross- and self-pollination result. It touches the stigma with the abdomen, which is previously covered with pollen.

Brooklime is visited by *Syrilla*, *Ascia*, *Eristalis*, *Scatophaga*, *Honey Bee*, *Andrena*, *Halictus*.

The capsule, which is rounded, is turgid, and adapted for distribution by water.
The plant is aquatic, and needs no soil except the usual sub-aqueous mud.

Two beetles, *Prasociris junici*, *Gymnometron beccabunga*, and a moth, *Athalia annulata*, feed on it.

*Beccabunga*, Dodoneus, is from German *Bach bunge*—*bach*, a brook, *bunge*, bunch.

The plant is called Becky-leaves, Broklembe, Brooklime, Cow-cress, Horse Cress, Horse-well Grass, Limewort, Limpwort, Water Pimpernel, Wall-ink, Water Purpy, Well-ink. In Chaucer’s day it was used for swellings, gout, &c. It is gathered with Water Cress, being acrid, disagreeable, and poisonous. But it is used as a spring salad occasionally.

**Essential Specific Characters:**


**Water Mint** (*Mentha aquatica*, L.)

Like numerous other aquatic types, Water Mint finds a place in the ancient floras preserved to us. It is represented in Preglacial beds at Pakefield, Suffolk; Interglacial and Roman beds at Silchester. The present distribution of the plant is Europe, N. Africa, N. and W. Asia, and it has been introduced into North America. This plant is universal in distribution in Britain, growing in every county in Great Britain as far north as the Orkneys, and up to a height of 1500 ft., for instance, in Yorks. It is a native also of Ireland and the Channel Islands.

Water Mint is a hygrophyte, luxuriating in the moisture of riversides, wet places by ditches, pools, and ponds, around the margins of which it forms quite a fringe in many places. Wherever a spring issues from a hill-side, one will also find it. It is a regular component of marsh and bog floras.

The stem is erect, stoloniferous with creeping shoots, many growing in a bed in association, square, roughly hairy, and leafy. The leaves are egg-shaped, stalked, coarsely toothed, roughly hairy, heart-shaped at the base. The uppermost leaves answer as bracts, and are less than the flowers.

The flowers are in a globular head, lilac, in whorls or forming a terminal head. The teeth of the calyx equal the tube, and are triangular. The calyx is regular or 2-lipped, glandular and hairy both
sides. The flower-stalks have bent-back hairs. The whole plant has a strong scent. The corolla is nearly regular. The erect stamens are equal in size.

Water Mint is 1½-2 ft. high. Flowers can be found between July and September. The plant is a deciduous, herbaceous perennial, propagated by division.

The small-flowered plants are female and not so common as the hermaphrodite. The anthers mature first, before the stigma. In the latter the tube is 4–5 mm. long, and 2 mm. wide at the mouth, otherwise the flower resembles *M. arvensis*. The corolla forms a bell. Honey is secreted in the ovary, which is enlarged. Honey is not so easily reached as in *M. arvensis*, but insect visits are more numerous because the plant is taller and the heads are larger and denser. It is visited by *Halictus*, Ichneumons, *Empis*, *Ascia*, *Eristalis*, *Syritta*, *Helophilus*, *Syrphus*, *Melanostoma*, *Onesia*, *Sarcophaga*, *Musca*, *Chrysops*.

The nutlets are adapted to fall when ripe around the parent plant, or to be eaten by birds and travel some distance, being thus dispersed by the plant itself or by animals.

This fragrant plant is peat-loving, growing in wet, moist, peaty soil, or pelophilous, growing on clay soil.

*Mentha*. Theophrastus, is from the Greek *mintha* or *minthe*; mint, a nymph, being transformed into this plant by Proserpine. The second name refers to the aquatic habitat. It is called Bishop's Weed, Bishop's Wort, Fish Mint, Balm Mint. It smells strongly of peppermint, and an oil is expressed from this and other species for the manufacture of it.

Essential Specific Characters:—

246. *Mentha aquatica*, L.—Stem erect, with subterranean stolens, hirsute, leaves ovate, serrate, the upper ones less than the flowers, flowers lilac, axillary, and terminal, subglobose.

**Gipsywort** (*Lycopus europaeus*, L.)

Gipsywort being a paludal plant is found in Preglacial beds in Norfolk and Suffolk; Interglacial, late Glacial beds, in Suffolk; and Neolithic beds. Its distribution lies in the Temperate regions in Europe, N. Africa, Siberia, W. Asia, as far east as India, N. America, Australia. It is thus a cosmopolitan species. In Great Britain it does not occur in Berwick, Haddington, Edinburgh, N. Perth, Forfar, N. Aberdeen, Banff, Dumbarton, N. Ebudes, Sutherland, Caithness, Northern Isles, or Brecon, Radnor, Montgomery, Merioneth, Wigtown, Peebles, Selkirk, Mull, W. Ross. From Ross it ranges to the S. coast. It is rare in Scotland, commoner in Ireland.

There is scarcely a ditch or wet place where one may not come across Gipsywort in the summer, for it is a common hygrophilous plant, frequenting the sides of streams, brooks, and rivers, as well as the still waters of ponds, pools, and lakes, along with Bur-reed, Bulrush, and reeds.

The square, erect stem is more or less simple, with egg-shaped, coarsely toothed, veined leaves, opposite, acute, likened to a wolf's foot by Linnaeus, hence the first Greek name. The stem is roughly hairy and bears opposite branches. The flowers are small, white, in whorls, close, with a tubular, stiffily hairy calyx, with awl-shaped segments. The corolla is a cylindrical tube with a short limb, with 4 blunt, softly and loosely hairy segments. The nutlets equal the tube of the calyx, and are brown and polished. There are only 2 stamens. **Gipsywort**
No. 1. Gipsy Wort
(Lycopus europaeus, L.)

a. Section of corolla, showing epipetalous stamens, and lobes of corolla with purple dots, calyx and part of corolla removed. b. Pistil, with style, and 2-fid stigma. c. Corolla and calyx, with stamens within former. d. Nutlets, within persistent calyx. e. Seed. f. Upper portion of plant, showing leaves and flowers in axillary whorls.

No. 2. Skullcap
(Scutellaria galericulata, L.)
a. Section of corolla, showing epipetalous stamens, 2 long, 2 short. b. Calyx, enclosing ovary and long style and stigma. c. Nutlets within calyx. d. Upper part of plant, showing stem-leaves, flowers axillary, in pairs or racemes, in various stages.

No. 3. Amphibious Knot-grass
(Polygonum amphibium, L.)
a. Carolla, cut open to show 5 epipetalous stamens. b. Pistil, with 2 styles and capitate stigmas. c. Fruit, with remains of styles. d. Leaf-man in enlarged, showing scapate edges. e. Part of plant, showing floating leaves with ovals, and flowers in spike or racemes with bracts below.

No. 4. Crack Willow
(Salix fragilis, L.)
a. Staminate flower, with 2 stamens and scale. b. Pistillate flower, with ovary and 4-fid style and scale. c. Twig, with petiole and stipules. d. Twig, with leaves and staminate catkins, anthers exerted. e. Pistillate fruiting catkin, on twig with leaves.

No. 5. Frogbit
(Hydrocharis morsus-ranae, L.)
a. FEMALE flower, with perianth-segments, 3 petaloid, 3 hermaphroditous. b. Pistil, with 6 styles. c. Androecium, with stamens and staminodes. d. Plant, with adventitious roots, and leaves, and with staminate flowers in spathelike bracts, in bud and expanded.

No. 6. Yellow Flag
(Iris pseudacorus, L.)
a. Stamen, with long filaments and purple anthers. b. Seed. c. Capsule, opening with seeds within. a. Leaves, on stem, equitant, fusiform. a. Flowering scape, with spathe, and flower with turned-back sepals, petals rolled in, petaloid 2-fid stigmas.
FLOWERS OF THE LAKES AND WET PLACES

1. Gipsywort (Lychnis europaeus, L.)
2. Skull cap (Scutellaria galericulata, L.)
3. Amphibious Knotgrass (Polygonum amphibium, L.)
4. Crack Willow (Salix fragilis, L.)
5. Frogbtit (Hydrocharis morsus-ranae, L.)
6. Yellow Flag (Iris Pseudacorus, L.)
is from 2–3 ft. high. Flowers are to be found in July and August. The plant is a perennial propagated by division.

The flowers are small and proterandrous in the complete flowers. There are small female flowers. The corolla is bell-shaped, 3–4 mm. long, 2½ mm. wide at the mouth, hardly 1 mm. wide at the base. The honey is secreted at the base of the ovary, which has a yellow, fleshy base, and can be reached by short-lipped insects. It is sheltered from rain by long hairs which reach from the sides of the corolla to the middle. The underlip has purple spots on it which serve as honey-guides. The 2 stigmas are still unexpanded when the anthers have ripened. As soon as they spread the anthers wither and are turned down. There is a wide space between the anthers and the stigmas to secure the plant against being self-pollinated. Two of the stamens are rudimentary. There are many visitors, which touch the 2 developed stamens on account of the small size of the flower.

These visitors include Polistes, Melithreptus, Syricta, Lucilia, Sarcophaga, Pollenia. Hemiptera, several bugs, Lepidoptera, Adela, Thysanoptera, Thrips.

The nutlets are free, and fall around the parent plant, which is thus dispersed by its own agency, or if they fall in the water by the agency of the water.
Gipsywort is a peat-loving plant and requires a peat soil, or a clay-loving plant and grows on clay soil.

Three beetles, *Scirtes hemispherica*, *Longitarsus lycopii*, *L. abdominalis*, are found upon it. No fungi infest the plant.

*Lycopus*, Fuchs, is from the Greek *lukos*, wolf, and *pous*, foot, from the shape of the leaves; and the second name (Latin) refers to its supposed range.

The plant is known as Gipsy-herb, Gipsy-wort, Marsh Horehound, Water Horehound. It is called Gipsy-herb on account of its use by "those strolling cheats called gipsies" to give themselves "swart colour such as the Egyptians and the people of Africa are of" (Gerarde).

This plant yields a black dye, and a permanent colour to wool, linen, and silk. There are 82 flowers in a whorl. The leaves vary much in the degree of hairiness, and may be smooth or slightly downy.

**Essential Specific Characters:**

248. *Lycopus europaeus*, L.—Stem erect, branched, leaves petiolate, acute, serrate, opposite, flowers small, white, sessile, in dense whorls, axillary, calyx 5-fid.

**Skull-cap** (*Scutellaria galericulata*, L.)

This is another marsh plant which is one of the Arctic species not found in early deposits as yet. It is found to-day in the Arctic and Temperate Zones in Arctic Europe, N. Africa, N. Asia, as far east as N.W. India, and N. America. In Great Britain it does not grow in N. Somerset, Monmouth, Carmarthen, Mid Lanes, Haddington, Mid Perth, S. Aberdeen, Easternness, Caithness, or Northern Isles, except the Isle of Harris. It is rare in Scotland and local in Ireland.

The Blue Skull-cap is a familiar waterside plant, which is distinctly hygrophilous, occurring by the side of most tracts of water, such as ditches, streams, rivers, and also by the margins of pools, ponds, and lakes. It is found also in damp places in woods in the shade, and is frequent in bogs and marshes.

It grows in small clusters or groups, with an erect, quadrangular, concave or hollow stem, with oblong, heart-shaped, blunt, stalked leaves, scalloped, acute at the top, and serrate or coarsely toothed.

The flowers are blue, in pairs, all turned one way, axillary, softly and loosely hairy, and whitish below. The calyx has a blunt mouth, with a scale acting as a lid, and the first Latin name refers to its shape, the second having reference to the corolla, which is white inside, much
longer than the calyx and gaping, with a short turned-back tube, and the throat long, with hollow upper lip, the lower lip ending in a notch.

Skull-cap is 2–3 ft. high. The flowers may be met with from June to September. It is perennial, and propagated by division.

The tube of the corolla is long, smooth inside, with an expanded throat as in other long-tubed labiates. The upper lip is 3-lobed and has a small surface adapted to butterfly visits, the lower dilated with spreading lateral lobes. The opening between the two lips is large enough for humble bees. There are 4 anthers. The anthers are in

pairs and ripen first, fringed with hairs to hold the pollen, with 1 cell in the lower, 2 in the upper. The style has a short upper lobe, and both it and the stamens are included. There are complete flowers, and others with the anthers undeveloped. They may be on the same or on different plants. Skull-cap is visited only by the Brimstone, Rhodocera rhamni.

The nutlets fall when ripe automatically just around the parent plant. The calyx on the fading of the corolla closely envelops the ovary and protects the seeds, being a helmet-like hood.

This is a peat-loving plant, requiring a moist humus soil or peat soil. A beetle, Phyllobrotica quadrimaculata, and a moth, Choreutis scintillulana, are found upon Skull-cap.
Scutellaria is from the Latin scutella, a shield, from the shape of the calyx, and the second Latin name refers to the helmet-shaped corolla.

The plant is called Hooded Willow Herb as well as Skull cap, both alluding to the shape of the upper lip.

**Essential Specific Characters:**

254. *Scutellaria galericulata*, L.—Stem erect, stout, leaves ovate, serrate, cordate below, flowers blue and white, opposite, axillary, the tube exceeding the calyx.

**Amphibious Knotgrass (Polygonum amphibium, L.)**

Though it is unknown in any ancient deposits in Britain this ubiquitous plant is known in S. Sweden. At the present time it is found in the N. Temperate and Arctic regions. It is found everywhere in Great Britain except in Cardigan and Merioneth, as far north as the Shetlands, and in Ireland and the Channel Islands.

As the specific name implies, this plant grows both in water and on land, being by nature really aquatic or a hydrophyte, but taking, when so driven, to a terrestrial habitat, when it passes through a hygrophilous state, growing in damp situations, to a sometimes quite dry habitat, where it becomes a xerophyte. When aquatic it is smooth, when terrestrial it is extremely hirsute, and seldom flowers. It is found in rivers, brooks, ponds, pools, and when found on land its occurrence denotes the former existence of some pool or ditch, since drained.

When growing in water it is prostrate or floating, the flower-stalks, however, being erect; but on land the whole plant, from a creeping, fibrous, long root, is erect. The root is reddish-brown. The leaves are stalked, heart-shaped, lance-shaped, hairy or smooth, rigid, sometimes spotted, alternate and spreading. The ochrea or membranous stipules are large, closely pressed, blunt.

The flowers are apetalous, with no corolla, bright-pink, in solitary, terminal racemes, dense, on hairy flower-stalks, which are paired. The calyx is pedicellate, 5-partite, with oval, blunt segments. The seeds are glossy and flattened at the margin. There are 5 stamens and 2 styles.

Amphibious Knotgrass is 1–2 ft. high. The flowers bloom in June till August. The plant is perennial, and freely propagated by roots.

The stigma is projecting one-fifth, allowing ants to get honey without pollinating it. The honey is plentiful, situated in 5 yellow glands at the base of the ovary, and the flowers conspicuous. The stamens
are short, and ripen before the stigma, the former being proterandrous. When growing in water it is protected from ants or flying insects, so that the stem is smooth. When growing on land it is densely hairy with sticky glands, so that small insects cannot crawl up the stems, an adaptation for the promotion of cross-pollination.

There are two forms of flowers; in the one case the pistil is long and the stamens are short, and there are other flowers with a short pistil and long stamens. Pistillate flowers also occur.

The fruit is partly enclosed in a perianth, and may be blown to a distance to fall in the water and be thus dispersed by it. If aquatic it needs no special soil, if on land it is usually a clay-loving plant addicted to a clay soil.

A fungus, *Puccinia polygoni*, attacks the leaves, and it is galled by *Cecidomyia persicaria*, causing the leaves to curl. A beetle,
Rhinoceros inconspicuus, and a Homopterous insect, Aphisara calthae, feed upon it.

The second Latin name refers to its amphibious habitat. It is called Arsmart, Flatter-dock, Willow Grass, Ground Willow, Lake-weed, Red Shank, Ruckles, Willow-weed. Ruckles was the name given to a pond weed said to be dangerous to bathers by impeding their swimming—probably this one. The name Willow Grass is given to the land form because the leaves resemble those of a willow.

It is very difficult to eradicate from garden ground, in which it sometimes occurs.

**Essential Specific Characters:**

268. Polygonum amphibium, L.—Rootstock creeping, stem erect or submerged, with floating leaves, aquatic form glabrous, terrestrial hirsute, leaves oblong, cordate below, flowers pink, in terminal spikes, solitary.

**Crack Willow (Salix fragilis, L.)**

Though a marsh plant, there are no traces of this tree in ancient deposits. It is found in the N. Temperate Zone in Europe, N. and W. Asia, and has been introduced in N. America, but is said not to be indigenous except in N.W. Asia. In Great Britain it is absent in N. Devon, E. Kent, Bucks, E. Suffolk, Hunts, Monmouth, Pembroke, Cardigan, Flint, Derby, Mid Lanes, Isle of Man, Dumfries, Kirkcudbright, Fife, Mid Perth, N. Perth, N. Aberdeen, Banff, W. Highlands, except Clyde Islands, Cantire, N. Ebudes, N. Highlands, North Isles, but occurs elsewhere from Ross to the South coast. It grows at 1300 ft. in Northumberland. It is not native in Scotland or Ireland or the Channel Islands.

The occurrence of the Crack Willow in any locality indicates moist, damp ground, whether it be a marsh, the margin of a pool, pond, or lake, or the side of a ditch, stream, or river. Wherever it grows it is a hygrophyte, loving moist conditions, and it is normally a lowland plant.

This tree may be recognized at a distance by its tall trunk, slightly listing, with widely-spreading branches, incurved upwards, thus affording ample shelter in spite of its small leaves. The plant has the tree habit. The tree is often 90 ft. in height, and in girth 10 ft. The branches spread obliquely, and are round, polished, smooth. The twigs become easily broken (hence *fragilis*). They are yellowish-brown. The leaves are lance-shaped to elliptic, long and narrow-pointed, hairless, glandular, toothed, bluish-green below or pale. The
young leaves are hairy. The stipules or leaflike organs are half heart-shaped, and are deciduous, soon falling. The leaf-stalk is glandular at the tip. The catkins are spreading, stout, inversely egg-shaped, lance-shaped, hairless, stalked, and appear with the leaves. There are usually 2 stamens, rarely 3–5, longer than the scales. The style is short. The stigma is of the same length, and 2-lobed. The capsule is stalked, hairless, the ovary awl-like.

The Crack Willow is 15–50 ft. or even 90 ft. in height, flowering in April and May. It is a perennial deciduous tree propagated by seeds.

The flowers differ little from wind-pollinated flowers, but the kindred species *S. caprea, S. aurita*, &c., have special structures for various insect visitors in spring to produce cross-pollination. In the first place, the crowded flowers in one catkin make it conspicuous, and more readily and quickly sucked by bees than if separate. As in other diclinous insect-pollinated flowers, the male flowers are more conspicuous than the female, owing to the bright-yellow anthers. Secondly, the appearance of the flowers before the leaves, makes the flowers more conspicuous; and thirdly, the large store of honey and pollen; and fourthly, the
early flowers, which lead many bees to feed almost entirely on them, ensure their fertility. The power of secreting honey is the only feature developed to attract insects, and ensures cross-pollination, the unisexual flowers preventing self-pollination. The majority of diclinic insect-pollinated flowers, such as Asparagus, Ribes nigrum, Lychnis vespertina, have become diclinic by degeneration of the hermaphrodite flower, but in Salix it is inherited from the primitive Angiosperms, which were probably diclinic and wind-pollinated. The plant is visited by bees, &c., flies, beetles, Lepidoptera.

The seeds are fringed with hairs which assist in wind-dispersal.

Crack Willow is a peat-loving plant, growing in peat soil.

A fungus, Melampsora vitellina, especially attacks Crack Willow, which is galled by Nematus gallicola very frequently.

Other fungi which attack willows generally are Capnodium, Botryosphaeria, Rhytisma, Cryptomyces, Psilocybe, Hypholoma, Flammula, Pholiola, Pleurotus, Collybia, Trametes, Fomes, Polyposes, Diplodina. Crack Willow is galled also by Cecidomyia saliceti, C. terminalis, Cryptocampus medullarius, Enura angusta.

The beetles which attack willows are of many different kinds, such as Carabus, Badistes odes, Homalota, Plinella, Platynaspis, Soronia, Tiresias, Sinodendron, Ludius, Corymbites, Helobium, Ptlinus, Rhopalodontus, Aromia, Cerambyx, Lamia, Saperda, Lema, Cryptocephalus, Phylloclcta, Plagioclera, Luperus, Lochmaea, Galeruca.

Two Hymenoptera that frequent willows are Megachile willoughbyella, M. eirenmeineta, and Colletes and Andrena are found on Sallows, and Nematus salicis on willow.

The Satin Moth (Liparis salicis) and the Double Kidney (Tethea retusa) are two moths common on Crack Willow, which is also attractive to the Eyed Hawk Moth, Goat Moth, Puss, Swallow Prominent, White Satin, Lappet, Herald Moth, Copper Underwing, Red Underwing, Chocolate Tip, Dark Dagger, Early Thorn, Small Emerald, Common Pug, Small Seraphim. Several Heteropterous insects infest willows, as Plesiocoris rugicollis, Lysus limbatus, Elyrihins angulatus, Oralthyulus diaphanus, O. flavicervis, O. marginalis, Psallus albicinctus, P. sanguineus, P. salicellus, Platignotinus roserii, Drymus pilipes, and Homoptera, Aphrophora salicis, Hybos smaragdula, Idiocerus adustus.

Salix, Pliny, is Latin for willow, and the second Latin name refers (as does the English Crack Willow) to its brittle boughs and twigs.

It is called Crack Willow and Snap Willow; and as to the last a writer speaks of: “The Snap Willow which is so brittle that every gale breaks off its feeble twigs”.

The willow was the symbol of sadness, garlands being worn by forsaken lovers. Willows are weak, but bind other wood. Unhappy lovers had garlands of willow placed on their biers. In Baireuth young girls are said to go at midnight on Easter Day to a fountain silently, and, taking care to escape notice, throw into the water little willow rings, with the names of their friends inscribed thereon; that which sinks first indicating the one first to die.

The catkins were called Goslings, and children sang them brown, repeating verses the while. The willow was said to be the rod with which Christ was scourged. With knots tied in a willow one could slay a distant enemy, was one belief, and if one tied three knots in an old willow one could cure ague. The trees are pollarded, the branches being cut down every five or six years. The timber is used for fencing, poles, casks, &c. The bark is used for tanning.

**Essential Specific Characters:**

284. *Salix fragilis*, L.—Tree tall, twigs brittle, leaves glabrous, lanceolate, serrate, glaucous, whitish below, catkins on short branches, 2 stamens, with style as long as the stigma.

**Frogbit** (*Hydrocharis morsus-ranae*, L.)

Aquatic but delicate, no evidence of its occurrence in early beds is forthcoming. It is found in the N. Temperate Zone in Europe and N. Asia. In Great Britain it does not grow in Cornwall or N. Devon; in the Peninsula and Channel provinces; not in Wilts or Isle of Wight, N. Hants; but in the whole of the Thames province, Anglia, Severn province, except in Mid Lancs; in the Humber province, except in S.E. Yorks, i.e. from Durham to Devon and Kent. It is local in Ireland.

This is one of those local plants which have been further rendered scarce owing to lack of suitable habitat by modern drainage. It is found in little pools and ditches of a still nature, leading into larger rivers and estuaries, many of which originate in flood time, but afterwards disappear, hence doubtless its mode of reproduction. It is found also in isolated ponds.

Frogbit is a floating plant with only erect flowering stems, and leaves in clusters at points where roots strike downward and root deeply in the mud below; or it may be floating loose, especially in deeper water. The plant multiplies largely by hibernacula, or stolons, or short shoots, with fibrous roots developing shoots and new leaves which fall off and sink to the bottom. The leaves are stalked, rounded, kidney-shaped, fleshy, and smooth.
The plant is dioecious, and the flowers are erect, white, large, with a yellow patch at the base, and yellow anthers. The petals are delicate, inversely egg-shaped. The flowers spring in pairs from a transparent membranous sheath at the base of the flower-stalk. Frog-bit, however, does not always flower, and seldom produces any seed.

The flower-stems are 3–4 in. Frog-bit blooms in July and August. It is a herbaceous perennial, propagated by division.

The flowers are dioecious and produced on the surface. The 12 stamens are partly without anthers (3–6). The anthers are fixed by the base. The plant is usually pollinated by the wind, but is largely propagated by bulbils, being stoloniferous. In winter it is kept alive by buds from the stolons or hibernacula. Honey is also secreted in 3 glands in the crown of the ovary or base of the petals, and is half concealed, but insects do not often visit the flower.

Ripe fruit is almost unknown. The manner of opening is irregular, and the small seeds are blown out from their lightness. But the plant does not often produce fruit and seeds, as it seldom flowers.

The plant is aquatic, being a member of the floating-leaf association.

Two beetles, *Galeruea sagittarii* and *Donacia menyanthidis*, are found on it.
**Hydrocharis**, Linnæus, is from the Greek *luidor*, water, *charis*, elegance, grace. *Morsus-ranae*, Dodoneus, is from *morsus*, bitten, *rana*, frog, because the margin was supposed to be bitten by frogs.

The only name by which it is known is Frogbit.

**Essential Specific Characters:**

288. *Hydrocharis morsus-ranae*, L.—Plant floating with runners, leaves tufted, reniform, entire, smooth, purplish below, flowers white, from a pellucid sheath, sepals green.

**Yellow Flag** (*Iris Pseudacorus*, L.)

This marsh plant is found in the Neolithic deposits at Crossness, and Fife. To-day it is found in Europe, N. Africa, and Siberia in the N. Temperate Zone. In Great Britain the Yellow Flag is universally distributed. It is also found in Ireland.

One of the most distinctive components of the marginal vegetation of watery places is this plant, which is common in every habitat where aquatic conditions are continuous and marked. It is a denizen of ponds, pools, and lakes. It is to be found by the side of every stream and river, often in ditches, and it invades the wider areas of marsh and bog-land, growing in the reed swamp.

This is a tall plant, with leaves all or mainly radical, adopting the grass habit. The plant has the flag habit. The rootstock is acrid, stout, and creeping. The stem is round in section. The leaves are flat, long, broad, sword-shaped, mainly radical, equitant.

The scape is leafy, sometimes branched above. The flowers are deep-yellow. The ultimate flower-stalks are as long as the ovary. The petals are spoon-shaped, shorter than the sepals, 3, erect, the latter being petaloid and purple-veined, with an orange spot near the base. The 3 outer perianth-segments are of clear yellow, large and spreading, bent back, the blade broadly inversely egg-shaped, the claw rather short. The tube is cylindrical. The stigmas are long and narrow, longer than the petals, yellow. The capsule is leathery, 3-angled, 3-ribbed, the seeds numerous, vertically flattened, with flat faces, with a hard testa.

The Yellow Flag is 3 ft. high. Flowers are found in June. This beautiful plant is a perennial deciduous herbaceous plant, propagated by division of the rhizome. It is quite worthy of a place in our gardens.

The flowers are honeyed. The outer perianth is petaloid, in 6 parts (2 sets of 3 segments), with sepals taking the place of petals, bending
down at the outer ends. The styles are petaloid with broad appendages, and opposite them and below are the 3 stamens, which are inserted at the base, with free anther-stalks, and basifixed anthers which open externally. The flowers are large and conspicuous, the stigmas arching over the stamens. The petaloid sepals and golden stigmas, also petaloid, render the flowers conspicuous. The honey is secreted at the base of the flower. The style is opposite the anthers and large, with 3 large, flat branches, the appendages resembling a petal, which arch over the anthers and outer perianth-segment.
The stigma forms a flap on the outer side, just over the anther, with a point below the stigmatic lamella. An insect seeking honey pushes its way between the outer perianth-segments and the style, the anther being between. It must rub its back against the anther, which opens outwards. In returning from its honey quest it does not touch the stigmatic surface of the stigma which is above, but does this on entering already dusted with pollen from a previous flower.

The Yellow Flag is visited by Bombus, Osmia, Honey-bees, and a fly, Rhi ngia rostrata.

The capsule opens above, and allows the smooth flattened seeds, when blown by the wind, to fall some distance away.

Yellow Flag is a peat-loving plant, growing in a peat soil, or pelophilous on a clay soil.

The fungi Puccinia iridis, Uredo iridis, attack the Yellow Flag. Several beetles are found on it, Aphthona non-striata, A. ponderosa, Mononychus, and two Lepidoptera, the Crescent (Apamea fibrosa), the Double-lobed (A. ophiogramma).

Iris, Theophrastus, is the Greek for rainbow. Pseudacorus, Linnaeus, is Greek for false acorus, Acorus being the generic name of the Sweet Flag or Galingale.

There are many English names, e.g. Butter-and-Eggs, Cegge, Cheiper, Cucumbers, Daggers, Dragon-flower, Flag, Water or Yellow Flag, Flaggan, Flagnons, Fliggers, Yellow Flower-de-luce, Jacob's Sword, Laister, Laver, Levers, Livers, Lug, Maiken, Meklin, Yellow Saggan, Sedge, Seag, Seggs, Water Seg, Seggin, Shaldor, Skeg, Sword Flag, Water Lily. It is called Cheiper, "because children make a shrill noise with its leaves". The name Cucumbers refers to the seed-vessels, which when green resemble young cucumbers. Fliggers was applied to it from the motion of its leaves by the slightest impulse of the air. As to the name Flower-de-luce, Shakespeare writes:—

"Awake, awake, English nobility!
Let not sloth dim your honours new-begot,
Crop'd are the flower-de-luces in your arms;
Of England's coat one half is cut away."

Spenser also includes it:—

"Show me the grounde with daffadowndillies
And cowslips, and kingcups, and loved lillies,
The pretie pawnce
And the chevisaunce
Shall march with the fayre flowre delice".
When chopped up and chewed, the root was considered a cure for toothache. In Chaucer's day it was called Gladdon or Gladyne, and an antidote for poison. The seeds have been used as coffee. The root powdered was used also as snuff. The plant is astringent, and has been used for ink and dye of a black colour. The juice of the root is cathartic, and has been used for dropsy.

Essential Specific Characters:—

296. Iris Pseudacorus, L.—Stem round, leafy, leaves ensiform, flowers yellow, stigmas longer than the perianth, which is beardless.

Snake's-head Fritillary (Fritillaria Meleagris, L.)

This choice wild flower has much the same range as other Liliaceous flowers, the North Temperate Zone of Europe (except Greece and Turkey), and West Asia, and is not known before the present day. In Great Britain it is found in the Peninsula province only in N. Somerset; in the Channel province only in N. Wilts, Hants, in the Thames province, not in E. Kent; Anglia, not in W. Norfolk, Hunts, Northants; in the Severn province only in W. Glouces, Worcester, Warwick, Stafford. Watson thinks it is not indigenous in E. Cornwall, S. Devon, Dorset, W. Sussex, Salop, Leicester, N.E. Yorks, Westmorland, Cumberland, and Ayr, and perhaps not even in all of the foregoing. But in Leicestershire it is truly native, growing in the same habitat as in the Thames valley. But it is rare from Norfolk and Stafford to Somerset and Hants.

This is by no means a common plant, and the only spots in which it is likely to occur are flat meadows on either side of rivers, especially in wide open valleys where recent alluvium occurs. It is a graceful flower with a bulbous rhizome and fibrous roots, growing in scattered clumps here and there. The leaves (4–5) are alternate, channelled, linear lance-shaped, stalkless, not sheathed. The stem is erect, simple, bluish-green, and rounded.

The flower is chequered, of a purple colour, with white and darker patterns interwoven, or pure white. In shape the flower is like a snake's head, or a dice-box, hence the English and first Latin names. The flowering stems bear single flowers, which are drooping, and there is no calyx. The petals or petaloid sepals are 6 in number, swollen below. The 6 anthers are yellow, the stamens being inserted below the ovary.

The Fritillary is about 1 ft. high. One may look for the flowers in March, April, and May. Snake's-head Fritillary is a perennial bulbous plant, propagated by offsets, suited to growing under trees.
No. 1. Snake's Head
(Fritillaria Meleagris, L.)

a, Stamen, with long awl-like filament, and anthers fixed above the base. b, Pistil, with ovary, style, and 3 stigmas. c, Bulb, with roots.
d, Scape, with leaves, and bract, with flower with bell-shaped perianth.

No. 2. Reed Mace
(Typha latifolia, L.)
(monoecious)

a, Stamens, with silky perianth scales. b, Stalked ovary, with style and stigma (unilateral). c, Leaf. d, Root-stock, with roots, and sheaths.
e, Spike of flowers, male above, female below, with bract.

No. 3. Bur Reed
(Sparganium ranarium, Curt.)
(monoecious)

a, Staminate flower, with 3 inner perianth scales and stamens. b, Pistillate flower, with ovary, style, stigma, and perianth scales. c, Drupe, with persistent style. d, Leaf.
e, Inflorescence, with male and female flowers in round heads, male above, female below.

No. 4. Sweet Flag
(Acorus Calamus, L.)

a, Stamen and scale. b, Flower, with pistil and stamens. c, Berry with pyramidal top. d, Scape with spathe, turned over, and spadix (lateral) with bisexual flowers. Fruit not produced in British Isles.

No. 5. Duckweed
(Lemna minor, L.)

a, b, Frond, with stamens from different aspects, and showing root-tip with membranous sheath. c, Flower, with spathe, anthers, and pistil. d, Group of duckweed plants, with roots below.

No. 6. Water Plantain
(Alisma Plantago-aquatica, L.)

a, Whorl of achene, with outer perianth-segments. b, Achene, showing compressed sides. c, Rootstock, with leaves and sheaths. d, Scape, with bracts below, and flowers in umbel, showing 3 inner petaloid perianth-segments, 6 stamens, and style.

2. Reed mace (*Typha latifolia*, L.).
The flowers are solitary, and last five days, being erect in bud, then drooping, egg-shaped, pyramidal, bell-shaped. The nectary with concealed honey is a narrow green gland at the base of the petal, which causes an external protuberance. The corolla is swollen below, and bears the stamens at its base, with awl-like anther-stalks. They are twice as long as the pistil, and bear oblong, yellow or greenish anthers, which after they have opened are half as long, and then lie on a level with the stigma. The 3 styles are furrowed and downy, thickened, and spreading. The stigmas are softly hairy and simple. It is thus adapted for insect visits, and in their absence to self-pollination.

The plant is proterogynous, the stigma ripening first.

The fruit, a capsule, contains many seeds, and splits open, distributing them close to the parent plant.

The plant is a sand plant, growing in sand soil or sandy loam, the alluvium of most valleys.

*Fritillaria*, Lobel, is from the Latin *fri-tillus*, a dice-box, from the shape of the flowerhead. *Meleagris*, Dodonaeus, is Greek for guinea-fowl, from the chequered pattern of the corolla.

Names by which the Fritillary is known include Dead Man's Bell, Chequered Daffodil, Chequered Lily or Tulip, Cowslip, Crow-cup, Daffodil, Deith-bell, Drooping Tulip, Fritillary, Frits, Froccup, Guinea-hen Flower, Lazarus Bell, Leopard's Pheasant, Snake's-head Lily, Snake Flower, Snowdrop, Toads-head, Weeping Willow, Widow Wail. Lazarus Bell was originally Lazar's Bell, and the flower was so called from the small bell the lazar wore on his person. Leopard’s Lily is doubtless Leper’s Lily, and both from the chequered appearance also. It was called Death Bell from the dingy, sad colour of the flowers. The name Drooping Tulip is from the habit it has of drooping and its likeness to a tulip. Froccup is Frog Cup from its spotted flowers, and Guinea-hen Flower from the marking of the

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*Snake's-head Fritillary (Fritillaria Meleagris, L.)*
flower. It is called Snake's-head Lily from the shape of the flower and the spotted petals. It is an ornamental plant which is cultivated and grown in gardens.

**Essential Specific Characters:**


**Reed-mace** (*Typha latifolia*, L.)

A common and familiar plant, associated with pond and aquatic life generally, our present knowledge of its range and history is derived from the modern distribution of the Reed-mace, which is the N. Temperate Zone in Europe (except Greece), N. Africa, N. and W. Asia, N. America. In South Britain it does not grow in N. Devon, Cardigan, Mid Lancs, S.E. Yorks, Isle of Man. In Scotland it is found only in Wigtown in West Lowlands, not at all in the E. Lowlands, and not in S. Perth or Kincardine. In the W. Highlands it is found only in Clyde Islands, Cantire, and in N. Highlands in E. Ross, Caithness, and it is extinct again in the Orkneys, in the North Isles. It is found in Ireland and the Channel Islands.

The common Reed-mace is a local but generally distributed aquatic plant, growing deeply rooted in the mud in ponds, pools, and lakes, generally in a more or less sheltered position. It is also found less commonly in rivers and by the sides of streams, as well as in fen and marsh land in the reed swamp, open or closed.

While grass-like, the Reed-mace has a habit of its own, with tall, erect, unbranched stems, and leaves 1 in. broad and 3 ft. long, bluish. They are flat, linear, in two rows, blunt, and longer or taller than the flowerheads.

The plants are monoeious, with male and female flowers on the same spike, the latter below, dark-brown or black, the former yellow. The anther-stalks are shorter than the anthers at first, then longer after the pollen is shed. The stigmas are long, lance-shaped, oblique.

Reed-mace is 6–10 ft. high. The flowers are in bloom in July. The plant is a herbaceous perennial and propagated by seeds, forming a great ornament in ponds and even growing on dry soil.

The flowers are wind-pollinated, monoeious. The yellower flowers above are male, with 2–5 stamens, the connective extending beyond the anthers, which are monadelphous. The flowers (both sexes) are surrounded by persistent membranous scales or hairs. The anthers open laterally, producing showers of pollen. The stigma is blunt, the
style being simple and stigmatic ventrally. The female flowers are brown, contain 1 carpel and a pendulous ovule, with the micropyle toward the base. The stigma ripens first.

The small fruits, achenes, shortly stalked on a thread-like stalk,

are fringed with hairs from the persistent perianth, and thus dispersed by the wind.

The Reed-mace is a peat-loving plant, growing in a peat soil, and usually aquatic or submerged, rooting along the margins of ponds.

The Reed-mace fungus, *Epichloë typhina*, is frequently to be found on it. Several beetles, *Stilbus oblongus*, *Telematophilus sparganii*, *T. caricis*, *T. typhae*, *T. schonneri*, *T. brevicollis*, *Donacia vulgaris*,
D. cinerea, Thysanoptera, Thrips cereatum, Lepidoptera, Reed Wainscot (Nonagria canne), Bulrush (N. typhae), N. sparganii, Fenn's Nomagria (N. brevilinea), Gold Spot (Plustria festuca), Chilo paludellus. Laverna phragmitella, a Heteropterous insect. Chilacis typhae, are found on it.

Typha. Theophrastus, is from the Greek typhae, and the second Latin name refers to the wide leaves. Bulrush was formerly pole-rush or pool-rush.

Reed-mace is called Baccobolts, March or Marish Beetle, Black-amoor, Blackcap, Blackheads, Black-puddings, Bullrush, Bull-segg, Cat-o'-nine-tails, Cat's-spear, Cat's-tail, Cat's-tails, Club-rush, Dod, Dunce Down, Dunche Down, Flag, Flax-tail, Holy Pokers, Lance-for-a-lad, Levers, Livers, Lyvers, Reed Mace, March Pestill, Marsh Pestill, Mat-reed or Mat-weed, Pokers, Seggs, Serge, Son's Brow, Sootipillies, Water Torch, Whiteheads. Turner says: "It maye be also called rede mace because boyes use it in their handes in the stede of a mace". It is called "Whiteheads when the downy matter has ripened and lost the colour which leads to the designation Blackheads". The name Baccobolts is given because the female spikes are supposed to be like a roll of tobacco. It is called March or Marish Beetle in reference to the form of its inflorescence, and because it grows in marshes. The name Black-puddings is given from the shape and colour of the flowerheads. Dod is the Reed-mace in the North of England. Dunche Down is applied to it "because the downe of this herbe will cause one to be deafe, if it happens to fall into the ears, as Matthiolus writeth", according to Lyte. The name Flax-tail refers to the fruiting heads, which are downy like finely combed flax.

Reed-mace was used traditionally by witches as a besom upon which they were supposed to fly. It has been placed in the hand of Christ as the rod given to Him to carry, by Rubens and other painters. If a light is applied to the pollen it takes fire very quickly, and has been used for fireworks. The roots have been eaten in salads, and the leaves are relished by cattle. Pillows are stuffed with the downy flowers. The leaves are used for making casks watertight. Mats are made from the leaves, baskets, chair-bottoms, thatch. The rhizomes are farinaceous, and the pollen has been made into cakes in India and New Zealand.

Essential Specific Characters:—

309. Typha latifolia. L.—Stem tall, leaves very tall, longer than the scape, linear, flowers in a long spike, the yellow male flowers above the silky, brown females.
Bur-reed (Sparganium ramosum (Curt.) = S. erectum, L.)

As a typical aquatic form this plant is found in Preglacial beds in Norfolk and Suffolk, Interglacial beds at West Wittering, Sussex, late Glacial and Neolithic beds. It is found to-day in the N. Temperate Zone in Europe, N. Asia, N. Africa, and N. America. It is commonly found in every part of Great Britain except in Cardigan, E. Sutherland, up to the Shetland Isles, and up to 1200 ft. in Derbyshire. It is found in Ireland and the Channel Islands.

Bur-reed is one of the features of aquatic vegetation. It grows in a continuous fringe with sedges, flags, and reeds along the sides of a river or stream. It forms beds in the shallow parts, helping to choke up the bed and to divert the course of a stream. It also grows widely in ponds, lakes, and pools, which again it assists in silting up, forming part of the reed swamp.

The rhizome or underground stem is strong, creeping, the roots fibrous. The culm is erect, glabrous or smooth, leafy, branched. The leaves are triangular at the base, the radical leaves twice as long as the stem, sheathing with hollowed margins, in two rows, keeled. There are four leaflike bracts.

The plants are monoeocious, and the flowers are stalkless, the male olive-brown, falling, the lower ones female, 1–3, in spiked branched heads. The fruit is a drupe with a short beak, egg-shaped, stalkless, with linear stigma, angular below. The flower-stalk is branched.

Usually Branched Bur-reed is 18 in. to 2 ft. high. The flowers
bloom in July and August. A herbaceous perennial, the plant is propagated by seeds.

The stigma ripens first, and self-pollination is avoided. The flowers are pollinated by the wind. The flowers are in spherical heads, the male above. There are 3-6 stamens, which are alternate with 3-6 perianth-scales, and the connective is scarcely produced. The stigma is linear. The anthers open laterally. The female flower consists of 1-2 carpels, 1 ovule, pendulous near the base of the ovary.

The fruits are drupes which fall when ripe to the earth or water, being thus dispersed. A few may be dispersed by birds.

Branched Bur-reed is aquatic, and a peat-loving plant growing in peat soil or in water half-submerged.

Several beetles, Telmatorphilus sparganii, T. schonherri, Donacia vulgaris, D. cinerea, Lepidoptera, Gold Spot (Phasia fuscata), Nonagria sparganii, Orthotelia sparganella, and a fly, Simulia reptans, are found on it.

Sparganium, Dioscorides, is from the Greek sparganon, band, from the long narrow leaves, and erectum refers to the upright flower-heads.

Some names given to the plant are Bede-sedge, Bur-flag, Bur-reed, Reed Grass, Knop Sedge, Seg or Seggs, Seggin. The first name refers to the large beadlike fruits, as also does Bur-reed.

Essential Specific Characters:

310. Sparganium erectum, L.—Stem erect, branched above, leaves triquetrous below, side concave, male flowers in heads, brown, sessile, upper heads barren.

Sweet Flag (Acorus Calamus, L.)

The distribution of this rather local aquatic plant, which is known only from its modern occurrence, is N. Temperate Europe (except Greece), N. Asia, eastward to the Himalayas, N. America. In Great Britain it grows in N. Somerset only in the Peninsula province; in N. Wilts, Dorset, Hants in the Channel; in the Thames province, not in Kent, Herts; in Anglia, in W. Suffolk, Cambridge, Hunts, Northampton; in the Severn province, in Warwick, Stafford, Salop; Carnarvon, in N. Wales; in the Trent province, except in Lines; in the Humber province, except Mid and N.W. Yorks; and elsewhere generally from York and Lancaster to Somerset and Sussex. It is naturalized in Scotland and Ireland. Considered by Bentham native in the East counties. Ludwig says it is descended in Europe from a plant brought by Clusius from the East.
SWEET FLAG

This plant is local, generally, but frequent in some counties. It is entirely aquatic, growing in the water close to the margin of a river, brook, or even ditch, or else it is to be found fringing the sides of a pond, pool, or lake. It is associated with reeds, bulrushes, bur-reeds, growing with them in the marginal reed swamp.

The stem is tall, erect, with the radical leaves clustered round it, and the plant has a grass-like habit. The leaves are long, sword-shaped, flat, with wavy margins, sweet-scented when bruised, like the stem and rhizomes.

The scape is flattened, long, leafy. The prolongation of it is a spathe which is two-edged. In the spike are several hundred flowers. At its base is a long, slender spadix, which is lateral, and made up of many flowers, curved. The perianth-segments of 6 short scales equal the ovary, and the fruit is inversely egg-shaped.

Sweet Flag is 2-6 ft. high. It flowers in June and July. The plant is a perennial, propagated by division.

The flowers are proterogynous, bisexual or complete, and cross-pollination is ensured. There are 6 stamens, fixed on the base of the segments, with flattened anther-stalks. The 6 stamens with anthers
are in pairs, the stigmas sessile and very small. The flowers are sweet-scented. The plant is not usually fertile in the British Isles, as it is in Asia, the proper insects being absent here.

The fruit, which does not ripen in Europe, is a berry, which falls when ripe, being full of mucus, into the water or to the ground, and is thus dispersed.

Sweet Flag is entirely a peat-loving plant, growing in peat soil. *Acorus*, Dioscorides, is from *acoros*, the Greek name of the plant; and *Calamus*, Dioscorides, is from the Greek *calamos*, a reed.

Sweet Flag is named Beewort, Cinnamon Sedge, Myrtle and Sweet Flag, Myrtle-flag, Myrtle-grass, Myrtle-sedge, Sweet Seg, Sweet Sedge, Sweet Rush.

Powdered, the root has been used in lieu of spices. It is a stimulant and tonic. When bruised, the leaves smell sweet, hence it was used to strew the floors of houses. It yields an essential oil, obtained by distilling it. It has been used for fevers and ague. The roots are carried abroad, eaten as sweetmeat, and used as a means of avoiding contagion. As orris-root it is used as a tooth powder.

**Essential Specific Characters:**

312. *Acorus Calamus*, L.—Stem terminating in a spathe, leaves long, ensiform, radical, 2-edged, like the scape, flower (spadix), lateral.

**Duckweed** (*Lemna minor*, L.)

Although Duckweed is almost ubiquitous in its distribution it is not found, as can hardly perhaps be expected from its small size and fragile nature, in early plant-beds. In Great Britain it is found in every county except Radnor, Peebles, Sutherland, and the Shetlands, that is, it ranges as far north as the Orkneys. In Derbyshire, moreover, it is found at the height of 1200 feet. It is a native of both Ireland and the Channel Islands.

Duckweed is so common that one expects to find it in every aquatic habitat, but it is more addicted to still than running water, as, for instance, that in ditches, drains, ponds, pools, lakes, meres, and that in slow-flowing rivers. It is a member of the floating-leaf association.

There is a single root hanging down from the floating, flat, inversely egg-shaped frond, with no stem or leaf. The frond is subconvex below, and flattened at the sides. The young fronds are seated at first on older ones but become detached. Below they are paler green than above. They are compact, and the cells of the epidermis are lined with wavy walls.
DUCKWEED (Lemma minor, L.)
The flower, which is rare, is enclosed in a membranous spathe, and is formed in a marginal depression in the frond. There are 2 stamens altogether, each a male flower, with slender anther-stalks, and they develop in succession. The style is long, the anthers didymous. The flowers are reduced to a spathe-like bract, the stamens and pistil in separate flowers.

The plant floats on the surface, being an aquatic. Flowers may be sought in June and July. It is a herbaceous annual, and propagated by offsets, or divisions of the frond.

When it flowers several bloom at once. The flowers are unisexual and monocious. They are borne in grooves at the margin of the frond-like stems, with 2 male flowers with 1 stamen each, only developed in succession, and 1 female flower of 1 carpel. The anther-stalks are slender, the style is long. The anthers are 2-celled and open transversely and in pairs, with prickly pollen. The plant is adapted to pollination by water-insects, but flowers are rare. The stigma is mature first, but the anthers soon open.

The seeds are dispersed by water, sinking to the bottom in autumn, and remaining during the winter when germinating, to rise in spring, and grow in summer. Lesser Duckweed is aquatic.

Two fungi infest it: *Recessia amarboiidea*, which is rare, and *Olpitium lemneae*. A beetle, *Donacia lemneae*, the small China Mask (*Catoelysta lemnotata*), a Heteropterous insect, *Hebrus pusillus*, and a fly, *Hydrellia albilabris*, are found on it.

*Lemmia*, Theophrastus, is the Greek name for Duckweed, and *minor* refers to its small-sized frond.

Lesser Duckweed is called Creed, Dig-meat, Duck-Meat, Duck-pond Weed, Duckweed, Duke's Meat, Endmote, Greeds, Greens, Groves, Grozens, Jenny Green-teeth, Water Lentils, Marulling Swimming Herb, Toadspit. Jenny Green-teeth was also the name of a well-known Lancashire boggart who was supposed to haunt pits and pools, and from whom it has probably been transferred to the plant. It is called "in Latin *Lens palustris* or *lacustris*, in Shoppes *Lenticula aquae*, in English Water Lentils, in High Douch Lue Sen, in base Almaigne Water Simeen".

It is valuable as food for waterfowl, and for aquaria, aerating the water.\(^1\)

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\(^1\)The arrangement of the chlorophyll granules is interesting. In darkness they are ranged along the side and inner walls of the cells, in direct sunlight they lie along the lateral walls, where they are less exposed to intense light, whilst when the light is diffused they lie along the sides and the inner walls.
Essential Specific Characters:—

313. Lemma minor, L.—Roots blunt, stemless, frond flat, obovate, oblong, compressed, convex below, flowers from a cleft, in a spathe, plant monocious.

Water Plantain (Alisma Plantago-aquatica, L.)

As one of the Arctic plants, addicted to an aquatic habitat, one might expect to find this in the Glacial plant-beds, and it is found in Preglacial, Interglacial, Late Glacial, and Neolithic deposits. It is found to-day in the North Temperate Zone generally, and in the Himalayas and Australia. In Great Britain, Water Plantain does not grow in Cardigan, Stirling, Mid Perth, Westernness, Main Argyle, N. Ebudes, N. Highlands, except Ross and Northern Isles. It is found in Ireland and the Channel Islands.

Water Plantain is an aquatic plant, which becomes terrestrial under certain exigencies when a piece of water is silted up. It is impartial to still or running water, growing in ponds, pools, and lakes, where it forms at the margin dense clumps, tall and graceful. It is less frequent in running water, streams, and rivers. It grows in the reed swamp.

The aerial flowering stems, which are scapes, with broadly branching panicles, make an imposing show in the pool or lake. The leaves are all radical, stalked, the leaf-stalks channelled and sheathed, the leaves oblong, lance-shaped, acute, veined, and when floating they are linear. The second Latin name indicates a resemblance between the leaves of the Plantain (hence also the English name) and this plant.

The scape bearing the flowers is three-angled, and swollen or fleshy below. The white or pink flowers have a yellow claw, and are borne in panicles with branches in whorls, compound, smooth, naked. The numerous carpels are flattened at the side, blunt, with the style, ventral, below the top of the carpel. They are twice as long as the ovary, and the stigmas are simple. The perianth consists of 6 segments.

Water Plantain is 18 in. to 2 ft. high. The flowers bloom in June and July. The plant is a perennial, propagated by division.

The white or pink flowers in a loose pyramidal panicle are yellow at the base, forming a disk 10 mm. in diameter. The anthers and stigma are ripe together. If the insect alights in the middle it touches the stigma first, then the anthers, or else if it alights on the petals it then touches the anthers covered with pollen with different parts of the body, as well as the stigma. It is more likely to cross- than self-pollinate the
Plant, especially when alighting in the middle, and when alighting on the petals the former result is also more probable from the relative position of the parts. The anthers open externally, and are directed upwards and outwards. Honey half-concealed is secreted in 12 drops at the base of the stamens in the ring formed by the anther-stalks, and one opposite each anther-stalk, and one in each interval.

The flies make a tour of these drops and get thoroughly dusted with pollen in the process. The plant is visited by flies, Erístalis sepulchralis, Syritta pipiens, Aescia podagrica, Melanostoma mellina, Melithreptus.

The carpels when ripe fall to the ground or water and are so dispersed.

This handsome plant is aquatic or terrestrial. It grows on sandy loam or silt, alluvium, &c.

A fungus, Doassansia alismalis, is found to attack it. Two beetles, Donacia menyanthidis, Hydronomus alismalis, three moths. The Dog’s Tooth (Hadenia snasa), Gold Spot (Plusia festucae), Tortrix viburnana, are found on it.

Alisma, Pliny, is ultimately connected with the Greek hals, salt, and the second Latin name means water plantain, Plantago being a name given by Pliny.

This plant is called Deil’s Spoons, Great Thrumwort. It causes blisters applied externally, and is bitter. It is injurious to cattle.

Essential Specific Characters:

314. Alisma Plantago-aquatica, L.—Scape tall, branched, leaves radical, erect, lanceolate, petiolate, flowers pink in whorls, fruit compressed.
Arrow-head (Sagittaria sagittifolia, L.)

Remains of this typical aquatic and arctic type are found in inter-glacial beds at West Wittering in Sussex. To-day it is found in Arctic Europe (except Greece), N. Asia, N. W. India in the North Temperate and Arctic Zones. In Great Britain it is absent in Cornwall and N. Devon from the Peninsula province, and in the Channel from the Isle of Wight, occurring throughout the Thames and Anglia; in the Severn, not in Monmouth; in S. Wales only in Pembroke; in N. Wales in Denbigh, Flint, Anglesea; and in the Trent province and Mersey except in Mid Lancs; in the Humber province; only in Durham in the Tyne province; not in the Isle of Man in the Lakes province, and in Renfrew and Lanark. Elsewhere it ranges from Cumberland to Kent and Devon. It is naturalized in Scotland, local in Ireland.

Arrow-head is always the associate of Water Plantain, Flowering Rush, and pondweeds of different kinds, being aquatic, and likewise found in both still and running water, growing in ponds and lakes, and also in rivers and streams. Canals are also a favourite habitat, since they are intermediate between stagnant and flowing water. The plant grows in the reed swamp.

A floating plant with erect leaves and scapes only in later stages, the Latin names and the English at once point to its main characteristic, the arrow-shaped leaves, which are at first lance-shaped, with a long point, with long lobes, borne on long 3-angled leaf-stalks. The early submerged leaves are linear and streaming. The stems are stoloniferous, the stolons or creeping shoots forming winter buds, and also, like the main stem, tubers.

The flowers are white on simple scapes, in whorls, with purple anthers in the centre, and the petals have also a purple claw. The male flowers are larger. The carpels are flattened at the sides and winged.

The plant is 2–8 in. in height. Arrow-head flowers from July up to September, and is perennial, propagated by division.

The flowers resemble those in Alisma, but are unisexual, diclinous, racemose, and the male flowers are above the female. The anthers are purple and dehisce laterally, there being many stamens. The female flowers are also variable. They are visited by flies, and contain honey.

The carpels are numerous, the smooth seeds falling when ripe
No. 1. Arrow Head
(Sagittaria sagittifolia, L.)

a, Stamen, filament, and anthers. b, Pistil, c, Carpel.
d, Leaf, arrow-shaped.

Scapé, with flowers in whorls, female below, on short pedicels, male above, on longer pedicels.

No. 2. Flowering Rush
(Eutomeris umbellata, L.)

a, Follicles, group of 6, beaked. b, Leaf, 3-angled, sheathed below c, Scapé, with flowers in umbel, with bracts below, showing 6 coloured perianth-segments, 9 stamens, 6 stigmas.

No. 3. Bulrush
(Scirpus lacustris, L.)

a, Flower, with glume (2-lobed, ciliate), 3 stamens, and pistil, with ovary, and 2-fid stigma. b, Nut, with 6 barbed bristles. c, Section of nut. d, Leaf, sheathed below. e, Cyne, with spikelets in clusters.

No. 4. Wood Club Rush
(Scirpus sylvaticus, L.)

a, Flower, with glume, stamens, pistil. b, Nut, with bristles. c, 3 spikelets in cluster, showing flowers with glumes and exerted anthers. d, Stem, with leaves and terminal branched cyme, with flowers in clusters, with bracts below.

No. 5. Reed
(Phragmites communis, Trin.)

a, Flower, with palea, flowering glume, 3 stamens, and pistil, with 3 feathery stigmas. b, Stem, with sheathing leaf. c, Panicle, with spikelets in whorls. d, Spikelet.
ARROW-HEAD (Sagittaria sagittifolia, L.)

Photo L. R. J. Horn
into the water, in which they do not sink but germinate in the mud at the side, the plant being dispersed by currents and by its own agency.

Arrow-head is aquatic, and a peat- or clay-loving plant.

This choice plant is infested by two fungi, *Aecidium incarceratum* and *Doassassia sagittarii*. A beetle, *Galeruca sagittaria*, is found on it.

*Sagittaria*, Lobel, is from the Latin *sagitta*, an arrow, and the second Latin name also refers to the arrow-shaped leaves.

Arrow-head is called Adder’s Tongue, Water Archer, Arrow-head. As to the second name Gerarde says, “Because it is good to pull out arrows” by Doctrine of Signatures! and as to the last he says, “Hath large and long leaves, in shape like the signe sagittarius, or rather like a bearded broad arrowe-heade”.

The rhizome is bulbous, and has been used as an article of food in China, and here it is cultivated.

There are 3 types of leaf. The submerged type is ribbon-like, the floating leaves are oblong to heart-shaped, short, the erect, non-submerged aerial leaves are arrow-shaped. The first are extremely thin, and the chlorophyll granules are arranged according to the state of the light; they are flat and wave about in the water.

**Essential Specific Characters:**—


**Flowering Rush** (*Butomus umbellatus*, L.)

This beautiful species, entirely aquatic, is found to-day in the North Temperate Zone in Europe, N. and W. Asia, N.W. India. It is unknown in early plant beds. In Great Britain it is absent in Cornwall in the Peninsula province, but grows throughout the Channel, Thames, Anglia, and Severn provinces; in S. Wales only in Glamorgan, Brecon, and Pembroke; in N. Wales Carnarvon, Flint, Anglesea; throughout the Trent, Mersey, and Humber provinces; in Durham only in the Tyne province; in Scotland only in Mid and E. Perth. Elsewhere it ranges from York and Durham to the South Coast. It is naturalized in Scotland, rare in Ireland.

The Flowering Rush is one of the pictures of aquatic vegetation, which rises up in the mind’s eye in recalling its main characteristics, as obtained from the point of view of the most beautiful species. It grows in canals, rivers, brooks, streams, and also in ponds and pools indifferently, in the reed swamp.
Like many other aquatic plants, the aerial stem is a scape with many sword-shaped, long leaves surrounding it, and giving it a grass-like habit. The leaves are 3-sided, spongy, twisted, and very sharp, hence the first Greek name. The base of the stem is reddish, like the flower-stalks also. The leaves are sheathed at the base.

The scape is smooth, round, bearing a single umbel of large numerous flowers (20–30 in an umbel), rose-colour, red, purple, the perianth-segments oblong at first with 4 grooves, then more or less heart-shaped. The bracts have a membranous margin. The involucre
BULRUSH

is in threes, the corolla consists of 6 petals, and there are 9 stamens, 6 pistils, and later 6 capsules.

Flowering Rush is 2-3 ft. high. The flowers may be sought in June and July. The plant is a herbaceous perennial, propagated by division.

The flowers, which are on long stalks, forming a flattish umbel, are proterandrous, the anthers ripening first, the stigma soon after. There are 9 stamens, which are hypogynous, 6 in pairs, 3 opposite the inner segments of the perianth. The anther-stalks are awl-shaped, and the anthers are fixed by the base. The styles are short, and the stigmas stalkless.

The follicle contains many seeds, which fall, when the stem is swayed by the wind, into the water, and are so dispersed.

This handsome plant is aquatic, growing in lowland loving areas, with peat-loving or clay-loving plants.

Butomus, Theophrastus, is from the Greek bous and temno, because the leaves cut the mouths of cattle; and the second Latin name refers to the umbellate inflorescence.

This plant is called Flowering Rush, Water Gladiole. Gerarde says of it: "The water-gladiole or grassie-rush is of all others the fairest and most pleasant to behold and serveth very well for the decking and trimming up of houses, because of the beautie and braverie thereof".

**Essential Specific Characters:**

316. **Butomus umbellatus, L.**—Scape radical, leaves radical, triangular, long, slender, flowers in umbels, rose colour with scarious bracts.

**Bulrush (Scirpus lacustris, L.)**

Remains of the arctic Bulrush have been found in Preglacial beds in Norfolk and Suffolk, in Early Glacial beds in Norfolk, in Interglacial and Late Glacial beds, as well as in Neolithic deposits. Its present distribution is the Arctic, Temperate, and Tropical regions, being cosmopolitan. In Great Britain it does not grow in the Isle of Wight, Monmouth, Pembroke, Cardigan, Roxburgh, Linlithgow, Mid Perth, N. Perth, Banff, Easternness, S. Ebudes, but elsewhere ranges as far north as the Shetlands, and occurs in Ireland and the Channel Islands.

Bulrushes are widespread in these islands, forming a typical part of the landscape, one may almost say in every piece of water scenery. They form tall beds in the channels of rivers, streams, or ditches in

1 Or the stigma may not ripen till later. In some cases both mature simultaneously. The 6 anthers which alternate with the perianth-segments ripen first. The other three open later, and then the stigmas.
low-lying districts, and are a component part of the fen, marsh, and bog. And in addition they are common to the still waters of lakes, ponds, and pools, growing in the reed swamp.

The tall, graceful stems and leaves of the Bulrush have a distinct habit of their own. The stem is erect, leafless, round, spongy, sheathed at the base. The leaves are long, floating, keeled or strap-shaped. The cymes of flowers are in terminal compound clusters, at first lateral, the stalkless cylindric spikelets having smooth fringed glumes, with

3 stigmas. The nut is egg-shaped and brownish, longer than the 4 6 bristles.

The Bulrush is 8–10 ft. high. The flowers are at their best in July and August. The plant is a herbaceous perennial, propagated by rhizomes.

The flowers are bisexual. There are 6 perianth-scales in two rows, and 3 stamens. The style is 2–3 cleft, and falls. The flowers are proterogynous and wind-pollinated.

The fruit is a nut, three-cornered, and when ripe it falls into the water and is thus dispersed.

The graceful Bulrush is practically always an aquatic plant.

A fungus, *Puccinia scirpi*, attacks the Bulrush. Three beetles, *Eririnus festucae*, *Donacia obscura*, *D. thalassina*, and Lepidoptera,
Chilo cicatrículus, Slender Clouded Brindle (Xylophasia scolopacina), are found on it.

Scirpus, Plautus, is Latin for Bulrush, and the second Latin name indicates its normally lacustral habitat.

This plant is named Bass, Bent, Bolder, Bullrush, Bumble, Club-rush, Frail-rush, Holrysche, Spurt Grass, Panier Rush. Lyte explains thus: "Bycause they use to make fygge frayles and paniers therewithal". In respect to the name Bass a writer remarks: "According to Kennett the term is also applied to a collar for cart horses made of flags". In Cumberland the word is applied generally to dried rushes.

The name Bulrush is applied more commonly to Typha latifolia to-day. It is spelt pole-rush, poolrush, but bullrush probably means a big bush, bull being used to denote coarse or large. A horse's collar of straw or rushes is called a bumble barfan, as distinguished from the leather barfan, hence the name Bumble or Bumbles. It was called Frail-rush "from its use in making frails", a light kind of basket made of rushes or matting; much used for fruit; the term is still in use in East Anglia for a shapeless, flexible mat basket.

It has been used for making matting and chair-seats, or rush-bottomed chairs, mats, and hassocks; and it is used like reeds and grass-wrack, &c., for thatching. Bulrushes have also been used for packing casks and rendering them watertight. The roots are astringent, and were once used medicinally. Pack-saddles used to be stuffed with bulrushes.

**Essential Specific Characters:**

320. *Scirpus lacustris*, L.—Stem terete, no leaves, flower spikes in a terminal panicle, glumes glabrous, nut obovate, 3-angled.

**Wood Club Rush** (*Scirpus sylvaticus*, L.)

This is unrepresented in ancient plant beds. It is found in the North Temperate region in Europe (except Greece), North Asia, and Temperate North America. In Great Britain it is absent in the Peninsula province from W. Cornwall, and N. Devon in the Channel province; not occurring in Bucks in the Thames province; W. Norfolk, Cambridge, in Anglia; in the Severn province generally; in S. Wales only in Carmarthen and Pembroke; N. Wales, in Carnarvon and Denbigh; in the Trent province; in Mersey, Humber, Tyne, and Lakes provinces, not in Westmorland or Isle of Man; in the W. Low-lands, not in Wigtown, Lanark; in E. Lowlands, not in Selkirk, Roxburgh; in E. Highlands, not in N. Perth, Forfar, Banff, Elgin,
Easternness: in W. Highlands, not in Westernness, S. or Mid Eitudes; and in N. Highlands only in E. Ross. It occurs also in Ireland.

Wood Club Rush (Scirpus sylvaticus, L.)

Wood Club Rush grows in damp places in hollows in wooded districts, by the roadside in ditches, but usually where there is woodland, and in the woodland districts as a rule. It grows on the borders of rivers where they have overflowed and left pools.
The stems are stout, leafy, 3-sided, solitary. The leaves are long, keeled, broad, and flat. The flowers are borne in compound branched cymes with slender branches, terminal, and the spikes are in stalkless and stalked clusters, with blunt-pointed, finely furrowed glumes. There are 6 barbed bristles. The nut is bluntly pointed, 3-angled, inversely egg-shaped.

Wood Club Rush is 18 in. high. The flowers bloom from July up to September. The plant is a herbaceous perennial, propagated by suckers.

The flowers are pollinated by the wind, and bisexual, and the floral mechanism is similar to that of the Bulrush. The fruit is a nut, which does not open, and falls to the ground when ripe.

This Club Rush is a peat-loving plant, growing in peat soil or clay soil with some humus in woods.

A fly, Agromyza nigripes, infests the plant.

The second Latin name refers to its woodland habitat. It is called also Millet.

Essential Specific Characters:—

322. Scirpus sylvaticus. L.—Stem erect, with leaves flat, carinate, broad, lanceolate, spikelets in wide terminal panicle.

Reed (Phragmites communis, Trin.)

The Reed may be said to be ubiquitous in both time and space, for it is found in Britain alone in Preglacial beds everywhere, Interglacial beds in Hants, Sussex, Lines, Neolithic beds in the Thames Valley, Yorks, Glamorgan. It is found in the N. Temperate and Arctic regions in Europe, Asia, Africa, America, and in Australia. This common aquatic plant is found throughout Great Britain, except in East Sutherland, as far north as the Shetlands, and in the Channel Islands.

The common Reed is one of those familiar aquatic plants which has a place in the popular mind on account of its very universality, and because it forms in itself a characteristic botanical formation, a reed-swamp association. It grows in still water as well as running water, in lakes and rivers, nowhere more luxuriantly than in the meres of the E. counties or the tarns and lochs of Scotland, at two very different elevations.

The stem is round, tall, graceful, erect, arising from a jointed creeping rhizome, and stoloniferous, with creeping shoots. The leaves are long, flat, broad, rigid, with the margins hairy, and bluish-green.
below. The leaf-sheath is round, turned one way, and smooth. In a wind the leaf turns partly round like a flag.

The panicle is nodding, purple, soft and silky, branched, large, and dense, with smooth branches. The spikelets are 5-flowered, the flowers longer than the glumes, and glossy. The empty ones are the flowering glumes, awl-shaped, and longer. The florets in the spikelet are distant, with long silky hairs which form a parachute.

The Reed is 3-10 ft. high. It flowers in July and August. The plant is a herbaceous perennial, propagated by soboles or creeping
runners. The lower flowers are male, the others are bisexual, the panicles containing 3-6 flowers, being densely crowded. As in most other grasses the stamens are 3, the styles short, and the stigmas feathery. The lowest glumes are 1-3-androus, the others 3-androus. The flowers are anemophilous, protogynous.

The fruit is enveloped in the glume, and this in long silky hairs, and is light, and adapted to dispersal by the wind.

The Reed is a peat-loving plant, luxuriating in peat soil or clay soil, and it is then a clay-loving plant.

Two stages of Rust fungi, *Puccinia phragmitis* and *P. trilii*, attack the Reed, the other stage of each attacking species of *Rumex* in each case. *Puccinia magnusiana* and *Ustilago grandis* also infest it, and it is galled by *Lipara luccens*, *Cecidomyia inclusa*, *Lasiopteris arundinis*.

Reeds are a regular source of attraction to beetles, such as *Phytonomus arundinis*, and others of the genera *Acupalpus*, *Europhilus*, *Bembidium*, *Odocantha*, *Ætophorus*, *Dromius*, *Alianta*, *Homalota*, *Hygronomona*, *Tachyphorus*, *Stenus*, *Subcocinella*, *Hippodamia*, *Anisosticta*, *Coccidula*, *Cercus*, *Donacia*, *Crepidodera*. It is also visited by
the Lepidoptera Reed Moth (Macrogaster arundinis), Phragmatobia arundinis, Reed Tussock (Orygia crenosa), Obscure Wainscot (Lecania obsoleta), Fen Wainscot (Calamia phragmitidis), Senita nivea, Nonagria nevica. Twin-spotted Wainscot (N. geminipuncta), Gold Spot (Plusia festucae), Chilo phragmitelus, Elachista corsella, a Heteropterous insect Teraticoris antennatus, and several Homoptera, Delphax pulchella, Liburnia pallidula, L. punctulum, L. unicolor, L. speciosa, L. Scotti, L. smaragdula, Paramesus phragmitis, and flies such as Agromyza nigripes, Platycelypha umbraculata, Lipara lucens.

*Phragmites*, Trinits, is from the Greek *phragma*, fence, with reference to a spurious dissepiment at the nodes; and the second name indicates its universal character.

This graceful grass is called Bennels, Bog Reed, Ditch Reed, Doudle, Pole Reed, Pull Reed, Pull Spear, Reed, Speargrass, Spire, Streeds, Windlestraws. The name Bennels is applied to a kind of mat, made of reeds woven together, used for forming partitions in cottages, or laid across the rafters to form an inner roof. The name Doudle is "the root of the common reed grass found partially decayed in morasses, of which the children in the south of Scotland make a sort of musical instrument similar to the oaten pipe of the ancients".

The Reed was used traditionally by witches to fly upon. It is used for thatching, and a specimen thus used a hundred years ago is as fresh as if recently gathered. It is used for protecting sea embankments, for ceilings to cottages, verandas, rustic buildings, for plaster floors, for screens, and for hot-beds in kitchen gardens. Wool is dyed green by the flowers. The roots have been used for liver complaints. Mats are made of it, and formerly it was used for pens for black-letter type.

**Essential Specific Characters:**

336. *Phragmites communis*, Trin.—Stem tall, erect, leaves rigid, flat, panicle spreading, loose, purple, male flowers below covered with silky hairs.
Section IX

FLOWERS OF WASTE PLACES, GARDENS, REFUSE-HEAPS, VILLAGE GREENS, FARMYARDS, ETC.
FLOWERS OF WASTE PLACES, GARDENS, REFUSE-HEAPS, VILLAGE GREENS, FARMYARDS, ETC.

Man during his operations in one direction or another, by agriculture, horticulture, building operations, quarrying, railway or canal transit, causes considerable disturbance in the balance of nature by the introduction, unconsciously (as a rule), of many plants which are called aliens, casuals, colonists, denizens, &c. Collectively considered there are some 1100 aliens which come to us with seed from abroad, in cotton, &c., and are often to be found straying from mills where wheat is ground for flour, the small seeds being blown away in the winnowings.

A few are called Viaticals, and may be found along our waysides, having travelled thus by various means, there being seventy of these. The former use of herbs in medicine is responsible for a number of these.

Moreover, the carrying of corn with its complement of weeds along our highways, a necessary operation, causes the agrestal type of plants to find a place also along our highways and in those other places which are especially visited by man. Of these Mesophytes (treated in Section III) there are about 110, and a number of them are common to waste ground, as this last is often associated with the place of storage of cultivated plants.

The distribution of this class of plants being entirely artificial, it should naturally come at the end of the series, followed by the equally artificially-placed mural plants which are allied to the natural Lithophytes. These aliens cannot be regarded as identical with that group called Chersophytes, or waste herbage which grows on land formed by the cutting down of forests often removed from human habitations and on high land. At the same time it is allied to it, growing on dry soil, which is the usual characteristic of the soil of the waste places here
referred to. Such soil is usually dry, sandy, often loose, or in the case of farmyards moist and rich in nitrogen. These weeds are hardy, often woody-stemmed plants which out the native plants. They are usually annual, often biennial, and while some are ephemeral and remain a year only, others become well-established for several decades, such as Mallows. Most of them are xerophilous and have hairy stems. A few are shade-dwellers, but the bulk live in the open and are sun-lovers. They are all hardy strugglers, and not only herbaceous plants, but even shrubs, are liable to be choked by an alien incursion of weeds.

An Act to prevent the introduction of alien weeds into Ireland has been passed, and it is desirable that this be extended to England and Wales.

Waste places as a whole are diverse in origin and character. We have selected a few of the types, and include about thirty-three species.

We have first of all hedgerow plants, which owe their introduction largely to a former use in herbal medicine, such as Greater Celandine, which grows under the hedge binding a cottage garden close to a village. Here also, and always close to a building, one finds Goutweed, once used for gout, &c. Tansy is also found in the same sort of place. Strayed from the kitchen garden, again, we find Borage sheltered amongst the protecting branches of a low-trimmed hawthorn. The Bitter-sweet, usually found in the hedgerow, comes up luxuriantly in allotments, though it is also perhaps native in the marsh formation.

At the base of walls, where there is sand, one finds Common Mouse-car (along with Chickweed, Sandwort, &c.) and Barley Grass, the last ubiquitous on waste sandy ground, with Barren Brome Grass, Rye, and Couch Grass. On sandy wastes, especially on dunes and roadsides, one finds Stork's Bill, and on hilly ground, Musk Thistle. Along a cart-road Viper's Bugloss may be found on chalky soils. Railway embankments are a fertile source of weeds, but we only enumerate two very common ones, Common and Creeping Toad Flax, which along the embankments near Reading hybridize.

One of the most profitable pieces of ground to draw for cultivated weeds is a farmyard or a stackyard, and around the margins of either it is easy to find amongst others the following: Shepherd's Purse, ubiquitous and in flower all the year (in autumn with purplish flowers coloured by anthocyanin), Common Mallow, forming large and tall handsome, woody, shrub-like clumps, with clusters of striking purple blooms. Here, too, we find tall, sweet-scented Melilot, the stinking May-weed, Burdock, Spear Thistle (which grows in fields too), the lovely blue-flowered Chicory, Hawksbeard (common everywhere in
GREATER CELANDINE

The seeds of this plant which have been discovered in Interglacial deposits are both characteristic and in good condition. It ranges from Arctic Europe, W. Asia, W. Persia, and has been introduced in North America. It occurs in 96 vice-counties, everywhere but in the W.S.N. Highlands (except Clyde Islands), and in the Northern Isles, making 97, that is, from Inverness southward, probably in each case naturalized, and elsewhere as an escape. It is found in Ireland and the Channel Islands. Watson considered it a denizen.

No doubt the Greater Celandine owes its distribution very largely to former uses to which it was put, e.g. to heal the eyes, and one may usually find it hiding beneath the hedge surrounding the cottage garden in the country or near a village. It is always found where there has been some human habitation at one time or another. In the same way it is one of the plants to be found on waste ground with poppies, vetches, and other casual plants, and amongst ruins.

The Greater Celandine is a leafy plant, with leaves with lobes each side of a common stalk, rounded lobes, and rather slender stems, succulent and full of juice, easily broken, hence perhaps its choice of shelter under hedges, &c. It grows erect, and were its petals not so small might be taken for a yellow poppy. The juice serves to protect the plant from animals. Buds may be produced from the margin of the leaf.

The leaves and stem are roughly hairy, and somewhat bluish-green, the leaf-stalk enlarged at the base. The flower-stalk is umbelbed, and the capsules are linear, long, and contracted. Chelidonium refers to the supposed coincidence between its time of flowering and the swallow's appearance. The black seeds are shining with longitudinal rounded ridges.

Greater Celandine is usually about 2 ft. high. It flowers from May to August, and is a perennial, deciduous, and herbaceous plant.

When the flower opens the anthers open in the sun laterally, and the stigma also matures. It is taller than the anthers, so that insects
alighting in the centre must first touch it and promote cross-pollination, while those that alight on the petals may cause cross- or self-pollination. The anthers close up in dull weather, and the stamens open inwardly and cause thereby self-pollination. No honey is produced, so that insects are pollen-seekers.

The Greater Celandine is dispersed by its own agency. The pods readily open, and are jointed, and distribute the seeds around the parent plant. It is also dispersed by ants, the elaiosomes containing nutritive matter.

This is a sand-loving plant, requiring a sand soil, and also in part a humus-loving plant, needing a slight amount of humus soil.

No fungal pests are known. The visitors are Lepidoptera, Large Ranunculus (*Polla flavocineta*), Small Angle Shades (*Euplexia lucipara*), *Tortrix senialbana*; Homoptera *Auleurodes prolecl ella* and *Siphonophora chelidonii*; Hymenoptera (*Apidae*), *Bombus pratorum*, *B. agrorum*, *B. rajaellus*, *Halictus cylindricus*, *H. zonulhus*, *H. sexnotatus*; Diptera (*Syrphidae*), *Syrphus baleatus*, *S. ribesii*, *Syritta picipens*, *Ascia podagraria*, *Rhingia rostrata*; Empidæ, *Empis livida*.

Dioscorides gave the name *Chelidonium*, which is derived from the
No. 1. Greater Celandine
(Chelidonium majus, L.)
a. Capsule, opening from below upwards, by valves, showing seeds. b. Seed, with crested raphe. c. Upper part of plant, with pinnate leaf, and inflorescence with flowers in umbel, showing 2 sepals, 4 petals, many stamens, and pistil, and one umbel with capsules.

No. 2. Shepherd's Purse
(Capsella bursa-pastoris Medic.)

No. 3. Mouse-ear Chickweed
(Cerastium vulgatum, L.)

No. 4. Common or Marsh Mallow
(Malva sylvestris, L.)

No. 5. Stork's Bill
(Erodium cicutarium, L’Herit.)

No. 6. Melilot
(Melilotus officinalis, Lam.)
2. Shepherd’s Purse (*Capsella Bursa-pastoris*, Medic.).
5. Stork’s Bill (*Erodium cicutarium*, L. Hérit.).
6. Melilot (*Melilotus officinalis*, Lam.).
Greek chelidon, a swallow, in allusion to its flowering when these birds appear; and majus is Latin for greater.

The English names are Celandine, Celidony, Cock-foot, Devil's Milk, Fellon-wort, Jacobs Ladder, Killwart, Saladine, Selendine, Swallow-wort, Tetter-wort, Wart-flower, Wartweed, Wartwort, Wretweed. It is named Sollendine in Ireland, where it is used for sore eyes. In allusion to the name Celandine it was believed the swallow found it to be an eye salve, and used it for its young. The acrid juice gave rise to the name Devil's Milk. It was also named Kenning Herb, a kenning being an ulcer in the corner of the eye, which it was held to cure. Gerarde calls it Swallow-wort "because it first springeth at the coming in of the swallows, or dieth when they go away, for it may be found all the year, but because some hold opinion that with this herbe the dam restore eyesight to their young ones when their eye be put out". Such was the peculiar belief our forefathers had about this peculiar plant. Thus further Coles, in The Art of Simples, says: "The swallow cureth her dim eyes with Celandine, the Wesell knoweth well the virtues of herb-grace, the dove the verren, the dogge dischargeth his mawe with a kind of grasse". Probably Pliny was the first to suggest the swallow legend, if he did not copy it from Aristotle.

The yellow juice is poisonous, and by the Doctrine of Signatures was used in the Middle Ages as a remedy for jaundice. It was used to make a plaster for sores in the head or eyes, and a drink made from it was used for the blood. The root is bitter, and used medicinally in Cochin China by the natives. The juice is bitter, and used for ringworm, and it was said to destroy warts and cure the itch; but it is not employed now except by the unexperienced as an eye salve.

**Essential Specific Characters:**

20. *Chelidonium majus*, L.—Stem glaucous, delicate, with yellow juice; leaves pinnate; flowers small, yellow, in an umbel; petals 4; capsule linear, valved; stigma 2-lobed.

**Shepherd’s Purse** (*Capsella Bursa-pastoris, Medic.*)

Unlike flax, which is equally a weed of cultivation, Shepherd’s Purse is not known in any early seed-bearing deposits. It is distributed throughout all Temperate and Arctic Europe, North Africa, and Asia to the Himalayas, and has become introduced into all temperate countries. This ubiquitous variable weed is found in every vice-county in Great Britain, and ascends to 1200 ft. in some parts.
Essentially a weed of waste places, Shepherd's Purse is a familiar sight wherever we turn on all ground which is not grass-grown, along our highways, in the farmyard, on waste heaps, in gardens, stableyards, and in the cornfield, or generally where open soil allows it to take a hold; and when it does so it comes up freely, flowering all the year round and forming abundant seed. To the farmer it is a pest, to the botanist an instance of mutations of great interest.

The Shepherd's Purse has the rosette habit, the leaves lying flat on the ground, in a circle around the base of the stem, which is more or less leafless above. The root is long, tapering. The plant is extremely variable in the form of the leaves as well as in the shape and size of the pods. The stems are branched. The radical leaves are

![Shepherd's Purse (Capsella Bursa-pastoris, Medic.)](Photo, H. Haskel)
Shepherd's Purse

Deeply divided nearly to the base, or they may be undivided, lance-shaped. The terminal lobe is often triangular. The upper leaves are clasping, auricled.

The flowers are white, or reddish-tinged in winter, like many other plants, e.g. White Deadnettle. The flower-stalks are slender. The sepals are spreading and equal. The pods are triangular, inversely heart-shaped, wedge-shaped, or rounded. The stigma is not stalked. The style is short. The valves are smooth. The seeds are numerous, oblong, dotted, very small. The pod has no wings, as in Thlaspi, in which the plant was once placed. The radical leaves as well as the pods are extremely variable.

This plant is often 2 ft. high, usually 1 ft. It is in flower all the year, and is a herbaceous annual, propagated by seeds.

The stamens and stigma are mature at the same time. The flowers are small and inconspicuous. Honey is secreted in 4 nectaries at the side of the short stamens. The longer stamens are of the same length as the style. Hence, as would be expected, the plant is usually self-pollinated. Female flowers have been found as well as complete flowers, both on the same and on different plants. In the earlier flowers the stamens have been found to be incomplete, so that the above unusual conditions may be due to the variation in the thermal constant.

The visitors are Diptera, Syrphidae, Eristalis nemorum, Syrphus balteatus, Syrrippa pipiens, Ascia podagrica, Melithreptus scriptus, M. teniatus, M. pictus, Muscidae, Anthomyia.

The plant is dispersed by its own agency. The pods are not winged and contain many seeds, and open and allow them to fall out around the parent plant.

Shepherd’s Purse requires a sand soil, and is a sand-loving plant.

The fungus, Cystopus candidus, distorts the branches, and covers them with a white crust, and Peronospora parasitica also infests it. The Bath White Butterfly (Pieris daplidice), Arelia cafa (Tiger Moth), Lepidoptera, and the Hemiptera Aphis brassicae, A. papaceris, Siphonophora pisi are amongst those that feed on it.

Capsella is Latin for a little box or capsule, referring to the pods. Bursa-pastoris is Latin for Shepherd's Purse, also in allusion to the pods.

This ubiquitous plant is called Bad Man’s Oatmeal, Blind-weed, Case-weed, Clappede Pouch, Cocowort, Fat Hen, Lady’s Purse, Mother’s Heart, Naughty Man’s Plaything, Pepper-and-Salt, Pick Pocket, Pick Purse, Pick-your-Mother’s-heart-out, Poor Man’s Parme-
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cetty, Sanguinary, Shepherd’s Bag, Shepherd’s Pouch, Shepherd’s Scrip, Tooth-wort, Toywort, Ward-seed, Witches’ Pouches, Pick Purse, &c., is given in allusion to the poorness of land. It was called Sanguinary because supposed to stanch a bleeding nose. Shepherd’s Pouch alludes to the shape of the seed-vessel, as does Shepherd’s Purse.

In the Eastern Border children play a game with the seed-pouch, one holding it out to a companion and telling him to take hold of it. It cracks, and the other triumphantly says, “You’ve broken your Mother’s heart”. The seeds are collected, and are given to birds.

Essential Specific Characters:—

35. *Capsella Bursa-pastoris*, Medie.—Stem erect, branched above, lower leaves pinnatifid, lanceolate, dentate, upper auricled, oblong, or sagittate at the base, flowers small, white, pouch triangular, obovate, 2-valved, variable.

Mouse-ear Chickweed (*Cerastium vulgatum*, L.)

This plant has not been found fossil so far. It is distributed to-day throughout Europe from the Arctic circle, southwards, in N. and W. Asia, to Spitzbergen, the Himalayas, and N. Africa, and has been introduced into the United States. Common Mouse-ear occurs in every county of Great Britain, ascending to 3600 ft. in Scotland.

The Common Mouse-ear is inconspicuous enough, and on account of its similarity to other stitchworts, not so widely known as its distribution should require. It is almost everywhere a plant of the waste places, growing on open ground where the surface has been disturbed, not only in gardens, and around houses, farmyards, and kindred spots where weeds of cultivation accumulate, but in the fields and along the wayside also. It is associated often with the 3-nerved Sandwort and Common Stitchwort, or Chickweed under the hedge, and is a shade plant.

This is a short, straggling plant, with many spreading stems, round and purple. Some of the barren shoots are long. The stem is downy, and often prostrate, then ascending. The leaves are roughly hairy, and oblong below, narrow below; the upper are oval with rolled-back edges.

The flowers are white, the petals as long as the calyx, and both sepals and bracts are membranous at the margin. The capsule is cylindrical, the fruit-stalk as long as the calyx, the sepals of which are turned back in flower, and the primary bracts are not membranous.
Mouse-ear Chickweed is 6 in. or more in height. The flowers are to be seen in June and July. The plant is annual, and propagated by seed.

The flowers are much smaller than in C. arvense (which see), and consequently insect visits are few, and it is not so markedly proterandrous as C. arvense. The honey is half-concealed. The plant is self-pollinated, producing seed when no insects visit it. The visitors are Diptera, Syrphidae, Syrilla pipiens, Empidae, Empis livida.

This Chickweed is dispersed by the wind. The seeds are blown, when ripe, out of the many-valved capsule by the wind.

The plant is a sand-loving plant, requiring a sand soil or light sandy loam. It is found on many formations which yield an abundant sand.

Chickweed is galled by Cecidomyia cerastii. The insects that feed on it are Lepidoptera, Gelechia marmorca, Small Yellow Underwing (Heliodes arbuti), and the Homopteron, Dorthesia urtica.

Cerastium, Linnaeus, from ceras, Greek for horn, is so called from the shape of the seed, and vulgarum alludes to its universality.
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This plant is called Chickenweed, Mouse-car Chickweed, Mouse-car Chickweed and this plant were formerly used under the same name, Murion.

This species may be distinguished from C. glomeratum and C. semi-decandrum by being perennial, while the others are annual, with hairs on the stem-leaves, much longer, not terminated by muscular glands. It is much larger and more spreading at right angles.

Essential Specific Characters:—

52. Cerastium vulgatum, L.—Stem branched, jointed, tufted, leaves lanceolate, downy, dark-green, flowers white, petals not much longer than sepals, pedicels exceeding the latter, bracts with membranous margin, the tips glabrous.

Common or Marsh Mallow (Malva sylvestris, L.)

This has not been found fossil so far. It is found throughout the North Temperate Zone in Europe, N. Africa, Siberia, W. Asia, and is introduced into the United States. In Great Britain, though universal, it is not found in Cardigan, Stirling, Mid Perth, N. Aberdeen, Banff, Westernness, Main Argyle, Cantire, North Ebudes, Sutherland, Caithness, or the Northern Isles. Watson expresses doubt as to its being native in Scotland, where, indeed, it is rare. It is found in Ireland and the Channel Islands.

The Common Mallow forms a conspicuous object by the roadside, in or near villages and small towns, where it may be seen growing luxuriantly, and in profusion along the sward which surrounds a farmyard, or on banks in the village, or on the village green. It is thus a weed of cultivation which has established itself in most parts of the country. In waste places it is associated with Dwarf Mallow, Melilot, Mayweed, Mugwort, Hawk’s Beard, Goose Foot, Barley Grass, and many others.

The stem is tall, erect, strong, and woody, branched, with leaves on long leaf-stalks, 3-7-lobed, kidney-shaped at the base, with lobes radiating from a common centre, the lobes shallow, the margin scalloped, smooth above, roughly hairy below.

The flowers are large, purple, axillary, with veins of deeper tint, the petals much longer than the calyx. The flower-stalks are slender, spreading, the fruit (enclosed in an aril) smooth, netted, with short style, and the seeds are numerous and kidney-shaped.

This plant is very often 4 ft. high. The flowers may be gathered from May till October. Common Mallow is a perennial, deciduous, herbaceous plant.
As with Marsh Mallow, the flowers are proterandrous, the anthers ripening first, large and conspicuous, and visitors are numerous. There are honey-glands at the base of the stamens or petals not fully protected. In the centre of the young flower a group of anthers surround the still unripe stigmas folded together, arranged in a cone-like form. The stigmas afterwards lengthen and project in the place of the stamens, and branch outwards to avoid self-pollination. The anthers after opening also droop.

The honey is protected above from rain by hairs, which cause insects to wipe the pollen off on the anthers in young flowers to apply it to the stigma in older flowers.

Before the stigmas are ripe, the ends of the anther-stalks curl outwards and downwards, and this prevents self-pollination. The visitors are Hymenoptera, Apidae, Ichneumonidae; Diptera, Stratiomyidae, Syrphidae; Lepidoptera, Pieris rapae; Coleoptera, Haliotis. A bee, Chelisoma nigricornis, is a pollen-seeker.

The fruits are dispersed by the plant's own agency. The capsule is a typical schizocarp, and consists of numerous carpels which break up when ripe, and are dispersed around the plant, the single seeds remaining in the carpels.

This is a sand-loving plant, and subsists on a sand soil, and grows where it is barren and no other plants can compete with it.

A fungus, Puccinia malvacearum, infests it, as it does the Holly-hock. The beetles, Trachys pygmea, Lixus paraplecticus, Apion malvae, Podagriva furcicornis; a moth, Acontia solaris, feed on it.

The name sylvestris refers to its supposed woodland habitat. It is called Bread-and-Cheese, Cheese-cake, Cheese Log, Cheese-flower, Chock-cheese, Chucky-cheese, Custard Cheeses, Dock, Frog-cheese,
Loaves-of-Bread, Marsh Mallow, Maul, Maws, Pancake Plant, Pick Cheese.

The fruits resemble cheeses, hence some of the names. They have an insipid mucilaginous taste, and are eaten by children.

"The sitting down when school was o'er
Upon the threshold of the door,
Picking from mallows, sport to please,
The crumpled seed we call a cheese."

—Clare.

Because children use it like Dock when stung by nettles, it was called Round Dock to cool (and so fancifully cure) the parts affected. As it was employed in fomentations, it was called Marsh Mallow, which is really Mash Mallow. On account of its demulcent properties it was retained in the Materia Medica. It was formerly employed for bladder troubles, calculous concretions, stone, gravel, &c., coughs, and for hoarseness. A mallow is used by the Chinese, when the leaves are dried as food.

Essential Specific Characters:—

64. Malva sylvestris, L.—Stem tall, woody, branched, leaves palmate, 7-lobed, crenate, flower large, purple, veined, in 3-leaved involucre, carpels reticulate, rugose, fruit-stalk erect.

Stork's Bill (Erodium cicutarium, L'Hérit.)

The very characteristic seeds of this plant are unknown in a fossil state. The Northern Temperate Zone in Europe, North Africa, Siberia, Western Asia, as far east as N.W. India, is the limit of this plant's distribution. In Great Britain it is absent from Roxburgh, Mid Perth, W. Perth; and in Wales it ascends to 1200 ft. It is found in Ireland and the Channel Islands.

Stork's Bill is one of the familiar plants of the seaside, where it grows in association with other dry-soil or xerophilous plants, such as Hop Trefoil, Hound's Tongue, Plantago Coronopus, Hawk's Beard, and others. Inland it is found on the sandy soil of commons, waste places, golf-links, and places where the grass is turf-like, often on heaths; and it comes up also amidst the typical alien flora of the farm or garden.

This plant has a habit like Sandwort Spurrey, which also grows with it, being prostrate, with stems bent downwards, several from the root, thick, hairy, branched, with leaves with lobes each side of a
common stalk, the segments being divided nearly to the base, stalkless, and narrow. The stipules or leaf-like organs are lance-shaped and membranous, the upper entire, the lower divided into 2 nearly to the base.

The flowers are in umbels of 3-6 and rose colour, with fugacious or falling petals, hairy at the base, and longer than the calyx. The flower-stalks exceed the leaves in length, and are many-flowered. The petals are unequal. The capsule is ribbed and beaked, the seeds are oblong, brown, the long awn becoming spiral finally, but influenced by hygroscopic deviations.

The plant is 9 in. to 1 ft. high. It flowers in April and the five succeeding months. It is a perennial.

The five inner stamens are rudimentary and produce no pollen. The flowers are proterandrous, the stamens ripening before the stigma. In the absence of insects the plant possesses the power of self-pollination, as the anthers lie close to the stigma, and is self-fertile. Honey is secreted as in Geranium. Only the five outer stamens produce pollen. Though the plant is prostrate it is rendered conspicuous in the sun, turning its petals to the sun, opening at 7 a.m., the petals falling by noon. The upper 2 or 3 petals bear path-finders or fine black lines, and the lower are lengthened and serve as an alighting place. The flowers are visited by Hymenoptera (Apidae, Apis mellifera) and Coleoptera; the last fall off unless they cling on tightly.

The Stork’s Bill is dispersed by its own agency. The seeds are
expelled from the pod by an elastic movement, and are drawn into the
ground by a similar hygroscopic arrangement. The carpels do not open
but are contracted with the seeds still enclosed, the awn remaining
attached. The layers of the cell-wall consist of lamellae of different
densities and refractive indices. In the one the cells are elongate and
woody in concentric series, being light and dark alternately. These
last are the edges of the lamellae. The parallel lamellae in two series
are inclined to the axis at different angles, or wind spirally in opposite
directions around the lamellae. The expansion of the cell-wall tissue
during imbibition is caused by the swelling of the strike of less density,
and the imbibition of the water in all probability sets up spiral tension,
producing a twisting motion. Further single cells roll up as shown
by Francis Darwin. Or the twisting of the awn may be due to the
difference between the contraction of the woody fibres and the com-
paratively soft parenchyma or thin-walled cellular tissue, in which the
cells are not much longer than broad. The more complete lignifica-
tion of the outer cells, which contract more than the inner, may be
the reason, the spiral twisting being due to the curving of the woody
bars with the hollow side upwards. Moistness regulates the amount
of the twisting of the awn, which twists and untwists with variation in
atmospheric humidity, being thus hygroscopic. The fixing of the awn
during the process of untwisting causes the seed to be driven into the
ground. The seed vessel is so sensitive the arista or awn curls up
under the influence of the heat or moisture of the hand. The elastic
movement of the seed to promote dispersal is one of the most inter-
esting examples of sensitiveness.

Stork's Bill is almost entirely a sand plant, growing almost always
on sand soil. By the sea-coast it is a halophyte, living on a saline soil.

The Brown Argus (Lycana astrarche) feeds upon it, also Geotomus
punctulatus and Heterogaster urticae, Hemiptera Heteroptera.

Erodium is from the Greek Erodios, a heron, in allusion to the
shape of the fruit. Cicutarium is from cicutu, hemlock, because the
foliage resembles that of hemlock. The plant is called Wild Musk,
Pink or Powk Needle, Stickpile.

Essential Specific Characters:—

69. Erodium cicutarium, L'Hérit.—Stem prostrate, spreading,
downy, leaves pinnate, leaflets sessile, pinnatifid, stems many-flowered,
flowers lilac, in umbels, stipules lanceolate, stamens dilated.
Melilot (Melilotus officinalis, Lam.)

In spite of its numerous pods this plant is not found in any ancient deposits. The North Temperate Zone is its principal region, the plant being found in Europe, East and Western Asia, Thibet, and it has been introduced into North America. In Great Britain it is not known in Brecon, Radnor, Carmarthen; in N. Wales only in Carnarvon, Flint, and Anglesea; in the Trent province generally; not in the Isle of Man, Dumfries, Kirkcudbright, Ayr, but in Berwick and Haddington, Edinburgh, Fife, W. and N. Perth, from which county it is generally distributed southward. In Ireland it is very rare.

Watson regarded the sweet-scented Melilot only as a denizen, in which case we could not expect to find it in British Glacial or Preglacial beds. It grows in waste places, reaching a great height, growing generally in profusion, and once established it continues in the same locality for a long period. With it are associated Worm-seed, Lepidium Draba, and other weeds of cultivation.

The plant is of erect habit. The stem is much branched. The leaves are trifoliate. The leaflets are blunt, coarsely toothed, egg-shaped or inversely egg-shaped, linear to oblong. The stipules are awl-like, very slender, entire. The leaves go to sleep at night, and the leaflets assume a vertical position, facing north, and facing the terminal leaflet, so that the upper surfaces face N.N.W. and N.N.E. The terminal leaflet twists west or east, usually west.

Darwin also found that if horizontal the leaves suffered from frost. He says the terminal leaflet moves in another and more remarkable manner, for whilst its blade is twisting and becoming vertical, the whole leaflet bends to one side, and invariably to the side towards which the upper surface is directed, so that if this surface faces the west the whole leaflet bends to the west, until it comes into contact with the upper and vertical surface of the western lateral leaflet. Thus the upper surface of the terminal and of one of the two lateral leaflets is well protected.

The flowers are yellow, in racemes, all turned one way. The petals are nearly equal. The wings are keeled. The corolla is more than twice as long as the calyx. The ultimate flower-stalks are short. The pod is egg-shaped, flattened, acute, long-pointed, netted, hairy, black when ripe, 1–2 seeded.

Melilot grows often 4–5 ft. high, but usually 2 ft. The flowers are in bloom from June to August. The plant is an annual reproducing by seed.
In most respects the floral structure of Melilot is like that of Dutch Clover or Medicago. But the calyx is not so long as in the former. It is also more expanded, so that the petals, which are longer, have much greater freedom of movement. The cells of the ake or wings are at one point interwoven with those of the keel as if grown together, and when one is moved the other of necessity must also move, whilst at the same time both return together to their former position when pressure is removed. The wings and keel are able to rotate further downwards, the claws not being adherent as in Dutch Clover; and by aid of the finger-like processes, which here replace the pouches of the latter at the superior basal angle of the wings, they return to position. These processes clasp the central staminal column above, about a quarter of the way from the base. They separate when the carinae are drawn down, springing back and clasping it as before. The stigma projects beyond the anthers. Cross-pollination is therefore the rule. Melilot is visited by Hymenoptera, Apidae, Sphegidae, Tenthredinidae.

The seeds are dispersed by the plant's own action. The pod is short and straight, with few (1-2) seeds, which are scattered when
the pod falls owing to the pedicel rotting away, or by the opening of the pod.

Melilot is one of the sand-loving plants which subsist best on a sand soil. It is common on Keuper Marl or the sands of the Boulder Clay.


*Melilotus*, Pliny, is from *mel*, honey, *lotus*, Theophrastus; and the second name refers to its use in medicine. It is called Hart's, King's, or Plaister Clover, Little Grass, Heartwort, King's Crown, Wild Laburnum, the last in allusion to the resemblance between the flowers and Laburnum.

In ancient Greece *Melilotus* was worn in garlands and chaplets. It was said to have sprung from the blood of a lion slain by the Emperor Hadrian. *Melilot* smells like new-mown hay. It used to be much cultivated, but is now replaced by Lucerne, Clover, and Sainfoin. In Switzerland they use it to flavour Gruyère cheese, the flowers and seeds being bruised and mixed with the curd before being pressed. Doubtless the luxuriance of the meadows generally has much to do with its richness.

Essential Specific Characters:—

77. *Melilotus officinalis*, Lam.—Stem tall, erect, leaflets narrow, ovate, serrate, flowers in racemes, yellow, lateral, petals equal, legumes hairy, wrinkled, acute, wings keeled.

Goutweed (*Egopodium Podagraria, L.*)

This plant is confined, so far as its present-day distribution is concerned, to the North Temperate Zone, being found in Europe, except Spain, and in Western Asia. In Great Britain it is absent from Pembroke, Mid Lanes, 1. of Man, Hebrides, being thus well dispersed south of Elgin. Watson regards it as a doubtful native, and a denizen in North Britain.

Goutweed is doubtless responsible for its distribution largely to the former use made of it as a herb, endowed with various healing properties. To-day it is to be found on the outskirts of almost every village or town, and very often near isolated houses of some age. It is a common plant on waste ground, and is exceedingly rare far from a building of
some description. The first Greek (Latinized) name refers to the leaf segments, which resemble a goat’s foot.

It is an erect plant, with a round, furrowed stem, finely furrowed length-ways, and hollow, bearing branches above. The leaves above are 3-lobed, and minutely toothed; below they are stalkless, and two or three times 3-lobed, and egg-shaped with a prolonged point. The flowers are small and white, borne in wide flat umbels, with no calyx teeth, the petals unequal, the fruit flattened laterally with almost rounded seeds.

Goutweed grows to a height of 2 ft. or more. The flowers are in bloom in May, June, and July. This plant is a herbaceous perennial and propagated by division of the creeping rhizomes, occurring usually in beds.

The flowers are numerous and small. The styles are slender and bent back, and the petals inbent at the point. It is visited by numerous insects—Diptera, Coleoptera, Hymenoptera, and Neuroptera.

The flowers in the primary umbels are complete, those of the second order having male florets in the middle, complete ones at the side. The fruits are flattened and aided in wind dispersal, when ripe being semi-detached, and jerked to a distance by the wind or passing herds.

Goutweed is more or less a clay-loving plant addicted to a clay soil, but as its distribution is largely artificial it may be found on sandy loam or soil with some degree of humus in it in woods.

The fungus Protomyces macrosporus forms warts on the stem and petioles, and Puccinia agropodii causes swellings on the stem and mid-rib, and Plasmodora nivea is also found upon it.

A Hymenopterous insect, Tenthredo flava, and 2 moths, Depressaria applana and Chauliodus illigerellus, feed upon it.
No. 1. Goutweed  
(\textit{Egozodium Podagraria}, L.)

\(a\), Flower, with \(5\) sepals and \(5\) petals alternately, also \(5\) stamens and pistil.  
\(b\), Partial umbel with fruits immature.  
\(c\), Section of fruit, showing \(2\) carpels \(5\)-angled.  
\(d\), Fruit, schizocarp, of \(2\) mericarps with \(2\) persistent styles.  
\(e\), Upper part of plant, with ternate leaves and flowers in compound umbel.

No. 2. Stinking Mayweed  
(\textit{Anthemis Cotula}, L.)

\(a\), Ligulate or ray floret (female).  
\(b\), Tubular or disk floret, with scale.  
\(c\), Achene without pappus.  
\(d\), Neuter ray floret.  
\(e\), Upper part of plant, with alternate \(2\)-pinnatifid leaves and flowerhead with yellow disk and bisexual florets, and white ray florets, female or neuter.

No. 3. Tansy  
(\textit{Tanacetum vulgare}, L.)

\(a\), Tubular disk floret, \(5\)-toothed, male.  
\(b\), Tubular ray floret, \(3\)-toothed, female.  
\(c\), Achene, without pappus.  
\(d\), Upper part of plant, with \(2\)-pinnatifid alternate leaves and flowerhead in corymb with involucral bracts in many rows.

No. 4. Groundsel  
(\textit{Senecio vulgaris}, L.)

\(a\), Tubular floret, with achene, and pappus.  
\(b\), Achene, with pappus.  
\(c\), Section through involucre, with bracts below.  
\(d\), Upper part of plant, with alternate \(2\)-pinnatifid leaves, and flowerheads in corymb.

No. 5. Burdock  
(\textit{Arctium minus}, Bernh.)

\(a\), Floret, with bell-shaped corolla and inferior achene with short pappus.  
\(b\), Achene.  
\(c\), Bracts from involucre, with hooked tips.  
\(d\), Upper part of plant, with upper stem-leaves and flowerheads, with spinose involucre in the axils, in raceme.

No. 6. Musk Thistle  
(\textit{Carduus nutans}, L.)

\(a\), Tubular floret, with achene, and many-seriate pappus.  
\(b\), Achene with pappus.  
\(c\), Upper part of plant, with leaves with spinose teeth and dropping flowerheads with outer spreading involucre, with spinous phyllaries and inner ones turned back.
FLOWERS OF WASTE PLACES, ETC.

1. Goutweed (E. peduncularis, L.).
2. Stinging Mayweed (Chelidonium majus, L.).
3. Tansy (Tanacetum vulgare, L.).
4. Groundsel (Senecio vulgaris, L.).
5. Barlock (Artemisia nunis, Benin).
_Agopodium_. Linnaeus, is from the Greek αἷ, aigos, goat, and πόδος, podos, a foot, from the shape of the leaf. _Podagraria_, Lobel, is derived from the Latin word for gout, _podagra_. The plant is called Achweed, Aise, Aiseweed, Aishweed, Wild Alder, Ground Ash, Ashweed, Ayshweed, Bishop's Elder, Bishop's Weed, Dog Eller, Dwarf Elder, Wild or Ground Elder, Farmer's Plague, Garden Plague, Goat-weed, Goutweed, Gout-wort, Herb Gerard, Jack-jump-about, Jump-about, Kesh, Setfoil, Weyl Esh, White Ash. The name Wild Alder is applied from a superficial resemblance to the leaves of the Alder. The name Farmer's Plague, &c., refers to the difficulty of eradicating it; so, too, Garden Plague. The common name Goutweed is due to the reputed virtue of the plant in curing gout. The name Herb Gerard is given because St. Gerard was formerly invoked against gout.

Goutweed was introduced and much cultivated in the Middle Ages. The smell is like _Angelica_. It used to be eaten as a spring salad. In spite of its reputed use for gout it was not so employed in Chaucer's time.

Essential Specific Characters:—

125. _Agopodium Podagraria_, L.—Rhizome creeping, stem erect, hollow, furrowed, leaves ternate, serrate, radical, unequal at base, flowers white, in terminal umbel, bractless, fruit ovoid.

Stinking Mayweed (_Anthemis Cotula_, L.)

A familiar cornfield pest (to the farmer at least), Stinking Mayweed is found in Europe, North Africa, Siberia, West Asia, and has been introduced into North America. It is unknown in early deposits. In Great Britain it is found in the Peninsula, Channel, Thames, Anglia and Severn provinces, except in West Gloucs and Monmouth; in Wales in Brecon, Carmarthen, Pembroke, Carnarvon, Denbigh, Flint, Anglesea; in the Trent, Mersey, Humber, Tyne, and Lakes provinces, except in Westmorland; and in Dumfries, Lanark, Roxburgh, Haddington, Edinburgh, Fife, Dumbarton, Hebrides. It is thus rare in the N. of England and in Scotland. It is common in Ireland, except in the N.W. of Ireland. Watson regarded it as a colonist.

Stinking Mayweed is confined almost entirely to cultivated ground, being common in cornfields and other arable tracts, and also on waste ground, in gardens, and allotments. It may be found near hayricks or cattle-sheds, stackyards, and farmyards, being always a follower of the plough.
This plant generally grows in a solitary manner, with one or more at most associated. The stems are erect, with few branches. The leaves are stalkless, alternate, many times divided nearly to the base, with linear, awl-shaped segments, smooth, and dark-green. The florets of the receptacle are yellow, those of the ray white. The receptacle is conical. The phyllaries are bristle-like, and shorter than the disk florets, which are flat. There is no pappus. There is a scale between each two florets. The fruit, an achene, is strongly ribbed on the back. The height of the stem is 1 ft. The Stinking Mayweed flowers from June to September. It is annual, and multiplied by seeds.

The ray florets are white and neuter, with neither stamens nor pistil; the disk florets are flattened, bisexual, the tubes terminating in 5 teeth. The flowers are strong-scented, with a disagreeable smell. The flowers are conspicuous, and the plant is likely to be cross-pollinated frequently when not (as is usual) growing amid corn. The fruit is winged or ribbed, assisting in its dispersal by aid of the wind. The disagreeable taste and smell, in which it differs from *Matricaria inodora*, may serve as a protection against animals.
A sand soil is the chief requirement of Stinking Mayweed, but it is also satisfied with rock soils of many different types and ages.

A beetle, *Apion sorbi*, and three moths, Chamomile Shark (*Cucullia chamomilla*), *Euplectia anthemidiana*, and *Lozopera smeathmanniana*, live on it.

*Aethemis* is from the Greek *anthos*, a flower; and *Cotula*, Brunfels, is a Greek word for a small cup or hollow vessel.

The names by which it is chiefly known are Balder Brae, Baldeye-brow, Camomile, Dog's or Stinking Camomile, Camovyne, Dog or Horse Daisy, Dog-binder, Dog-fennel, Dog-finkle, Flowan, Hog's Fennel, Jayweed, Madder, Madenwede, Marse, Marg, Mathes, Mayweed, Morgan, Murg, Poison Daisy. Balder's Brae, i.e. Baldur's Brow, refers to the white brow of Baldur, the popular northern deity, given in Sweden. The prose Edda speaking of Baldur says: “So fair and dazzling is he in form and features that rays of light seem to issue from him, and thou mayst have some idea of his beauty when I tell thee that the whitest of all plants is called Baldur's Brow”.

This plant was once used for hysteria, haemorrhage, swellings, scrofula, rheumatism. It is acrid.

**Essential Specific Characters:**

158. *Anthemis Cotula*, L.—Stem branched, erect, furrowed, angular, leaves bipinnatifid, glabrous, linear segments, flowerheads white, with yellow disk, ray florets without styles, phyllaries with membranous margins.

**Tansy** (*Tanacetum vulgare*, L.)

Usually associated with cultivation or gardens, this plant has been met with in Early Glacial beds at Beeston, Norfolk, at the base of the Arctic freshwater bed. It is found in the North Temperate and Arctic Zones in Arctic Europe, Siberia, N.W. America, and has been introduced into the United States. It is general in Great Britain, but is not found in Cardigan, Flint, Mid Lancs, Linlithgow, Main Argyle, Dumbarton, and is often naturalized. In Scotland it is doubtfully wild, and certainly not so in Ireland.

Tansy is one of the plants whose status is very doubtful. It may be found by the side of a stream in an apparently native station, or by the roadside at a distance from a house, or along the hedgerows, in fields of corn, where it has been said to be a pest, difficult to eradicate. At other times it turns up on waste ground, and is then undoubtedly a straggler from elsewhere. It is often to be seen growing in cottage gardens.
FLOWERS OF WASTE PLACES, ETC.

The robust, upright, usually simple, smooth stem of the Tansy, with its leaflets divided almost to the base with finely toothed segments, is very characteristic in its habit. It grows in bushy clumps, excluding all other tender vegetation.

The small yellowish flowerheads are arranged in a terminal corymb, the florets are all tubular, or if ligulate longer than the others, and are flat or slightly convex, like buttons. There are no bracts upon the flower-stalks. The inner bracts of the involucre are blunt, the outer not so long, tough, with a membranous margin, scarious. The fruit is inversely egg-shaped and 5-ribbed.

The stems are usually 2 ft. high. Flowers may be sought in July and August. It is a herbaceous perennial, increased by division of roots, and often cultivated.

There are several hundred florets which form a flat disk, with no ray florets. It is thus, in spite of the absence of the latter, rendered conspicuous and accessible to insects, which can pass over the whole surface and cross-pollinate many florets together, which pollen-seekers find an advantage, and this causes the flower in turn to be much sought after. The honey is easily got at, because the tube is only 1 mm. deep. The style aids the simultaneous cross-pollination by insect visitors. It has a capitate tuft of spreading hairs, and in the first stage presses the pollen out of the cylinder, raising it so that it is swept off by insects, and in the second stage the two lobes spread out with papillae on the inner side. Tansy is visited by the Hymenoptera, *Apis, Colletes, Halictus, Andrena, Sphaecodes, Dinictus, Mellinus, Crabro, Odynerus*; Diptera, *Odontomyia, Eristalis, Syrphus, Syrtila, Melithreptes, Sarcoptera*; Lepidoptera, *Polyommatus, Vanessa, Hadenia, Botis*; Coleo-
ptera, Coccinella; Hemiptera, several species of Thrips; Neuroptera, Panorpa.

Though there is no pappus the achenes have a membrane, and are aided by this means by the wind in their dispersal. This plant grows on sand soil, being a sand-loving plant, or on alluvium on sandy loam.

A fungus, 

A fungus, 

Though there is no pappus the achenes have a membrane, and are aided by this means by the wind in their dispersal. This plant grows on sand soil, being a sand-loving plant, or on alluvium on sandy loam.

A fungus, Puccinia tanaceti, the sun-flower rust, may be found on the leaves.

Three beetles, Chrysoniela graminis, C. menthastri, Adimonia tanaceti; a Hymenopterous insect, Colletes fodiens; several Lepidoptera, Ringed Carpet (Boarmia cinctaria), Essex Emerald (Geometra sнаuragdaria), Cleodora striatella, Pterophorus dichrodactylus, Dicrophora alpinana, D. tanaceti; a Homopterous insect, Phytocoris ulmi; and 4 Heteroptera, Caniptobrochis tubescens, Orthocephalus mutabilis, Macrocolpus molliculus, and M. tanaceti, are found on it.

Tanacetum. Pliny, originally Аthanasia, or immortality, of which it is a corruption, is from the Greek, thanatos, death; and the second Latin name emphasizes its universal character.

Tansy is also called Bachelor's Buttons, Buttons, Bitter Buttons, English Cost, Fern (Parsley, Scented), Ginger, Ginger-plant, Joynson's Remedy Cheese, Tansy. It is called Scented Fern from its fern-like leaves and scented smell, and Bitter Buttons from the shape of the flowerheads and bitter taste of the whole plant.

The smell is strong and aromatic. The plant is very bitter, and is regarded as a stimulant and carminative. The seeds were supposed to be sudorific. It is said to drive away bugs. A distilled water and bitter for stomach complaints are made from it. The young leaves are shredded, and used to give colour and flavour to puddings, omelets, and cakes. The curled variety is used for garnishing. It is frequently grown in the garden.

Essential Specific Characters:

161. Tanacetum vulgare, L.—Stem erect, rigid, leafy, dark-green, leaves bipinnatifid, leaflets serrate, flowerheads numerous, yellow, corymbose, terminal, outer florets longer than phyllaries.

Groundsel (Senecio vulgaris, L.)

Common and widespread, but obviously connected with the pursuit of agriculture, Groundsel is not represented in ancient deposits. In the North Temperate and Arctic Zones it is found in Arctic Europe and N. Africa, and it has been recently introduced into other parts in the Temperate regions of the globe. Groundsel is found in every part
of Great Britain as far North as Scotland, and it is found in Northumberland growing at altitudes of 1000 ft., and in Ireland and the Channel Islands.

Groundsel is so familiar a plant and so cosmopolitan that one can hardly describe its habitat in brief, for it is found in a great variety of stations. It is essentially, however, a plant of cultivated ground, coming up in cornfields, turnip fields, in the farmyard, stackyard, garden, and on every description of waste ground, being one of those dominant species that ousts all else in its neighbourhood.

The plant is erect in habit. It may be downy or hairless, and is an extremely polymorphic species, numerous forms having been described by Professor A. H. Trow. The plant is succulent, with numerous fibrous rootlets. The stem is branched from the base, and glandless, like the rest of the plant. The leaves are deeply divided nearly to the base, half-clasping, the lobes distant, oblong, blunt, variable, with acute, irregular, coarse, unequal teeth, like the rachis and auricles. The lower leaves are stalked.

The flowerheads are few, small, drooping, hairless in a clustered raceme, oblong, cylindrical, and after flowering conical. The florets are all disk florets and yellow. The outer phyllaries are very short, and closely pressed, with black points, dark, egg-shaped to awl-like, many. There are usually no ligules. The fruit is ribbed, silky.

Groundsel is about a foot in height. It is to be found in flower all the year round. Propagation is effected by fruit, the plant being an annual and herbaceous. In the Alps it is perennial.

The capitulum is made up of 60-80 florets. They are all usually tubular, bisexual. The tube is $3\frac{1}{2}$ to 4 mm. long, the throat 1 to $1\frac{1}{2}$
mm. long. Honey rises in the tube as far as the throat, and can be readily obtained by short-lipped insects. The flowerheads are small, 4 mm. across, and are not generally rayed, so that they are not conspicuous, and few insects save Syrta, Pyrocoris, Holictus, Heriades, visit it. The plant is frequently self-pollinated. Hairs at the tip of the style sweep out the pollen grains, and they lie on the edge of the stigmas and fall on the inner surface when they separate. The plant is self-fertile. But fruit produced by cross-pollination has been shown by Bateson to be more vigorous than that derived from self-fertile plants.

The fruit is provided with pappus, and adapted for wind dispersal. The achenes have short, closely-appressed hairs which secrete runners. It is largely a sand-loving plant, and addicted chiefly to a sand soil.

There are two minute fungi which are to be found upon it, Thielavia basicola and Coleosporium senecionis. The plant is galled by Urophora macruna. The other stage of the second fungus grows on fir trees. A beetle, Longitarus holstaciens; 6 Hymenoptera, Colletes fodiens, C. daviesana, Andrena tridentata, A. denticutata. Nomada solidaginis, N. jacobaeae; 4 Lepidoptera, Silver Y-Moth (Plusia iota), P. pulchrina, Lime Speck (Eupithecia centurata), Wormwood Pug (E. absynthiata); a Heteropterous insect, Lopus subatus; and two flies, Tiferica Westermannii and Chromatomyia albiceps, visit it.

Senecio, Pliny, is from sacer, Latin for an old man, from its white pappus; and the second name (Latin) refers to its ubiquity.

Groundsel is called Bird Seed, Chickenweed, Chinchone, Grinning Swallow, Grinsel, Groundsel, Grunsel, Grundsel, Grunnishule, Sencion, Simson, Swichen. Grinning Swallow is a corruption of groundsel or grunswelge in Scotland, grundiewally, grundiewallow.

The Scottish Highlanders use it for the evil eye. Groundsel was said to have been the Virgin’s bed. The plant has been used as a charm against ague. In the fifteenth century it was cultivated, and used for various complaints.

Essential Specific Characters:—

165. Senecio vulgaris. Stem erect, branched, glabrous or downy, leaves half-clasping, lobed, dentate, not viscid, flowerheads yellow, in drooping heads, rayless, outer phyllaries short, with black points.
Burdock (Arctium minus, Bernh.)

Hardy and dominant, this plant has not been recognized in the early deposits preceding the present day.

It is confined to the Temperate Zone, and found in Europe, and N. and W. Asia. It is introduced in N. America. In Great Britain it is absent in N. Devon, in the Peninsula province; N. Hants, in the Channel province; E. Kent, in the Thames province; Bedford, in Anglia; W. Gloucs, Worcester, in the Severn province; in Wales, in Glamorgan, Pembroke, Cardigan, Carnarvon, Denbigh, Anglesea. In the Trent province it occurs in Leicester and Derby; in the Mersey province, not in Mid Lancs; in the Humber province, not in S.E. or N.W. Yorkshire; in the Tyne province, in Cumberland; not in Renfrew and Lanark in W. Lowlands; in Berwick, Haddington, Edinburgh, Linlithgow, Fife, West Perth, Forfar, S. and N. Aberdeen, Banff, Elgin, Easterness, Clyde Is., W. Highlands except Dumbarton, Ross, W. Sutherland, Hebrides as far north as Skye.

Burdock is a common weed found in waste places and on the borders of cultivated fields. It owes its wide distribution to its hardihood, and in the struggle for existence ousts, like many Docks and other quick-growing and sturdy plants, the smaller tenderer species.

This plant is tall and erect in habit. The species, as denoted by the specific name (minus), has leaves and flowerheads not so large as those of the other species.

The central stem is nodding, and with the branches bears scattered small heads, the terminal one being solitary. The leaves are heart-shaped, large, stalked, the radical leaves being coarsely toothed. The leaf-stalks are hollow, slightly angular, nearly round in section, and slightly furrowed.

The flowerheads are in a corymbose raceme on short stalks, globular, cottony, greenish, webbed in fruit, are slightly contracted at the mouth, and are not umbilicate. The phyllaries are not so long as the florets, awl-like, the inner row as long and gradually awl-like, more or less cylindrical. The upper part of the floret is as long as the lower. The fruit is brown with black blotches.

This plant may be 3–4 ft. high. It flowers in July and August. Lesser Burdock is biennial, and reproduced by seeds.

The tube of the corolla is narrow, the limb bell-shaped, with 5 slender lobes. The filaments are papillose. There is a long terminal appendage to the anthers, and the cells have a slender
awl-like tail. The arms of the style are united below, downy below, blunt. The throat of the corolla is 3 mm. long, the teeth erect, triangular, 1 mm. long. Honey is abundant, and lies in the tube to half the depth or more. The style arms are 1 mm. long, the papillae colourless, and the outer surface, which is of a violet colour, is covered with short, sharp hairs directed obliquely upwards. This prevents the honey being spoilt by rain or creeping insects, and has another significance also. For the hairs extend some way below where the forks of
the style commence, and end in a ring of longer hairs. The style projects from the anther cylinder 1-2 mm. below the ring of longer hairs, and the 2 stigmatic lobes are spreading. Hence pollen cannot fall on the stigma, and the plant is usually cross-pollinated. The visitors are Bombus agrorum, Halictus longulus.

The burs are provided with hooks which catch in the coats of animals and are thus dispersed, the plant on recoiling shooting the burs a distance. The achenes are also provided with a pappus and can be dispersed by the wind.

A sandy soil in which there is some little humus best suits Burdock, which is to be found on a variety of rock soil, and may be frequently met with also on a clay soil.

A fungus, Puccinia hieracii, may be found on it, and it is galled by Tephritis bardane.

The moths Agrotis rhomboidalis, Depressaria arenella, also the Ghost Swift (Hepialus humuli), Frosted Orange (Gortyna flavago), Argyrotaenia badiana, Parasia tappella, Pterophorus galactodactylius, and the flies Trypetla cornuta and Chromatomyia nigra are found upon it.

Arctium, Dioscorides, is from the Greek arctos, bear, from the coarse texture of the involucres; and the second Latin name refers to the size of the heads. The plant has been used as a remedy for rheumatism.

Essential Specific Characters:—

168. Arctium minus, Bernh.—Stem tall, nutant, branched, leaves large, cordate, stalks hollow, flowers in rounded heads, purple, in raceme, on short stalks, phyllaries less than the florets.

**Musk Thistle** (Carduus nutans, L.)

This plant is found throughout the North Temperate Zone in Europe, N. Africa, Siberia, and has been introduced into North America. It is unknown in any early beds. In Great Britain it occurs throughout the Peninsula, Channel, Thames, Anglia, and Severn provinces; not in Radnor or Cardigan in S. Wales; Montgomery or Merioneth in N. Wales; throughout the Trent, Chester, Humber, Tyne, Lakes districts, except in the Isle of Man; in Lanark: not in Peebles, Selkirk, or Linlithgow in E. Lowlands; in Stirling, Kincardine, and Perth; Elgin, N. Ebudes, Ross, and Shetland: or from Skye and Moray southward, ascending to 1600 ft. in Yorks.

The Musk Thistle is a conspicuous denizen of waste ground, rubbish heaps, growing near houses, and generally being a decided
MUSK THISTLE

follower of man. It also grows largely on sandy, hilly ground, hybridizing with other species and growing gregariously.

It is tall, erect, the stem being grooved, with wavy wings, very spinose, and cottony. The leaves at the base run down the stem. They are spinous, lance-shaped, hairy, with woolly veins below, and deeply lobed. The spines serve as a protection against animals.

The flowers are drooping, purple, with lance-shaped acute phyllaries.

The scales taper to a rigid point. The outer phyllaries are turned back. The florets are tubular, complete, and have scales at the base.

The height varies from 2-3 ft. Musk Thistle flowers in July and August. It is a herbaceous annual and multiplied by seeds.

The flowers are bisexual, with tubular corollas, the tube widened at the top, and short, so accessible to short-lipped insects. The anthers bear linear appendages, and the style arms are united to form a column with a ring of hairs at the base. The flowerheads are large and conspicuous, and there is abundance of honey and pollen. The plant is visited by Bombus hortorum, B. pratorum, B. vestalis, Haliocnus cylindricus, H. malachurus, and the Narrow-bordered Five-spotted Burnet (Zygaena lonicera).
The Musk Thistle is provided with abundant threadlike pappus to assist in the dispersal of the achenes by the wind.

The Musk Thistle is a sand-loving plant, fond of sand soil, and is abundant on Great Chalky Boulder Clay and Marlstone, which afford arenaceous and somewhat chalky subsoils. It occurs also on limestones commonly and chalk.

A fungus, Bremia lactucae, is found on the leaves of this and other thistles. The beetles Psyliodes chalcogera, Sphaeroderma testacea, Rhinocyllus latirostris, Lepidoptera, Painted Lady (Pyrameis cardui), Grapholitha scutulana, a Hemipterous insect, Monanthia cardui, and the flies Cheilosia cyancephala, Cephora solstitialis, feed on this plant.

Carditis, Pliny, is Latin for thistle, and the second Latin name refers to its nodding heads.

This plant is called Queen Ann’s Thistle, Bank, Buck, Musk, and Scotch Thistle. It is called Musk Thistle because of its scent.

To divine who loved her most, a young woman took three or four heads of thistles, cut off their points, and assigned to each thistle the name of an admirer, and laid them under her pillow. The thistle which first put forth a fresh sprout denoted the man who loved her most. It is lucky to dream of thistles, and to be surrounded by them is propitious, foretelling one will have before long some pleasant intelligence. It was sacred to Thor and worn about the body, and said to be useful in healing. The dried flowers have been used to curdle milk. The seeds are used as bird-seed.

Essential Specific Characters:

169. Carditis nutans, L. Stem single, grooved, winged, leaves lanceolate, spinous, decurrent, downy, flowers purple, red, in drooping heads, solitary, scales tapered to a rigid point, cottony, the outer ones recurved, pappus rough.

Spear Thistle (Cnicus lanceolatus, Willd.)

Unlike the Musk Thistle the Spear Thistle is found in Interglacial beds in Sussex, and Neolithic beds at Edinburgh and in Fife. It is now a plant of the North Temperate Zone, found in Europe, N. Africa, Siberia, and it is introduced in N. America. In Great Britain it is universally common.

The Spear Thistle is found on waste ground in or near villages and towns, about houses or farmyards. But it is also widely dispersed elsewhere, growing in fields and meadows, on upland pastures and hillsides, and in valleys. It is a familiar sight with other thistles by the wayside.
No. 1. Spear Thistle
(Chicus lanceolatus, Wild.)

- Tubular floret, with achene and feathery pappus.
- Achene, with pappus.
- Pappus, enlarged.
- Upper part of stem, with wings, and pinnatifid leaves with cotton below, and spinose lobes, and flowerhead with cottony involucre, with spinose phyllaries.

No. 2. Milk Thistle
(Silybum marianum, Gaertn.)

- Tubular floret, with achene and many-serial pappus.
- Achene, with pappus.
- Upper part of plant, with pinnatifid spinose leaves, and flowerhead with involucre, with long spines, and outer ones with spinous teeth.

No. 3. Chicory
(Cichorium intybus, L.)

- Ligulate floret.
- Achene, with scale-like pappus.
- Upper part of plant, with flowerheads in axils, the lower expanded, showing ligulate florets and style branches.

No. 4. Hawk's Beard
(Chelis viridis, L.)

- Ligulate floret, with achene with pappus.
- Achene, with pappus in several series.
- Radical runcinate leaf.
- Upper part of plant, with pinnatisect stem-leaves, and flowerheads in panicled cyme.

No. 5. Hound's Tongue
(Cynoglossum officinale, L.)

- Corolla, funnel-shaped, cut open to show epipetalous stamens.
- 4 nutlets, within 2-fid persistent calyx.
- Thickened border of nutlet to show hooked hristles.
- Upper part of plant, with alternate lance-shaped leaves, and flowers in forked cyme, the lower with nutlets within calyx.

No. 6. Viper's Bugloss
(Echium vulgare, L.)

- Corolla (funnel-shaped) cut open to show 5 epipetalous stamens.
- Calyx, gynoecious, enclosing nutlets with long persistent style, and 2-fid stigmas.
- 4 nutlets, with persistent style.
- Upper part of plant, with inflorescence with flowers in a panicked cyme, the flowers red-purple in bud, expanded ones blue, showing stamens and style inserted, included.
1. Spear Thistle (Cirsium lanceolatus, Wild.).
2. Milk Thistle (Silybum marianum, Gaertn.).
3. Chicory (Cichorium intybus, L.).
4. Hawk’s Beard (Crepis virginica, L.).
5. Hound’s Tongue (Cynoglossum officinale, L.).
This is one of our finest, tallest, and strongest thistles. The Spear Thistle is tall and erect in habit. The stem is erect, stout, hairy, furrowed, with strong spinous wings. The leaves are inversely egg-shaped, lance-shaped, deeply divided nearly to the base, running down the stem, white and cottony below, the lobes large, few, divided into two nearly to the base, the segments entire, lance-shaped, with stout long spines. The flower-stalk is short. The florets are purple.

The flowerhead is large, not so cottony as in woolly-headed Thistle, terminal, solitary or 2-3, in groups, erect. The involucre is egg-shaped, shaggy, cottony, the phyllaries lance-shaped, awl-like, with a strong midrib, spreading, spinous, the spines long. The fruit is striped, smooth, shining. The pappus is feathery.

Spear Thistle is about 3 ft. high. Flowers are found from June to September. The plant is a deciduous herbaceous plant, biennial, propagated by seeds.

The flowerheads are much as in *C. arenaria*, but the honey is not so accessible. The narrow tubes of the florets and involucre are much

1 Not improbably these radical leaves belong to the Marsh Thistle, but the photo, shows the similar rosette habit of Spear Thistle at this stage.
longer (16–18 mm.), and thus have no effect on the possibility of reaching the honey; but the throat where the honey collects is much longer, and is 4–6 mm. instead of 1–1½ mm. In the former, insect visitors are less varied. It is visited more particularly by long-tongued bumble bees and honey bees, butterflies, and flies, Bombus terrestris, B. agrorum, B. lapidarius, B. campestris, Megachile, Polistes gracilis, Eristalis tenax, and E. arbustorum, E. memorum, Pieris brassicae, Hesperia.

The pappus is feathery, and the achenes thus well adapted to wind dispersal.

This handsome Thistle is more or less a clay-loving plant growing on a clay soil, but will also subsist on sand soil or sandy loam.

It is infested by the cluster-cup fungi Puccinia hiraci, P. cardui.

Three Hymenoptera, Andrena filipes, A. denticularus, Megachile lignisca; Lepidoptera, Conchylis dubitana, Myelois cribrella, Gelechia acuminatella, Painted Lady (Pyrameis cardui), Catoptilia scopolianna, Cnephasia octomaculana, Argyrolepia cnicana, Xanthoseta humana, Depressaria arenella, P. propinqua, D. Carduella, &c.; and the flies Lonchaea nigra, Cheilosia variabilis, feed upon it.

Cnicus. Tournefort, is Greek for a thistle-like plant, and the second Latin name refers to the shape of the leaves.

Names by which it is known include Bow Fistle, Bur, Cheese, Dashel, Marian, Quat Vessel (Bank, Bell, Bird, Blue, Boar, Bow, Buck, Bull, Bur, Horse, Scotch Thistle). The first name was given because goldfinches feed on the seeds. Boar Thistle refers to the strong prickles. Children blow the pappus, saying:

"Marian, Marian, what's the time of day?
One o'clock, two o'clock, it's time we were away".

**Essential Specific Characters:**

170. Cnicus lanceolatus, Willd.—Stem tall, winged, leaves hairy, lanceolate, decurrent, obovate, pinnatifid, lobes spinose, bifid, flower-heads purple, scales woolly, spreading, lanceolate, involucres ovate, pappus feathery.

**Milk Thistle** (Silybum marianum, Gaertn.)

The distribution of Milk Thistle is limited to Europe from Holland southwards. It is unknown in early deposits. It is, moreover, not a native of Britain, and in Scotland and Ireland is quite rare.

The Milk Thistle is really only an introduction. It is found on waste ground, or in gardens where it has been sown with garden
seed, or dispersed in the same way as weeds, such as Mallow, Tansy, Wormwood, Chicory, Borage, Mullein, and other casualties.

The stems are thick at the base, branched, rather tall, with cottony down, ribbed, furrowed, and leafless above. The radical leaves are spreading and prostrate, tripinnate, sinuate, shining, with spinose margin, and with white, net-like veins, the stem-leaves clasping the stem.

The flowerheads, which are large and solitary, are purple and globose. The phyllaries are leaf-like below, closely associated, then spreading and bent back, spinous at the margin, leathery, broad, and with one long terminal spine. The receptacle is fleshy and hairy. The fruit is oblong, transversely wrinkled, black, with white pappus, growing obliquely. The seeds contain oil for emulsion and are used as bird-seed.

The plant grows to a height of 5 ft. The flowers open in July. Like Cotton Thistle it is a herbaceous triennial, and may be reproduced by seed. It is worth cultivating.

The flowers contain honey, and the tube is long and slender but enlarged above. The flower-head is like Carduus, rather large, rose-colour, with anther-stalks united into a sheath. Being of casual occurrence, observations on the number of visitors are wanting.

The achenes are large and provided with a pappus, which enables them to be dispersed by aid of the wind.

Milk Thistle is more or less a sand-loving plant or addicted to a sand soil or sand loam.

Sīlybum, Dioscorides, is the Greek name for an edible thistle; marianus, Linnaeus, is from the Virgin Mary, and refers to a legend that drops of her milk fell on the leaves and caused the spotting. Milk Thistle is a common name for it, in allusion to the markings (white veins or spots) of the leaves and the milky juice. From its numerous
sharp prickles it was recommended for "stitch" or pain in the side. The achenes are large and contain oil, formerly used for emulsion, and have also been used as food for goldfinches and other birds.

The plant was formerly cultivated, the young leaves being used as a salad in spring, or boiled. The young stalks were peeled, and soaked in water to make them less bitter. The second spring the root is eaten like salsify, and the receptacle is pulpy, tasting (and being eaten) like artichokes.

Essential Specific Characters:—

173. *Silybum marianum*, Gaertn.—Stem stout, rigid, branched, leaves oblong, wavy, amplexicaul, with white veins, sessile, glabrous, flowerheads purple, involucral spines recurved, appressed below.

**Chicory** (*Cichorium intybus*, L.)

Like other cultivated or casual plants, our knowledge of its range and age is derived from its present-day distribution in Europe, N. Africa, Siberia, N.W. India. In America it is only an introduction. In Great Britain it is found throughout the Peninsula, Channel, Thames, Anglia, Severn provinces. In S. Wales it is absent from Brecon, Radnor; in N. Wales from Montgomery and Merioneth. It is found throughout the Trent province, but not in the Mersey provinces, the Humber, Tyne, and Lakes provinces. It is rare in England, improbably native in Scotland, Ireland, and the Channel Islands.

Chicory is a casual plant which is always more or less a follower of man, being associated with weeds of cultivation. Sometimes it is found in towns, in areas fenced in as building plots, or in a cornfield, or perchance a fowl-run in an orchard.

This beautiful wild flower has a thick, yellow, milky, spindle-shaped root. The stem is rough, tall, rigid, wiry, twig-like, woody, with wide-spreading and ascending branches. The lower leaves have lobes each side of a stalk, turned backwards, slightly rough; the stem-leaves are smooth or nearly so, alternate, lance-shaped, clasping, entire, and axillary, paired, and more or less stalkless.

The flowerheads are of a beautiful blue colour, open in sunshine, but soon fading. They are stalkless, paired, borne in the axils of the upper leaves, or terminal. Linnaeus said they opened at 5 and closed at 10 at Upsala. Kerner, at Innsbruck, found them open at 6–7, closing at 2–3 p.m. The involucre is double, with lance-shaped phyllaries, broad at the base, and the outer ones are covered with a glandular fringe of hairs.
CHICORY

The stem is often 3 ft. high. The flowers are tall, blooming in July up to September. Chicory is a herbaceous perennial plant, propagated by division, coming up yearly in the same place, and worthy of cultivation.

In dull weather the flowerheads are closed, as at night also, but in the sun they expand 30 mm. The tube is 3 mm., and the limb 13 mm. long, and by this means it is rendered conspicuous in spite of the few flowers. The flowers are similar in plan to those of the Dandelion and Hawkweeds, but the branches of the style are more curved, making two spiral turns. If insects do not visit it, it pollinates itself. The honey bee, Andrena, Halictus, Osmia, Diptera, Syrphidae, Syrilla pipiens, Eristalis tenax, Lepidoptera, the Clouded Yellow Butterfly (Colias eurides), and a beetle, Malachius bipustulatus, visit it.

The pappus of the crown of minute, erect, blunt scales assists in dispersing the achenes by the wind.

Wherever it is found the requirements of Chicory are sand soil, as it is practically a sand-loving plant growing on sand soil or gravel, as well as on chalky soils or Oolite, where it may at least be native.

A fungus causing Chicory disease, Pleospora albicans, attacks it, as well as Puccinia hieracii.

Two beetles, Cassida sanguinolenta, Lacon murinus; a Thysanop-

*Cichorium* was the Latin name, and *Intybus* is *Intybus* or Endive.

This beautiful Composite is called Bunk, Chicory, Wild Cicory, Succory. Chicory is also called Harbe de capucin.

The plant served as a floral index. In Germany, a girl, "after waiting day after day for her betrothed, at last sank exhausted by the roadside and expired. Before long a star-like flower sprang up on the spot where the maiden's heart was broken and she breathed her last, and it was called the Watcher of the Road."

The plant is used for Chicory for adulterating coffee. The root is roasted and crushed. The root is boiled and eaten, and the leaves also when blanched. It was formerly used in skin troubles and chronic disorders, and as a cooling medicine.

**Essential Specific Characters:**

176. *Cichorium Intybus*, L.—Stem tall, rigid, striate, bristly, branched, lower leaves runcinate, upper clasping, flowerheads blue, numerous, axillary, subsessile.

**Hawk's Beard** (*Crepis virens*, L. = *C. capillaris*, Wallr.)

This common Composite is known from Neolithic beds at Redhill, near Edinburgh, so there can be no doubt as to its being native. It is found in the North Temperate Zone from Denmark southwards in Europe, and in the Canaries. In Great Britain Hawk's Beard is found in all parts from Caithness to the south coast. It even ascends to a height of 1350 ft. in Derby. It is found in Ireland and the Channel Islands.

Hawk's Beard is a common weed in many different types of habitat, but perhaps the most certain place in which to search for it is waste ground, where with Groundsel and Shepherd's Purse one is almost certain to find it. It also grows in gardens and along the roadside. It is very frequent along most hedgerows with Nipplewort, and grows commonly on all cultivated ground, in cornfields, &c. It is found as well on wall-tops and the roofs of mud and thatched houses.

Very commonly confused with other Composites, Hawk's Beard may be known by the shape of its flowerheads, small fruits, involucre, and the clasping leaves. The stem is erect, branched, angular, finely furrowed, with radical leaves like the Dandelion.
narrower, with a purple midrib, clasping stem-leaves, which are acute, toothed, with the inrolled margins and the lobes bent back.

The flowerheads are yellow, numerous, in a downy involucre, with the outer bracts narrow, linear, widely spreading or closely associated, the inner ones smooth within. The fruit is shorter than the pappus, which is silky.

Hawk's Beard is 6 in. to 3 ft. in height. Flowers may be found in June and July. It is an annual, herbaceous, and increased by seeds.

The flowerhead is large and conspicuous, and the plant is visited by many insects. The corolla is ligulate, bell-shaped, yellow, the florets being hermaphrodite. The stamens are borne on hair-like anther-stalks with the anthers united into a cylinder. The arms of the style are slender, the upper part hairy, and as long as the stamens. The 2 stigmas are turned back. The visitors are Hymenoptera, Panurgus, Rhophites, Dasypoda, Andrena, Halictus, Diptera, Syrphidae, Eristalis, Melithreptus, Syrphus, Cheilosia, Conopidae, Sicus, Colcoptera, Mordelliidae, Mordella.

The white pappus is in many rows, and assists in the dispersal of the fruit by the wind.

Hawk's Beard is addicted to a sand soil, and is more or less strictly a sand-loving plant.

Like other Composites, Hawk's Beard is attacked by a fungus, Puccinia hieracii. A Hymenopterous insect, Halictus vitiosus, is found upon it.

*Crepis*, Pliny, is from the Greek *crepis*, a kind of boot; and the second Latin name means green, fresh. It was called Hawkbit because the hawk was supposed to pluck it and smear its eyes with it to improve its vision.
Essential Specific Characters:

178. Crepis virens, Wallr. = Stem erect, furrowed, glabrous, branched, radical leaves lyrate, stem-leaves linear, sagittate, flower-heads yellow, outer phyllaries linear, inner glabrous inside, fruit shorter than pappus.

Hound’s Tongue (Cynoglossum officinale, L.)

This is one of the southern types, not usually found in ancient deposits. To-day it is found in Europe, N. Africa, Siberia, eastward to Asia, and it has been introduced into the United States. In Great Britain it has been found in the Peninsula province, Channel, Thames, Anglia provinces; Severn province; not in Brecon, Radnor, or Cardigan, in S. Wales; Montgomery, in N. Wales; Trent province; Mersey, Humber, Tyne, Lakes provinces, except L. of Man; E. Lowlands, except Peebles, Selkirk, Roxburgh; E. Highlands, except Stirling, S. Perth, Aberdeen, Banff, Elgin, Easterness. It is rare in Ireland.

Hound’s Tongue is really a plant of the fields, but is found commonly in waste places. It grows by the sea-coast on sandy dunes. It is to be found surviving on the kitchen-middens of old houses. It is often extensively spread in parks and similar places. Its status at best is that of such plants as Burdock, Borage, Comfrey, Henbane, Deadly Nightshade, and others.

The first Greek name, and its English equivalent, refer to the characteristic shape of the leaves of this plant, which is upright, tall, and leafy, the stem being rarely branched at the top, angular, very downy, with short close hairs, with long root, radical leaves, stalked, egg-shaped to acute, downy with silky, greyish, closely appressed hairs, both sides, the stem-leaves stalkless, lance-shaped, and heart-shaped below.

The reddish, purple-veined flowers are borne in long cymes, on curved-back flower-stalks which are downy and alternate. The calyx lobes are blunt, shiny within. The corolla is half as long as the calyx, and funnel-shaped. The capsules are flat, prickly, and catch in the wool of animals.

The plant is 2 ft. high. It flowers in June and July, and is biennial, propagated by seeds, and worth a place in the garden.

The corolla is monopetalous, and the mouth is closed by 5 scales, which are purple, swollen above, on the edge of the tube, and half as long as the limb, and perforated. The anthers are below the nectaries.
which form a roof above, on short anther-stalks, oblong and green. The style is tapered, and not as long as the stamens, which are included. The stigma is blunt and notched. Hound’s Tongue is thus adapted to cross-pollination with insect-visits, but self-pollination without.

The nuts are covered with spines or short-hooked prickles which aid in their dispersal by animals.

Hound’s Tongue is sometimes a halophyte, living on a saline soil, at others a sand-loving plant, when it is found on sand soil.

Several beetles, Meligethes marinus, M. obscurus, Longitarsus anchusae, L. quadriguttatus, Phyllotreta f.-pustulata, Teinodactyla holstatica, and a fly, Xydomyza lateralis, are found upon it.

*Cynoglossum* Dioscorides, is from the Greek, κυων, dog, γλῶσσα, tongue, from the form or texture of the leaf. The second name refers to its use in medicine.

Dog’s-tongue, Gipsy Flower, Hound’s-tongue, Rose Noble, Sea-khead, are all names bestowed upon it. Turner, to explain the name Hound’s Tongue, says: “it is good against the biting of mad doggs”.

It was supposed to have the power to prevent dogs barking at a person if laid beneath their feet, and Gerard says that “wild goats or deer, when they be wounded with arrows, do shake them out by eating of this plant, and heal their wounds”. It has a smell of mice. Being astringent it was used in medicine. Hound’s Tongue is narcotic. In Chaucer’s day the plant was recommended for stuttering. It was held to be antiscorbutic. Cattle refuse it.

**Essential Specific Characters:**

213. *Cynoglossum officinale*, L.—Stem erect, stout, downy, leaves downy, lower oblong, stalked, upper lanceolate, narrow below, flowers purplish-red, veined, nuts flattened, prickly.
Viper's Bugloss (Echium vulgare, L.)

This plant is found in the Temperate Northern Zone in Europe, N. Africa, and W. Siberia, and has been introduced in N. America. There is no trace of it in any early deposits. In Great Britain it is not found in Hunts, Cardigan, I. of Man, Dumfries, Kirkcudbright, Westernness, Main Argyle, Dumbarton, Cantire, X. Ebudes (or only in Clyde Islands, and Mid Ebudes in W. Highlands), Sutherland, Orkneys, Shetlands, but elsewhere generally. It is an alien or colonist in Scotland.

Viper's Bugloss is essentially a plant of cultivated ground or of waste ground. It occurs, though rarely, in woods, where it is only an escape from these habitats. It is associated with Mayweed, Wormwood, Chicory, Mullein, Yellow and Creeping Toad Flax, and many other casuals and aliens.

It is an erect plant with a very softly-hairy, wart-covered stem, armed with prickly bristles, with narrow, lance-shaped, stiffly-hairy stem-leaves, which are stalkless, narrow below, with a single rib.

The name Bugloss, from two Greek words, is given in reference to the roughness of the stem and leaves, like an ox's tongue. The flowers are like Lungwort, pink at first, then blue, and so variegated. They are borne on four or more lateral, scorpoid cymes, and all turned one way. The calyx is longer than the tube of the corolla, as are also the projecting stamens. The cymes are bent back. The nutlets are angular and rough.

The plant is 2 ft. high. It flowers in July and August. Viper's Bugloss is a herbaceous biennial plant increased from seeds.

The flowers are conspicuous. Honey is accessible to many different insects. The flower is funnel-shaped, tubular, and is narrower below, inclined obliquely upwards, which guides the visiting insects. There are 5 stamens, the lower part adhering to the corolla, one remaining in the tube dividing it into two, while 4 are projecting and form a landing-stage for insects, which dust their abdomen with the pollen, the flowers being proterandrous, turning their pollen-covered side upwards. The stigma is small at first, less than the tube, but becomes longer than the anthers, projecting 10 mm. beyond the tube, being divided into two short branches at the end. The honey is secreted by the fleshy base of the ovary. The mouth of the corolla, where the anthers lie free, is large enough for bees to insert their heads, and for small bumble bees to insert more than half their bodies, some entering bodily.
The flowers are visited by the honey bee, Diptera and Hymenoptera, Lepidoptera, and Coleoptera. In addition to the large complete flowers there are smaller ones.

The nutlets are dispersed, after the carpels have split up into four, just round the parent plant, and so help to form clumps.

Viper's Bugloss is a lime-loving plant and grows largely on lime soil, or is a sand plant and found on sand soil.

One stage of a fungus, *Puccinia rubigo-vera*, grows on Viper's Bugloss. It is much frequented by beetles, such as *Meligethes incanus*, *M. serripes*, *M. marinus*, *M. exilis*, *Longitarsus anethus*, *L. nasturtii*, *L. evelotus*, *Coccinella mutabilis*, *Centorynchus echii*; by several Lepidoptera, *Odontia dentalis*, *Anesychia bipunctella*, *Depressaria rotun-
della, Coleophora onosmella. Marbled Clover (Heliothis dipsacaceus), Small-angle Shades (Euplexia lucipara).

_Echium_, Dioscorides, is from the Greek name of the plant or a similar one, and the second name suggests that it is of common occurrence, which is not generally so.

Bugloss means Ox Tongue because of the roughness of the leaves. The name Viper’s Bugloss is bestowed because there is some fanciful resemblance between the seeds and a viper’s head, or the spots on the stem like a viper’s skin. Blue Bottle, Blue Weed, Wild Borage, Bugloss, Viper’s Bugloss, Cat’s-tail, Blue Cat’s-tail, Viper’s Grass, Iron-weed, Langdebeef, Our Lord’s Flannel or Our Saviour’s Flannel, Snake Flower, Snake’s Bugloss, Viper’s Herb. Lyte explains the name Viper’s Bugloss by the following quaint legend: “For as the ancient Nicander writeth, Alcibiades (being asleep) was hurt with a serpent; wherefore when he awoke he saw this hearbe, he tooke of it into his mouth and chewed it, swalloweing downe the juice thereof; after that he layed the herbe being so chewed upon the sore, and was healed. It is very good against the bitings of serpents and vipers, and his seede is like the head of an adder or viper.”

Even Gerarde recommends it as an opifuge, “as it keepeth such from being stung as have drunke it before, the leaves and seeds do the same”. This mythical remedy is of course arrived at by the logic of the Doctrine of Signatures.

**Essential Specific Characters:**

219. _Echium vulgare_, L.—Stem simple, erect, rough, upper leaves lanceolate, sessile, narrow below, radical leaves ovate, stalked, flowers red then blue, in scorpioid cymes, lateral.

**Bittersweet (Solanum Dulcamara, L.)**

Poisonous and rather addicted to artificial habitats, this plant has none the less an ancient history, being found in Preglacial beds in Suffolk and Interglacial beds in Sussex. At the present day it is found in the North Temperate Zone in Europe, N. Africa, West Asia, as far east as India; and in North America it is an introduction. In Great Britain it does not grow in Cardigan, Brecon, Radnor, Montgomery, Merioneth, Peebles, Selkirk, Aberdeen, Banff, W. Highlands except Clyde Islands and Ebades; N. Highlands except E. Ross, i.e. elsewhere from Islay and Ross southward. It is found in Ireland and the Channel Islands.

Bittersweet is a plant of waste ground as well as a common hedge-
No. 1. Bittersweet
(Solanum Dulcamara, L.)
a. Transverse section of berry, showing many seeds.
b. Section of flower, showing calyx, corolla, cut back, epipetalous stamens forming cone over ovary, with long style, with obtuse stigma.
c. Seed.
d. Upper part of plant, with flowers in a cyme, showing 5-fid corolla, and anthers inserted, with style, with many reniform seeds.

No. 2. Deadly Nightshade
(Aconitum Belladonna, L.)
a. Lower part of bell-shaped corolla, with stamens inserted into filaments, incurved above, introrse.
b. Calyx, with 2-lobed berry in section, 2-celled, with many reniform seeds.
c. Upper part of plant, with ovate leaves, and solitary flowers in axil of unequal paired leaves, with bell-shaped corolla, 5-lobed, and 5-lobed calyx, and in centre 5 stamens, and exerted style.

No. 3. Henbane
(Hyoscyamus niger, L.)
a. Section of corolla (lower part), showing 5 stamens declimate, with purple anthers, introrse.
b. Capsule, 2-celled, constricted above, opening by lid above (circumciss) and 2 seeds falling out.
c. Upper part of plant, showing sinuate leaves and flowers in axils, with gamosepalous urceolate calyx (which encloses capsule) and veined corolla, 5-lobed, with anthers half exerted.

No. 4. Mullein
(Verbascum Thapsus, L.)
a. Corolla, opened out, showing epipetalous 5 stamens, with bearded filaments and confluent anther cells.
b. Pistil, with style and stigma, with 2 lamellae.
c. Capsule, opening by 2 valves and persistent calyx.
d. Spike, rather foreshortened, with flowers with 5-lobed corolla and exerted stamens and style.

No. 5. Creeping Toadflax
(Linaria repensa, Mill.)
a. Corolla (personate), with spur and yellow palate, closing the throat.
b. 4 stamens, 2 long, 2 short.
c. Capsule, with persistent style, in 5-fd calyx.
d. Pistil, with long style and notched stigma.
e. Upper part of plant, with upperstem-leaves and flowers in raceme, with bracts, in various stages, the lower fruiting, showing spur nearly parallel with corolla tube.

No. 6. Common Toadflax
(Linaria vulgaris, Mill.)
a. Section of corolla, showing personate corolla, spur, palate, and upper lip, with 2 stamens and pistil within.
b. Capsule, opening by pores, within persistent calyx, with persistent style.
c. Upper part of plant, with flowers in raceme, with bracts and showing flowers with upper and lower lip, and palate closing the tube, and spur.
row plant. Almost every road and lane is lined with its dark-blue and yellow lurid blooms in summer, climbing over the hedge. It is also found commonly along the sides of streams and water generally, where hedges flank them, for it is more or less a climbing plant.

This is a rambling, climbing plant, with a wavy stem, woody, and much branched, usually smooth, with egg-shaped, heart-shaped leaves.

the upper ones lance-shaped and spear-shaped, or clasping the stem. The stem is hollow and nearly round.

The flowers are borne in drooping cymes, which are opposite the leaves. The corolla is purple, with two rounded green spots below each petal, the mouth black. The flower-stalks are swollen at the base. The calyx is purple, and does not fall. The corolla is wheel-shaped, with 5 lance-shaped segments, and turned back. The berries, at first green, are red when ripe, egg-shaped, and poisonous.

The plant may reach a length or height of 20 ft., but is usually 3-6 ft. It flowers in June and July. It is a herbaceous perennial, reproduced by cuttings, and is worth cultivating.

There is no honey in the flower, and it is therefore but little visited by insects. *Rhingia rostrata* examines the two round, shining, green
spots in a ring at the base, or in the middle, of the shiny violet corolla below each segment which serve as honey-guides, and then strokes the tips of the anthers with its labellae. The stamens are blackish-purple, inserted on the tube of the corolla. The anthers are yellow, and form a sub-conical tube round the pistil, with a pore at the end. The greenish knobs may be pierced and sucked by insects. The style is longer than the stamens, the stigma blunt and simple. The plant is visited by pollen-collecting Bomby and pollen-feeding Syrphidae.

The berry, containing many kidney-shaped, tapered seeds, is dispersed chiefly by falling ripe on the ground in winter, but occasionally is eaten by birds and man. The seeds are pitted and rough, white, cartilaginous.

The plant is a sand plant growing in sand soil; or it may grow in saline soil by the sea-coast, when it is a halophyte, but it usually prefers a sandy loam with some humus in it.

Bittersweet is infested, like the potato, to which genus it belongs, with a fungus, Phytophthora infestans, potato disease. Several beetles infest it, Priia dulcamare, Meligethes ineans, Crepidodora centralis, Epitrix pubescens, Psyllodes affinis, P. dulcamare; 2 moths, Gelechia costella, Acrolepia pygmeana; and a Heteropterous insect, Cynus glandicolor.

Solanum, Pliny, is the Latin name for this or a similar plant. Dulcamara, Dodonaeus, is Latin for Bittersweet, which is so called because the bark is first bitter then sweet.

The following are some of the names by which Bittersweet is also known: Awf ood, Belladonna, Blue Bindweed, Bittersweet, Deadly Nightshade, Dogwood, Dwale, fellon-wood, Fellowwort, Mad Dog's Berries, Bittersweet Nightshade, Wood Nightshade, Poison-berry, Poison Flower, Poisonous Tea Plant, Pushion Berry, Robin-in-the-Hedge, Skaw-coo, Snake-berry, Snake's Poison-food, Sweet Bitter, Terrididdle or Terrydivle, Tether Devil. The name Fellowwort is explained by Coles thus: “The leaves or berries stamped with musty bacon, applied to that joynt of the finger that is troubled with a felon, hath been found to be very sucessful for the curing of the same”.

In mediaeval times it was used in witches' potions as charms and spells:

“And I ha been plucking plants among
Hemlock, Henbane, Adder's Tongue,
Nightshade, Moonwort, Hibbard's Bane;
And twice by the dogs was like to be ta'en”.

— Ben Jonson, Masque of Queens.
It was held to be a plant of ill omen, of which Gerard says: “If you will follow my counsel, deal not with the same in any case, and banish it from your gardens, and the use of it also, being a plant so furious and deadly, for it bringeth such as have eaten thereof into a dead sleep, wherein many have died”. When dried the shoots are used for skin diseases. The berries are poisonous, causing vomiting. The roots smell like the potato, but are bitter when chewed. The leaves have been used for scurvy and rheumatism.

Essential Specific Characters:—

223. Solanum Dulcamara, L.—Shrubby, woody, climbing, leaves cordate, upper hastate, flowers purple, with two green spots at the base of each segment, drooping, anthers yellow, united to form a cone, berries scarlet, poisonous.

Deadly Nightshade (Atropa Belladonna, L.)

This is one of those southern plants which rarely appear in the deposits containing seeds of ancient plants. The present range of Deadly Nightshade in the N. Temperate Zone is south of Denmark in Europe, N. Africa, and it is introduced in North America. In Great Britain it occurs in S. Wilts, Hants, W. Sussex; in the Thames province, except in Essex; Anglia, except in E. Suffolk, Norfolk, Hunts; in the Severn province, except in Worcester, Salop, Flint, West Lanes; in the Humber province, except in S.E. Yorks; in the Tyne province, except in Westmorland. It is probably indigenous on chalk and limestone, being often naturalized near ruins, from Westmorland to the south coast. In Scotland it is found near houses. It is native in Ireland and the Channel Islands, in so far as it can be called native anywhere.

The habitat of this plant is undoubtedly artificial in the majority of cases, e.g. in quarries, along railway banks, &c. Watson says: “This plant possibly may be indigenous in some of the chalk or limestone districts. The roots are long lasting, and the seedling plants spring up freely in gardens; peculiarities which tend to establish the plant in localities to which it may originally have been carried by human hands. The localities on record for it afford not a few instances in illustration of the delusive manner in which superficial botanists have endeavoured to palm off the artificial as if genuinely indigenous localities.”

The stems are herbaceous, stout, numerous, branched, often purple, glandular above. The leaves are stalked, egg-shaped, entire, smooth,
and veined. There is a smaller leaf below each leaf, due possibly to displacement, the leaf-stalk being united below with following shoots as though arising from it.

The flower-stalks are axillary, and the flowers are drooping, bell-shaped, dingy-purple, clammy, glossy, and veined. The berry is black, velvety, round, sweet, bilocular, with brown seeds.

The Deadly Nightshade is 3 1/2 ft. high. It flowers in June and July. It is perennial, increased by division of the root.

The flower is bell-shaped, drooping, monopetalous, tubular, enlarged below, spreading above, with a short tube. There are 5 anther-stalks, bent below the anthers, 2 shorter, thicker at the base, hairy, bent inwards at the top, and as long as the tube. The anthers are large and yellow, with slits, and double. The anther-stalks lengthen after the anthers are ripe. The pistil is grooved both sides with a honey-gland at the base. The stigma ripens first, and projects beyond the anthers. The style is thread-like, longer than the stamens, inclined downwards; the stigma is pin-headed, two-lipped, green. The plant is adapted for cross-pollination by medium-sized humble bees, bees visiting it and also Thrips. Honey is secreted at the base of the ovary, and protected by stiff hairs on the stamens.

The fruit is a 2-lobed berry, which falls around the parent plant, or is dispersed by animals, birds, or man.
Deadly Nightshade is largely a sand plant living on a sand soil, or may be found on chalk.

A beetle, *Crepidodera atropae*, feeds upon it, and a moth, the Dotted Clay (Agrotis baja).

*Atropa*, Linnæus, is from the Greek *Atropos*, one of the Fates who cut the thread of life, in reference to its deadly poisonous nature; and *Belladonon*, Mathiolus, means beautiful lady.

It is called Banewort, Belladonna, Naughty Man’s Cherry, Daft-berries, Deadly Nightshade, Death’s-herb, Dwale, Deadly Dwale, Dway-berries, Jacob’s Ladder, Mad, Manicon, Mekilwort, Great Morel, Sleeping Nightshade. It is called Daft-berries because the berries cause giddiness, and Dwale.

“The frere with his fisik, this folk hath enchantad,
And doth men drink dwale that men dredeth no synne”.

—Piers Plowman.

Dwale means opiate, that which dulls. Manicon is so referred to in *Hudibras*:

“Bewitch Hermetic men to run
Stark staring mad with manicon”.

It used to be called *Solanum somniferum*, or Sleeping Nightshade.

In Bohemia they superstitiously believe it a plant of the devil, who watches it, but may be drawn from it on Walpurgis Night by letting loose a black hen, after which he will run. In Italy it was used by women to give lustre to the eyes. The berries are sweet and poisonous. The leaves are dried and used as a drug. It is an anodyne for neuralgia, and enlarges the pupil of the eye, and is used for ophthalmic complaints. There is a legend that the berries of Dwale were mixed with the wine of the Danes who came with Sweno, by the Scotch when they held a truce, and that the latter afterwards fell on the Danes. The plant is narcotic. Goats feed on it.

**Essential Specific Characters:**

224. *Atropa Belladonna*, L.—Stem stout, branched, leaves ovate, flowers purple, campanulate, drooping, axillary, on short peduncles, berries black, poisonous.
Henbane (Hyoscyamus niger, L.)

Like Deadly Nightshade, this southern plant is of quite modern origin apparently. It is found in the North Temperate Zone in Europe, N. Africa, N.W. Asia, and India. In Great Britain it grows in the Peninsula, Channel, Thames, Anglia, Severn provinces; in S. Wales, not in Brecon or Radnor; in N. Wales, not in Merioneth or Flint; in the Trent province; in the Mersey district, Humber, Tyne, Lakes province; in the W. Lowlands except in Dumfries or Kirkcudbright; in the E. Lowlands except in Peebles, Selkirk, Linlithgow; in Fife, Perth, Forfar, and Dumbarton. It is not native in Scotland, and occurs in Ireland and the Channel Islands.

Henbane is nowhere common, but is found here and there in sandy districts on waste ground, such as kitchen middens; and Hound’s Tongue, Mullein, Viper’s Bugloss, Borage, Bittersweet, Deadly Nightshade are all of the same status.

This fetid weed, so well distinguished by its mousy smell and the netted petals of the corolla, has an erect stem, slightly branched with radical leaves, wavy, divided nearly to the base, clammy, sticky, and hairy, light green or yellow. The upper leaves are clasping, stalkless, and the lower ones stalked.

The flowers are yellow, with a net of purple veins, drooping, large, broadly funnel-shaped, and arranged in one or two rows on the side of the flower-stalk, nearly stalkless and axillary. The fruit is erect, enclosed in the calyx, which does not fall, 2-celled, membranous, many-seeded, constricted in the middle, with the lid near the top. The seeds are pitted, flattened at the side, brown, with ridges, enclosing oblong or round areas.

The Henbane is about 1 ft. to 15 in. in height. It flowers in June and July. It is triennial, and propagated by seeds. Like Deadly Nightshade, it is interesting enough to grow in the garden.
The flower contains honey. The stigma and anthers ripen at the same time. The corolla is bell-shaped, plaited in bud. The hairy stamens are declinate, attached to the corolla base, with purple anthers, and provided with slits. The style is simple, the stigma pin-headed and prominent, ensuring cross-pollination. At first the stigma is longer than the stamens, but the tube grows, and the anthers are then on a level with the stigma, so that self-pollination is possible.

Humble bees visit it, and *Halictus cylindricus* collects pollen. The terminal flowers are said to be sometimes cleistogamic.

The fruit, a capsule enclosed by the calyx, opens by a lid above, and the seeds are thus dispersed immediately around the parent plant. Henbane usually grows in small clumps, as would result from the seeds being jerked (when the stems are dry and hard) to some distance also by the wind or upset by passing herds.

It is a sand plant, and grows mainly on sand soil.


*Hyoscyamus*, Dioscorides, is from the Greek *hus*, *hes*, pig, *kyamos*, bean. The second Latin name refers to the black fruit. It is called Belene, Broseworst, Chenile, Henbane, Hen-bell, Henkam, Loaves-of-bread, Stinking Roger. People call it Devil's Eye in Germany, as being associated with the evil one.

Ellis says as to the name Henbane: “Destroy Henbane if any grows near your house, for this will poison, and kill both these and the other fowls”. The name Belene is derived from its bell-shaped capsules, belle a bell, fellen, furnished with bells.
Loaves-of-bread is a child's name for the fruit.

"Hunting from the stackyard sod
The stinking Henbane's belted pod
By youth's warm fancies sweetly led,
To christen them his Loaves of Bread."

Ben Jonson includes it in the list of witches' potions. If a hare be sprinkled with its juice in Piedmont, they say all the other hares will be scared away as if by some invisible power. Gerarde says: "The root boiled with vinegar, and the same held hot in the mouth, easeth the pain of the teeth. The seed is used by mountebank tooth drawers, which run about the country to cause worms to come forth of the teeth by burning it in a Chafing-dish of coles, the party holding his mouth over the fume thereof; but some crafty companions to gain money, convey small lute-strings into the water, persuading the patient that those small creepers came out of his mouth or other parts which he intended to cure."

Leonato reproaches Don Pedro in Much Ado About Nothing for sighing for the toothache, which, he adds, "is but a tumour or a worm". The same notion is met with in Germany, where they say:

"Pear Tree, I complain to thee,
Three worms sting me."

In the same region it is held to attract rain and to produce sterility. Perhaps it is referred to in Macbeth:

"Have we eaten of the same root
That takes the reason prisoner."

Another writer says:

"Henbane, insane, mad, for the use thereof is perillous, for if it be eate or drinke it breedeth madnesse, or slowe lyknesse of sleepe".

It formed with opium the drug Dwale in mediaeval times. It induces sleep, and was used for operations before modern anaesthetics were discovered. The seeds were heated in a tile, and the vapour inhaled for the toothache or "worm in the teeth". It is narcotic, and used for coughs, epilepsy, and convulsions. The leaves have been smoked for the toothache. It is an anodyne and antispasmodic.

**Essential Specific Characters:**—

225. *Hyoscyamus niger*, L.—Stem erect, branched, leaves large, hairy, viscid, oblong, clasping, flowers yellow, with purple veins, drooping, fruit enclosed in enlarged calyx, erect, plant poisonous.
Mullein (Verbascum Thapsus, L.)

In Interglacial beds at West Wittering, traces of Mullein have been discovered, thus establishing its ancient origin. It is known to-day in the N. Temperate Zone in Europe, N. and W. Asia, as far as the Himalayas, and in N. America is an introduction. In Great Britain it is found in the Peninsula, Channel, Thames, Anglia, Severn provinces; in S. Wales, except in Radnor and Cardigan; in N. Wales, except in Montgomery and Merioneth; throughout the Trent province; in the Mersey province, except in Mid Lanes; in the Humber, Tyne, and Lakes district; in the W. Lowlands, except in Wigton; in the E. Lowlands, except in Peebles, Selkirk; in the E. Highlands, except in Mid Perth, Kincardine, N. Aberdeeen, Banff; Dumbarton, Clyde Islands, S. Ebudes, E. Sutherland, Caithness. It is found in Ireland and the Channel Islands.

Mullein is xerophytic and addicted to dry places. It is extremely local, and is very often an escape, being largely grown in gardens. It may be found in woods, on slopes of stony hills, and in such habitats may be indigenous. It is a tall, handsome plant, with an erect, simple stem, bearing leaves, woolly on both sides, as also is every part of the stem, the leaves running down the stem, scalloped, the upper ones acute, oblong, egg-shaped. The first name refers to the downy character of the leaves, the second relating to its supposed first name.

The flowers are yellow, borne on long, leafy spikes, dense, with wheel-shaped corolla, the flower-stalks less than the calyx, the corolla twice the latter. The anther-stalks are woolly (2) and smooth.

This plant is often 6 ft. high. July and August are the months when Mullein flowers. It is a herbaceous biennial reproduced by seeds and cultivated in gardens.

The flowers are conspicuous, but contain little honey. The corolla is wheel-shaped, and of the 5 stamens 2 are superior, and the three other anther-stalks are bearded with white hairs. The anthers in the long stamens are somewhat decurrent. The stigma is simple. Mullein is visited by the honey bee, Bombus, Halictus, Andrena, Polistes, Diptera, Syrphidae, Helophilus, Syricta, Ascia.

The capsule opens by septa, and allows the seeds to be scattered around the plant itself.

This plant is a sand plant and grows on sand soil, rupestral growing on different types of rock soil.

1 This serves as a protection, and excludes creeping insects.
The leaves are attacked by a mould, *Peronospora sordida*. Four beetles, *Coccinella 22-punctata*, *Cionus thapsi*, *Longitarsus patruellis*, *L. tabidus*; 3 moths, *Mullein*, *Cucullia verbasci*, *Eubulea verbascalis*, *Nothris verbasceella*; and a fly, *Lonchaea nigra*, are found upon it.

*Verbascum*, Pliny, is the Latin name for it. *Thapsus* is a place in Africa.

The names given to it are numerous: Aaron's Rod, Adam's Flannel, Ag-leaf, Ag-paper, Beggar's Blanket, Beggar's Stalk, Blanket Leaf, Bullock's Lungwort, Sea Cabbage, Candle-wick, Clot, Clown's Lungwort, Shepherd's Club, Cow's Lungwort, Cuddy's Lugs, Mullein or Velvet Dock, Duffle, Feltwort, Flannel, Our Lord's or Our Lady's Flannel, Fluffweed, Foxglove, Golden Grain, Golden Rod, Hag-taper, Hare's Beard, Hedge Taper, Hig Taper, Wild Ice-leaf, Jacob's Staff, Jupiter's Staff, Ladies' Foxglove, White Mullein, Mullein Dock, Old Man's Flannel, Peter's Staff, Rag Paper, Shepherd's Staff, Taper, Torches, Virgin Mary's Candle, Woollen.

As to the name Torches, Lyte says: "The whole topppe, with his pleasant, yellow floures, sheweth like to a wax-candic, a taper, cunningly wrought"; and Coles says: "The elder age used the stalks dipped in suet to burn, whether at funerals or for private uses". It is called Aaron's Rod from the tall, straight stem, and Adam's Flannel and Blanket Leaf from the texture and appearance of the leaves. Gerarde says as to the name Bullock's Lungwort: "The country people, especially those husbandmen in Kent, doe give their cattell the leaves to drink against the cough of the lungs, being an excellent approved medicine for the same, whereupon they do call it Bullock Lungwort". In N. Somerset they "called " it Lucernaria, " or wick plant, useful for
wicks of lamps". "Duffle" is the name given it because of the softness of its leaves, like a textile fabric so called. It is called "Feltwort" from the felty leaves, and also Flannel. Hag-taper is from A.S. hæg or haga, a hedge, from the usual place of growth, and taper because it is, or was, used as a torch. Mullein, Mollen, is wolleyn or wullen = woollen.

Witches used it in their potions according to the superstitious. Boiled in milk the leaves have been used as an emollient for coughs. It used to be called Candela from its use as a light. The down on the leaves makes a tinder. It is cultivated in gardens and makes a showy plant.

**Essential Specific Characters:**


**Creeping Toadflax** (*Linaria repens*, Mill.)

This pretty flower is found in West Europe in the N. Temperate Zone to-day, but is not known in any early deposits. In Great Britain it is found in West Cornwall, S. Devon, N. Somerset, I. of Wight, S. Hants, W. Sussex, W. Kent, Surrey, Herts, Berks, Oxford, Bucks, Bedford, Monmouth, Worcester, Warwick, Stafford, Glamorgan, Brecon, Carmarthen, Pembroke, Cardigan, Leicester, and Rutland, N.E. Yorks, Westmorland. It is rare and naturalized farther north. In Ireland it is very rare, occurring also in the Channel Islands.

Creeping Toadflax is a plant of waste places, and has the same sort of distribution as Common Toadflax, with which it hybridizes. It is on the increase, being extended by railways, and is especially abundant on the banks of the Great Western Railway near Reading.

In spite of the second Latin name meaning creeping, this plant has not a conspicuous creeping stem, but the root is creeping, and the stem usually erect, simple or branched, slender, woody, smooth, very leafy. The leaves are linear, whorled or scattered in fours below, close.

The pale-blue, violet flowers with veined corolla are borne in a loose raceme, rather long, with calyx as long as the capsule, and lance-shaped sepals. The spur of the corolla runs nearly parallel to the tube. The capsule is flat, with seeds wrinkled transversely and elevated ridges.

Creeping Toadflax is about 1 ft. in height. The flowers are late, blooming from July up till October. The plant is perennial, and propagated by seeds.
The flower is very similar to that of the Common Toadflax but smaller, and violet and white, less conspicuous except in patches, and

the spur is blunt. The capsule breaks up by numerous valves, and allows the seeds to fall out around the parent plant.

It is a sand-loving plant addicted to a sand soil, or a lime-loving plant growing freely on lime soil, being found on Lias limestone, and chalk, or Oolite.

The second Latin name refers to its creeping habit.
Essential Specific Characters:

228. Linaria repens, Mill.—Root creeping, stem slender, erect, leaves glaucous, linear, flowers lilac, in racemes, sepals lanceolate, seeds angular.

Common Toadflax (Linaria vulgaris, Mill.)

This plant is not an ancient one apparently, though its range to-day is that of the northern plants, being found in the N. Temperate and Arctic Zones in Arctic Europe, and W. Asia. It is introduced in North America. In Great Britain it is absent from Cardigan, Stirling, N. Perth, Kincardine, Aberdeen, Easternness, W. Highlands, except Main Argyle, Dumbarton, Clyde Islands, and it does not grow in the N. Highlands or the Northern Islands. It is found in Ireland and the Channel Islands.

Common Toadflax is found in great abundance on waste ground, and is especially abundant wherever ballast has been thrown down, as on railway banks, at stations, and in quarries, docks, and similar places. It grows profusely also in the south of England on dry, open ground.

This showy, erect plant is leafy, with a grass-like habit, smooth and bluish-green below. The leaves are linear-lance-shaped, acute, rather close, not whorled. The stems are numerous, downy, and glandular above.

The general shape of the corolla is that of a Snapdragon, with a spur below, and the flowers are large, yellow, with an orange palate, in a raceme, overlapping, terminal. The sepals are ovate-lance-shaped, the upper one longest. The corolla is gaping, with the spur parallel to the tube, and blunt, the upper lip bifid, divided into two nearly to the base, with turned-back lobes, the lower lip trifid, divided nearly to the base. The anther-stalks are white, the anthers yellow. There are traces of a posterior stamen. The seeds are brown or black, rounded, notched at the base, flattened at the margin, winged, and netted. Common Toadflax is about 1 ft. high, and the flowers are in bloom from June to September, perennial, reproduced by seed or division of roots, and worth cultivating.

The flower has a long spur, 10-13 mm. long, and is like a closed vessel. The honey is protected by hairs. It is secreted by the base of the ovary, which is swollen in front, opposite the lower lip. The honey collects in a groove which leads to the tip of the spur, filling it up to 5-6 mm., the hairs being arranged between the nectary and the two anterior stamens. The sides of the inferior stamens are clothed with
pointed processes at the base, and honey is thus only reached by long-lipped insects, hairs bordering the groove protecting the honey and keeping it in position. The closing of the swollen lower lip excludes beetles from the spur. The palate of the lower lip is orange, and acts as a path-finder, the insect depressing it, and pushing its head within the wide part of the spur, touching the anther and stigma with its back. These mature together, the stigma being between the short and long stamens, and a bee causes both self- and cross-pollination, while the plant can also pollinate itself. It is visited by the Honey Bee, *Bombus*, *Megachile*, *Os- mia*, *Anthidium*, *Andrena*, and several Formicidae.

The capsule opens by several valves above, and the seeds are liberated so that they fall out near the parent stem, or are jerked out or blown away by the wind. The outer cells contract most, the wall curves outwards, and the upper end of the capsule opens.

It is largely a sand-loving plant growing on sand soil or lime soil, being common on chalk, limestone, and Oolite.

Toadflax is galled by *Diplosis linaria* and *Gymnetron collinus*, *G. noctis*. Other beetles, *Brachypterus gravidis*, *Meligethes obscurus*, and *Chrysomela marginalis*, are also found on it; also the moths Striped Hawk Moth (*Deilephila livornica*), Broom Moth (*Calophasia linariae*), Toadflax Pug (*Hadena pisi*), Beautiful Pug (*Epithedea linariata*), and Marbled Clover (*Heliothis dipsaccus*), a Heteropterous insect, *Lopus flavomarginatus*.

The second Latin name indicates its common occurrence. It is
called Bride-weed, Butter-and-Eggs, Buttered Haycocks, Chopt Eggs, Churnstaff, Doggies, Dragon-bushes, Eggs-and-bacon, Eggs-and-butter, Eggs-and-clops, Toad, Wild and Yellow Toad Flax, Flaxweed, Gallwort, Larkspur, Lion's Mouth, Monkey Flower, Pattens-and-clogs, Rabbits, Snapdragon, Yellow or Yaller Rod. The name Snap Dragon is in vogue and explained because the flowers are "fashioned like a frog's mouth, or rather a dragon's mouth; from whence the women have taken the name Snap Dragon". Coles says it was called Toadflax "because Toads will sometimes shelter themselves amongst the branches of it". Gallwort was applied because it is bitter and used "against the flowing of the gall in cattle".

It was supposed to avert witchcraft. Because it was considered to be associated with the evil one it was called Devil's Ribbon. It was said to possess the power of destroying charms. It was also supposed to be capable of "cleansing the skin wonderfully of all sorts of deformity". It is bitter and acid, and has been used in dropsical cases and for sore eyes. Piles have been cured by ointment made from it. In Sweden people used to boil the plant in milk to kill flies with the infusion made from it.

Essential Specific Characters:—

229. Linaria vulgaris, Mill.—Stem erect, branched, glabrous, leaves linear-lanceolate, flowers yellow, terminal, in dense racemes, sepals ovate, acute, glabrous.

Purple Dead Nettle (Lamium purpureum, L.)

The present distribution of this common plant is the N. Temperate Zone in Europe, the Canaries, Siberia, W. Asia, and it is introduced in North America. It is unknown in early deposits. In Great Britain Purple Dead Nettle is found throughout the country, and in Northumberland ascends to 2000 ft.

Purple Dead Nettle is almost entirely a weed of cultivation, occurring freely on all kinds of waste ground, and in gardens as well as in all cultivated fields; and whilst the White Dead Nettle may be found along the roadside under hedges far from dwellings, Red Dead Nettle is more or less attached to these last or the vicinity of tilled land.

The stem is weak, suberect, square, with paired spreading branches, originating from near the base of the stem. The leaves are stalked, heart-shaped, blunt, coarsely toothed, the upper ones rather close. The stem is naked below. The foliage has a purple tinge.

The flowers are purple, in more or less terminal whorls, with many
flowers. The calyx, roughly hairy, is spreading above, tubular, with five roughly-hairy teeth. The corolla is gaping, with a short cylindrical tube, inflated with a ring of hairs inside. The bracts or leaf-like organs are numerous, not overlapping, nearly stalkless. The seeds are triangular, pale-brown, included in the calyx. The plant is rarely a foot high. It flowers from May to August. It is an annual, propagated by seed.

The flower is similar to that of the White Dead Nettle, but the tube is only 10-11 mm. long, and for 4-5 mm. at the top is enlarged, so that a humble-bee can insert its head. A hive-bee with a proboscis 6 mm. long can suck honey. The flowers are homogamous, the stigma and anthers ripening together. The angle between the two stigmas is less at first, and the lower stigma first stood between or above the anthers, being turned down afterwards. Before the flower opens the stigma and anthers have come in contact, and self-pollination has taken place. The hive-bee, *Anthophora, Bombus, Melecta, Halictus, Bombylinus*, visit Purple Dead Nettle. The nutlets fall when ripe around the parent plant.

A clay soil suits Purple Dead Nettle, which is a clay-loving plant, or a sand soil, when it is a sand-loving plant.

Two Hymenoptera, *Anthidium manicatum, Anthophora quadrimaculata*, and a moth, Speckled Yellow (*Venilia maculata*), are found upon it.
No. 1. Purple Dead Nettle
(Lamium purpureum, L.)
a, Flower, showing calyx and labiate corolla with arched upper and lobed lower lip, with stamens in throat. b, Stamen, with hairy anthers. c, Calyx, enclosing nutlets, and persistent style. d, Upper part of plant, with 4-angled stem, opposite leaves, and flowers in axillary whorls.

No. 2. White Dead Nettle
(Lamium album, L.)
a, Corolla, gibbous below, showing arched upper lip, hairy, above 2-fid lower lip, and toothed lateral lobes, and stamens in throat. b, Stamens with hairy filament, and hairy anthers. c, Upper part of plant, with paired opposite leaves and flowers in whorls with calyx with acute teeth.

No. 3. All-good
(Chenopodium bonus-henricus, L.)
a, Flower, with 5 glandular perianth-segments, 5 stamens, and pistil with 2 papillose stigmas. b, Upper part of plant, with upper stem-leaves, and flowers in axillary clusters.

No. 4. Good King Henry
(Chenopodium bonus-henricus, L.)
a, Flower, with perianth-segments, 5 stamens, and pistil, with 2 papillose stigmas. b, Seed. c, Stamen. d, Upper part of plant, with hastate leaves, and axillary clusters of flowers.

No. 5. Knot Grass
(Polygonum aviculare, L.)
a, Flower with coloured perianth-segments and included stamens. b, Pistil, with 3 styles. c, Stamen. d, Upper part of plant, with leaves and spiked clusters.

No. 6. Dairy-Maid's Dock
(Rumex obtusifolius, L.)
a, Flower with 6 perianth-segments, in 2 series, inner toothed, and 6 included stamens. b, Fruiting perianth-segments, toothed. c, Ovary, with 3 styles. d, Upper part of plant, with flowers in whorls on a raceme, and upper stem-leaves, the lower ripe, with toothed perianth-segments.

No. 7. Wall Barley
(Hordeum murinum, L.)
a, Flower, with palea, awned flowering glume and awned empty glumes, with stamens exserted, and pistil half hidden. b, Upper part of plant, with flowers in spike close, awned, the last leaf nearly reaching the top of the spike.

5. Knotgrass (Polygonum aviculare, L.)
6. Dairy Maid's Dock (Rumex obtusifolius, L.)
7. Wall Barley (Hordeum murinum, L.)
3. All-good (Goosefoot) (*Chenopodium album*, L.).
Lamium, Pliny, is the Latin name for the Dead Nettle, and the second Latin name refers to the purple colour of the petals.

This common plant is known by the names of Red or Sweet Archangel, Badman's Posies, Black Man's Posies, Day Nettle, Dead Nettle, Red Dead Nettle, Deaf Nettle, Dee Nettle, Dog Nettle, French Nettle, Nettle, Purple Dead-nettle, Rabbit-meat, Tormentil. Dead Nettle, Day Nettle, are meant to indicate its harmless character.

A writer says: "It is far from being fetid as is the case with many others, so that by some for distinction this plant is termed the Sweet Archangel". In Sweden it has been boiled as a pot herb.

Essential Specific Characters:

258. Lamium purpureum, L.—Stem suberect, leaves stalked, cordate, crenate, flowers purple, corolla-tube straight, with hairs exceeding the calyx-teeth, lower lip with obcordate lobe.

White Dead Nettle (Lamium album, L.)

Like Purple Dead Nettle the White Dead Nettle is modern, so far as we know, and is found to-day throughout the North Temperate Zone in Europe, N. Africa, N. Asia, and is an introduced plant in N. America. In Great Britain it is universally common, but absent in Cardigan, Anglesea, Mid Lancs, l. of Man, N. Aberdeen, Elgin, Easternness, and is not found in the N. Highlands or North Isles except in Dumbarton. So it ranges from Moray to the south coast, but is rare and local in Scotland and Ireland.

As remarked under Purple Dead Nettle, this species is much more truly indigenous or addicted to a truly wild type of station. At the same time, it is nowhere more common than on waste or cultivated land. Its favourite situation is under a hedge on a high bank, with a gentle, or even steep, slope to the south.

The plant is prostrate, then erect in habit. The rootstock is creeping, branched, and the plant is stoloniferous. The stems are square in section, rooting and branching from the base, then erect. The leaves are heart-shaped to egg-shaped, with a long and narrow point, stalked, coarsely toothed, scalloped, rarely spotted or blotched with white. The lower leaves are long-stalked. The leaves and whole plant resemble the true Nettle, and this may be an example of protective resemblance. The two often grow together.

The flowers are white, rarely pink, large, in whorls of 6–10, crowded above, distant below. The hairs in a ring on the curved corolla-tube, which is longer than the calyx, are oblique. The calyx is smooth or
hairy, with narrow, straight, triangular to awl-like teeth, the points long and slender, as long as or longer than the tube, which is straight. The corolla-tube is swollen below. The throat is gradually inflated. The upper lip is vaulted, softly hairy. The lateral lobes are variable. The anthers are hairy, and the outer or the inner stamens may be the longer. The nutlets have no scales.

The plant is 1 ft. high. It flowers in April up to September. It is a perennial propagated by division.

Honey lies in the rather narrower portion of the tube. The vaulted upper lip amply protects it from the rain, and the ring of hairs also serves the same purpose. The lip is broad above this narrower part, the tube expanding above; and this serves as an alighting place for insects, especially large bees, which are able to penetrate to the bottom of the narrow portion, whilst smaller bees cannot. The hairs near the base of the tube exclude creeping insects. The lower lip has lateral projections, rudiments of lateral petals of primitive Dead Nettles, which serve as levers for the insect, to push its proboscis down the tube. The anthers and pistil are covered by the arched upper lip, and this prevents them from yielding too readily, ensuring that pollen brought by the insect from other flowers is applied to the stigma.

The stamens do not form a ring, and one is absent or rudimentary, and the 4 lie, 2 on each side of the pistil under the lip, 2 long, 2 short,
in such a position that they touch that part of the bee’s head that will in the next flower touch the stigma and not the eyes. The bee touches the stigma first, then the anthers, and so pollinates the stigma with pollen from a previous flower.

The White Dead Nettle is visited by Bombus, honey bees, Anthophora, Eugera, Melecta, Halictus, Diptera, Rhingia rostrata, being specially adapted to humble-bees. The nutlets fall free around the parent plant when ripe.

White Dead Nettle is a clay-loving plant and addicted to a clay soil, but is equally a sand plant and grows on sand soil, being common on Triassic, Liassic, and Boulder Clay rock soils.

It is a food plant for several beetles, Meligethes difficilis, M. kunzei, M. brunnicornis, M. pedicularius, and the Lepidoptera, Golden Y-Moth (Plusia iota), Speckled Yellow (Venilia maculata), and the Small Rivulet (Lygris alchemillata), and the Burnished Brass Moth.

The second Latin name refers to the white colour of the flowers. Other names for this plant are: Archangel, White Archangel, Bee-nettle, Blind Nettle, Day Nettle, Dead Nettle, White Dead Nettle, Deaf Nettle, Dee Nettle, Dumb Nettle, Dummy Nettle, Dunny Nettle, Nettle, White Nettle, Snake Flower, Stingy Nettle, Suck-bottle, Suckie Sue. In Italy the plant is assigned to St. Vincent.

The leaves have been eaten in Sweden as a pot-herb. The smell is disagreeable when bruised. Boys make whistles of the stalks. It has been used in internal, lung disorders, the leaves being bruised for tumours and scrofula. It has also been used as a tea or herbal drink.

**Essential Specific Characters:**

259. *Lamium album*, L.—Stem erect, stout, leaves cordate, serrate, stalked, flowers large, white, with an oblique ring of hairs in the curved corolla-tube, upper lip arched.

**All-good (Goosefoot)** (*Chenopodium album*, L.)

This common waste-land species is another Arctic species not found in early deposits. It is found to-day in Arctic Europe and Temperate Asia, and is introduced in North America. It is found in every district in Great Britain as far north as the Shetlands, up to 1000 ft. in Yorkshire, and is found in the Channel Islands, and in Ireland.

All the Goosefoots except the maritime species are found on cultivated ground, and to this All-good is no exception. It is common in gardens, allotments, on building ground, manure heaps, and in culti-
vated fields throughout the country, exhibiting numerous forms and intermediates which are an interesting but difficult puzzle to the beginner.

The stems are erect, from a woody base, much branched, with spreading branches, which are smooth or with rounded hairs, veined, and angular. The leaves are flat, egg-shaped, or rhomboidal or triangular at the base, with few, blunt teeth, the upper ones entire, narrow; and the name Goosefoot refers generally (as a translation of the first Greek name) to the shape of the leaves, the second name referring to the general mealy, whitish colour of some forms of it. There are alternate bands of colour. At night the young leaves become erect.

The flowers are greenish-yellow, in compound branched racemes, with or without leaves, 5-merous, apetalous, without a corolla. The fruits are smooth, nearly kidney-shaped, larger than the calyx, and enclosed by the segments.

This plant is 2–4 ft. high. The flowers are in bloom between July and September. It is an annual and propagated by seeds. The stigma ripens first, and there is honey. The flowers are anemophilous, pollen being transferred by the wind, the plant growing in colonies making this effective. It is also visited by pollen-eating
Syrphid, *Melanostoma mellina*. The fruit is a utricle which falls when ripe around the plant, and being enclosed in a membranous calyx it may be partially wind-dispersed. All-good is largely a sand-loving plant growing on sand soil.


*Chenopodium*, Pliny, is from the Greek *chen*, goose, and *pous*, foot, because the leaves are like a goose's foot. The second Latin name refers to the white appearance, due to a mealy tomentum.

This well-known plant is known by several common names, such as Bacon-weed, Dirtweed, Dirty Dick, Drought-weed, Fat Hen, Frost-bite, Hen-fat, Lamb's-quarters, Lamb's-tongue, Mails, Melgs, Midden, Myles or Milies, Milds or Miles, Muck-weed, Mutton-tops, Rag Jag, Wild Spinach. It was called Bacon-weed or Bacon Weed, because it denotes rich, fat land, and Dirtweed, Dirty Dick, &c., because it grows on manure heaps. It is sold in May by the countrywomen in Ireland by the name of Lamb's-quarters. "Boil Myles in water and chop them with butter, and you will have a good dish" is an old saying. The name Mutton-tops refers to the young tops or shoots. It was boiled and eaten like greens, and eaten as a pot-herb in Scotland.

**Essential Specific Characters:**


**Good King Henry** (*Chenopodium Bonus-Henricus, L.*)

Mercury as it was called, once so commonly a kitchen-garden weed, or herb rather, has no record in the ancient past to indicate its more than recent origin. It is found to-day in the Temperate Northern Zone of Europe and in Siberia, and has been introduced into N. America. It is not found in Cardigan, Mid Lanes, W. Highlands except the Clyde Islands, in the N. Highlands except in Ross and E. Sutherland, and not in the N. Isles, but elsewhere from Caithness
to the south coast; up to 1200 ft. in the north of England. It is common in Ireland and the Channel Islands.

Good King Henry was so often cultivated at one time as a salad that it is now not uncommon near houses, and indeed it is to be found usually in one or more spots, at least, in every village, as well as in towns, growing in or near the churchyard, or within or hard by the yard of a farmhouse or other dwelling. It is almost always in evidence also on waste ground of every description.

The stem is erect, pyramidal, with widely-spreading branches or leaves below, tapering above. The leaves are flat, succulent, angular, on long, furrowed leaf-stalks, arrow-shaped or triangular, mealy below, bright-green, entire, and succulent. The stem is covered with warty projections, and has alternate red and green bands.

The flower is green, apetalous, the flowers being compound, with a corolla arranged in a terminal tapering spike, leafless, with a hollow, membranous calyx, and a long stigma which is bipartite, acute, and white. The fruits are smooth, exceeding the perianth.

This plant is usually about 1 ft. high. It flowers in May up till August. It is perennial, and can be propagated by division. It is cultivated as Spinach.

Good King Henry has very long styles and from 2–3 anthers, and is proterogynous, the stigma ripening before the anthers. Like other species it is anemophilous, or pollinated by the wind. The fruit is a utricle which falls when ripe, or being enclosed in a membranous calyx is wafted some distance away by the wind.

Being addicted to a sand soil it is a sand-loving plant, and being cultivated is improved by humus.
Like other Goosefoots it is infested in summer by several bugs, e.g. 4 Heteroptera, *Piasina quadrata*, *Lopus sulcatus*, *Calacoris cheno-podii*, *Ortholytus flavosparsus*, and a Homopterous insect, *Trioza chenopodii*.

The name *Bonus-Henricus*, Fuchs, is a translation of Guter Heinrich, or Good Henry, given it by the Germans.

This plant is called All-good, Blite, Smear Dock, Flowery Docken, Mercury Docken, Fat Hen, Good Henry, Good King Harry, Markerry, Mercury, English, False and Wild Mercury, More Smere-wort, The Roman Plant, Shoemakers’ Heels, Smiddy Leaves, Wild Spinach.

Markerry was "used as a Spinach and always called Markerry". In Flowery Docken, probably "flowery" is intended from the mealy leaves. In regard to the name False Mercury, Gerarde says: "It is taken for a kinde of Mercurie but improperly, for that it hath no participation with mercuric, either in forme or qualitie, except yee will call every herbe mercurie which hath power to loose the bellie". "It is a common proverbe among the people, Be thou sick or whole, put mercurie in thy Koale". The name Smear-wort refers to its use as an ointment. Smiddy Leaves "indicates the observation of one of its favourite habitations, viz. the nigh vicinity of the blacksmith’s workshop".

It was formerly used for wounds and to cleanse old ulcers. It has been and is still used as a Spinach, until the foreign variety was introduced.

**Essential Specific Characters:**—

265. *Chenopodium Bonus-Henricus*, L.—Stem erect, leafy, simple, leaves sagittate, entire, triangular, mealy, flowers in terminal spikes, stigmas long, fruit exceeding the perianth.

**Knotgrass** (*Polygonum aviculare*, L.)

This ancient species is found in Interglacial beds in Hants and Sussex, Late Glacial, Neolithic beds at Edinburgh, Roman beds at Silchester. It is found to-day in Arctic and Temperate Europe, N. and W. Asia, and has been introduced into North America. It is found in every county except Main Argyle, as far north as the Shetlands; up to 1800 ft. in Northumberland. It grows in Ireland and the Channel Islands.

There is scarcely a gateway in close proximity to a barn or outhouse, in a field, or attached to a farmhouse or ordinary dwelling,
around which Knotgrass does not form a wide uniform carpet many yards in extent. It is abundant wherever agricultural operations are conducted, and also on waste ground.

This plant is widely spreading, trailing, twining, with numerous, branched, slender, finely-furrowed, smooth, jointed stems, with swollen joints. The leaves are variable, oval, lance-shaped, linear, alternate, issuing from the sheaths of the stipules or ocrea, which are membranous, white, shining, torn, red at the base, and 2-lobed. The young leaves are erect at night.

The flowers are apetalous, without a corolla, in the axils of the stipules, in spikes which are long, loose, interrupted and leafy below the flower-stalks, jointed above, white, pink, red, or green, the calyx hollow, the lower green, half-spreading, the upper white or coloured. The 8 anthers are yellow, the fruit is brown, triangular, finely furrowed. There are 3 styles. The plant is seldom more than 3-6 in. high. It flowers in April up till October. The plant is perennial, and propagated by seed.

The flowers are small and inconspicuous, the plant being usually prostrate. There is little or no honey or scent, so that insects are few. The flowers are hardly 2½ mm. long, solitary, scentless, and self-pollination is effective. The floral mechanism is as in Fagopyrum. The 5 segments of the perianth with the function of the corolla serve as a calyx, the lower part being green, the extremities white or red, and they act as a corolla to make the flower conspicuous. The 5 stamens alternate with the perianth segments, and bend outwards, and three others bend inwards to the centre till the anthers stand just above the stigmas and at the same level, and are thickened at the base to
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contain honey; but the flower only offers pollen. The flower is herma-
phrodite and homogamous, and visitors by the position of anthers and
stamens self-pollinate the flower as well as cross-pollinate it. It is visited
by Ascia podagrica, Syrilla pipiens, Melithreptus. It has cleistogamic
flowers under the ochrea, as well as subterranean cleistogamic flowers.

The fruit is triquetrous and enclosed in the perianth, which may
partly aid in its dispersal by the wind.

Knotgrass is a sand-loving plant addicted to sand soil.

This plant is attacked by 2 rusts, Cronyces polygoni, Ustilago
urticulosa, in the flowers, and galled by Asychia aratella. Several
beetles frequent it—Gastroidea polygoni, Spercheus emarginatus, Apion
diforme, Gastrophysa polygoni; 3 moths, Brown Russet (Russina tene-
brosa), Blood-vein (Bradycyclea anularia), and Asychia aratella; and
a Homopterous insect, Aphalarca caltha.

Polygonum, Dioscorides, is from the Greek polus, many, goni, knee,
from the numerous nodes, and aviculare, from Latin avis, bird, because
it is used for bird-seed.

The plant is called Allseed, Armstrong, Beggar-weed, Bird's Knot-
grass, Bird's Tongue, Black Strap, Bloodwort, Centinode, Cow-grass,
Crab-grass, Crab-weed, Cumberfield, Doorweed, Finzach, Iron, Knot,
Pig, Swine's, and Wiregrass, Hogweed, Knotgrass, Knotwort, Mantie,
Nine-joints, Ninety-knot, Pig-rush, Pig-weed, Pink-weed, Red Legs,
Redweed, Red Robin, Sparrow-tongue, Stone-weed, Swine-carse,
Swine's Skir, Tackers-grass, Surface Twitch, Way Grass, Wireweed.

From the difficulty of pulling it up it is called Armstrong; Swine's
Grass because, as Coles says, "Swine delight to feed thereon"; and
"it is given to swine with good success when they are sick, and will
not eat their meate. Whereupon the country people do call it Swine's
Grasse and Swine's Skir", according to Gerarde. It is called Nine-
joints because "of its great number of joynts", according to Coles.
By Doctrine of Signatures it was called Knotgrass from some pro-
erty it was supposed to have of stopping the growth of children. So
Shakespeare in Midsummer-Night's Dream refers to it as the "hinder-
ing Knotgrass", and Beaumont and Fletcher also, in Coxcomb, Act II,
Sc. 2: "We want a boy extremely for this function kept under for a
year with milk and Knotgrass".

The seeds are used as bird-seed. The plant is astringent, and has
been used in dysentery, haemorrhage, &c.

Essential Specific Characters:

267. Polygonum aviculare, L.—Stem procumbent, branched, leaves
narrow, oblong, flowers in axillary clusters, stipules (ocreae) fringed.
Dairy Maid's Dock (Rumex obtusifolius, L.)

Though not so distinctly a marsh plant as the Golden Dock, this species is found in Interglacial beds in Sussex and near London, in Late Glacial beds in the Isle of Man, and Neolithic beds in Edinburgh. It is distributed to-day in the North Temperate Zones in Europe, N. Africa, N. and W. Asia, N.-W. India, and has been introduced recently in North America. This plant occurs in all parts of Great Britain, N.-W. Shetland, up to 1000 ft. in N. England, Ireland, and the Channel Islands.

Dairy Maid's Dock is a very common species, equally varied in its habitat. For while it is a typical follower of man, and found on all waste ground, it occurs in fields and meadows not only around haystacks and barns, &c., but in damp ditches and hollows, as well as by the wayside, where it is quite plentiful in shaded spots. It is also a regular component of aquatic formations, growing by streams, rivers, ponds, and in marshes.

It is long-rooted, with a tall, erect, branched stem, furrowed, smooth, solid, jointed. The radical leaves are oblong, heart-shaped, egg-shaped, stalked, veined, the upper ones oblong-lance-shaped, those in the middle reddish, the leaf-stalks nearly round, below hollow, flat, slender.

The flowers are greenish, the parts in threes, with 3 oval, entire petals, membranous at the margin, in a narrow panicle. The calyx is hollow, with 3 lance-shaped segments, membranous, the sepals net-like, containing the fruit. The fruits are 3-sided and brown, with oval valves.

This plant is 2–3 ft. high. Dairy Maid's Dock flowers in June up till August. It is perennial, and increases by means of the root. The flowers are anemophilous, or pollinated by the wind, and bisexual. They are visited by Halictus cylindricus. The stigmas are large, tasselled. The stigmas ripen first. There is honey in the flower.

The fruit or seeds are winged, and when they fall they are carried to a distance by the wind.

This dock is semi-aquatic, and a peat-loving plant growing on peat soil, or a clay-loving plant when it is found on clay soil in fields and pastures.

Two microfungi, Uromyces rumicis and Puccinia phragmitis, attack the leaves, also a mould, Peronospora effusa. It is galled by Diplosis.

The second Latin name refers to the shape (obtuse) of the leaves. It is called Batter Dock, Butter Dock, Celery-seed, Cushy-cows, Docken, Kettle Dock, Red Shank, Smair Dock. As to the name Docken: “When a boy gets stung by a nettle he searches for a dock-leaf, and rubs it on the wounded part, repeating the charm, Docken dock-an in, nettle nettle out”. This is the explanation of Cushy-cows or Curly Cows: “Children call the seeded plant Cushy Cows, and they milk it by drawing the stalk through the fingers”.

In Wilts, when exorcising the nettle sting with a dock leaf, children repeat:—

“Out ettle
In dock,
Dock shall ha a new smock;
Ettle zhout
Ha nannu”.

An old remedy for boils was Dock tea. This plant is laxative. The roots powdered are used for cleaning the teeth. The leaves have been used for wrapping round butter and cream cheese.
Essential Specific Characters:

270. Rumex obtusifolius, L. — Stem tall, rigid, leaves ovate, cordate, below obtuse, upper lanceolate, flowers in distant whorls, petals enlarged, upper sepal tubercled.

Wall Barley (Hordeum murinum, L.)

Almost ubiquitous in some places, Wall Barley is found in the North Temperate Zone in Europe from Scotland southward, and in North Africa. It is found in the whole of South Britain, but not in Brecon, Radnor, and Flint in Mid, and N. Britain in the Trent, Mersey, Hum-ber provinces, except in S.-E. Yorks, Tyne district, only in Cumberland in the Lakes province. In Scotland it is found in Wigtown, Ayr, Roxburgh, Berwick, Haddington, Edinburgh, Linlithgow, Fife, Stirling, Forfar, Kincardine, Elgin, Caithness, or as far north as Caithness, and in E. Scotland generally. It is very rare in Ireland and the Channel Islands.

Wall Barley is a common plant in all waste places, growing in dense masses on ground awaiting building operations, along the boundaries of gardens, along the roadside, in towns as well as in villages. It also grows in cultivated fields, where it is better developed.

The stems are numerous, sub-erect, prostrate then ascending, below leafy, jointed, with large nodes paler
than the stem. The leaves are small, long, broad, bluish-green, downy, with inflated sheaths. The ligule is very short.

The spike is flattened at the side, drooping, pale-green, flat, stout. The spikelets are in threes, overlapping, dense, with linear-lance-shaped glumes fringed with hairs in the middle spikelet, lateral, bristle-like, rough. The awn is longer than the glumes, the flowering glumes are lance-shaped, the empty glumes thread-like.

The plant is 1 ft. high. It flowers in June and July. It is annual, and propagated by seeds. The lateral flowers are male, those in the middle bisexual or hermaphrodite. There are 2 long, pointed nectaries at the base of the ovary. The anther-stalks are thread-like, the anthers yellowish-green and small. There are 2 styles, bent back and softly hairy, and the stigmas are nearly stalkless and feathery. The flowers are anemophilous, or pollinated by the wind. In Barley the flowers open between 5 and 6 a.m., at as low a temperature as 12.5°C. The middle florets are cleistogamie. The fruit adhering to the palea is light and adapted for wind dispersal, and the long awn may catch in wool, &c., and cause the seeds to be dispersed by animals.

This common grass is a sand-loving plant growing on a sand soil.

The Wall Barley Grass is infested by a cluster-cup fungus, 

\textit{Us-tilago segetum} and \textit{Pyrenophora trichostoma}. The moths \textit{The Antler (Charcias graminis), Gelchipsis cerealella} are found on it.

\textit{Hordeum} is found in Virgil as the Latin for barley, and the second name indicates the mural habitat.

It is called Mouse, Wall, Way, or Wild Barley, Way Bennet, Way Bent, Rye Grass, Squirrel-tail Grass, Purr Barley, Pussies, the last referring to the habit boys have of putting the long-awned, flowering spikes down the sleeve.

It is called St. Peter’s Corn in Germany. So injurious is it to the teeth of horses that the best advertisement for an inn there, it was said, would be “Hay without any mixture of Squirrel Grass”.

**Essential Specific Characters:**

345. \textit{Hordeum murinum}, L.—Stem glabrous, erect, leaves long, flat, glumes of middle spikelet ciliate, linear, lateral, spikelets imperfect.
SOME GENERAL HINTS AND NOTES

SECTION VII

MOUNTAINS, HILLS, AND DRY PLACES

The Effect of Altitude upon Plants.—For every successive rise in altitude of 300 ft. the temperature decreases by 1° F. Hence the effect of altitude upon plants in the first place is to drive the southern species downward and the northern species upward. A point is reached above 2000 ft. when Arctic plants begin to become dominant, and at the highest elevations in the British Isles the vegetation is distinctly Alpine, consisting of such groups of plants as Saxifrages, Pinks, and Willows. Another effect of altitude is to make the conditions as a whole moister, owing to the fact that mountains act as condensers of moisture.

As a whole eastern, and a great part of southern, England has a rainfall of not much more than 20 in., per annum, and these are the lowland areas. The rainfall of the north and west and south-west is much greater, and in places amounts to 100 in., whilst in parts of the Lake district it may be as much as 200 in. Though the rainfall is so great in hilly districts the ground is not necessarily so saturated, for water finds its own level very quickly, and it is in the lowlands where it lies longest. Only in the hollows, or on some hill-tops, does the hilly tract develop boggy conditions. Elsewhere the conditions, especially the slopes and rocky summits with shallow soil, are suitable for dry-soil forms, and a large bulk of the plants are adapted to this state. Owing to altitude, again, especially above the deciduous tree zone (1000 ft.), the ground flora is much more exposed to wind.

A further effect of altitude (or the existence of hills) is to determine the prevalent winds, and to regulate the distribution of valleys and rivers. Another feature is the exposure of plants to mist and fog. The clouding of the sky on hills has an influence on the light conditions.

Lowlands and Uplands Compared.—The general conditions in the lowlands make for uniformity. It is true that wide associations occur also upon hills, as those formed by Heather, Cotton Grass, Sedges, Rushes, and some grass types, but these are, even when widespread, more or less discontinuous owing to physical structure, slope, &c., whereas in the lowlands these conditions are less variable. Moreover, lowland tracts vary little in altitude, so that the temperature and rainfall are more or less uniform. Thus we find in the lowlands wide expanses of forests, pasture, heath, arable, lowland moors, and aquatic vegetation on a grand scale, as formerly in the Fens. Hence there is a preponderance of southern types of plants. Clay plants in particular are characteristic of the lowlands, and those found upon marts and loams, or in other words, the vegetation of the Agrarian Zone.

The uplands, on the other hand, exhibit the opposite characteristics. The associations are not so homogeneous as in the lowlands. The sloping sides of hills are often unstable, the talus and debris moving downwards, and the soil is also of a more barren character, owing to the exposure of the surface to denuding agencies and the slight opportunity afforded for soil formation or retention. Hence not only climatic but also physical factors cause the lowlands and the uplands to present entirely dissimilar types of vegetation, as may be recognized at once by comparing, for instance, the flora of the Welsh hills with that of Bedfordshire.

Prevalence of Bare Rocks in Hilly Tracts.—One marked characteristic of upland areas is the preponderance at high altitudes of bare rock surfaces. Moreover, an outcrop where soft and hard rocks are contiguous is as a rule diversified, and the hard rocks are exposed as hills or escarpments, whilst soft clayey or shaly
beds are weathered down rapidly to lowland conditions. It is usually where quarries have been made in the lowlands that rock surfaces are to be seen, and even these are less frequent than along a hillside itself. Rock may be exposed in a valley or level region, but except in the case of coal-pits and granite quarries this is unusual.

**Influence of Hills upon Drainage.**—It has already been mentioned that a hilly tract may, in spite of a higher rainfall, have really less moisture relatively than a region with a smaller rainfall. The wind is a very important factor in this connection, its drying effect at certain seasons, when not itself moisture-laden, tending to counteract the condensing effect of the mountain itself.

It is only where hollows are formed in a hillside by the oozing out of underground water through porous strata or other causes that water remains upon a hill permanently. It is aided in this by the effect of bog-mosses such as Sphagna, and the rapid growth of moorland plants that help to retain the water in such pools or bogs.

In the case of hills such as those formed by chalk or limestone, where streams do not carry the water away, the whole surface acts as a sort of sponge and water collects in underground reservoirs. In both cases the effect of carbonic acid gas in the water in dissolving the lime is to form pipes, fissures, and cavities in the rock, and to produce caverns, as in Derbyshire and elsewhere.

**The Limits of Agriculture.**—As one ascends from the lowlands a noticeable feature is the absence of, or decrease in, the areas given over to cultivation. This is due largely to the same causes that control the existence of wild plants at high altitudes, such as increased cold, moisture, wind, a high degree of insolation, exposure, shallower and in general more barren soil. Also fog and mist may be prevalent.

Watson indeed established a zone, called the Agrarian Zone, within which cultivated plants would grow and flourish, and above which they are unprofitable. This more or less corresponds with the limits of growth of the chief deciduous tree types, as the Oak, &c., or 1000 ft. above sea level.

This has a decided effect upon wild plants that are addicted to a mountain habitat. For up to that altitude both soil and vegetation have been more or less disturbed. At the same time also the soil conditions, where cultivation has been carried on, in many cases have undergone considerable change, making the return of natural vegetation, when the land relapses into an uncultivated stage, less likely, and its substitution to a great extent by the followers of man and the plough the more probable.

**Dry and Wet Hills.**—Mountains upon the older granite, siliceous, or schistose rocks that reach a considerable altitude are frequently the habitats of true moorland or bog plants. There are, in fact, upland moors and lowland moors. In each case it is a sine qua non that peat of a considerable depth be formed. When the peat is waterlogged there is also a Sphagnum or bog-moss association, and a moss is formed. But since these conditions are really dependent largely upon soil characters, they have been treated separately under bogs. A peaty dry surface gives rise to a moorland with ericaceous plants, such as Ling, Heath, and Mat-weed, whilst a Cotton-grass moor is largely intermediate in regard to the supply of moisture. The heaths that are developed on thin stony or gravelly soil at lower elevations correspond to the lowland moors, as do the upland moors to the upland heaths.

Excluding these special types there are wet mountains or hills and dry ones, and the plants that are found upon the one do not as a rule occur on the other.

Dry hills furnish such plants as Dyer’s Weed, Rock Rose, Hairy Violet, the chalk or limestone on which they grow being naturally well drained. Marsh Mallow also grows on sandy rocky hills, and Hare’s Foot Trefoil, Kidney Vetch, Silky Mountain Vetch, Sainfoin, Oak-leaved Mountain Aven, Salad Burnet, Ploughman’s Spikenard, Cotton Thistle, Wild Thyme, Clary, Sheep’s Sorrel, Box, Musk Orchis, Sheep’s Fescue are found also on dry hills. Yellow Balsam, Gentian, Felwort, and Fragrant Orchis are found on wet hillsides, and Field Scabious, Dropwort, on damp clay, often, though not invariably, at high altitudes.

**Climate and Hills.**—Hills have an important bearing upon climate. As one ascends 300 ft. there is a difference of 1° F., so that the thermometer in the lowlands at 56° F. would read at the summit of a hill of 4500 ft. (the limit in the British Isles) at 41° F., a difference of 15 degrees. This has naturally a great effect upon plants in performing their various life functions. Germination to begin with is slow, and may never take place in many ill-developed seeds. Growth is maintained slowly by impoverished powers of assimilation, respiration, and transpiration, for nutrition is scanty, and therefore reproduction must be hazardous, so that it is inevitable that montane plants differ in their seasons of flowering from those within the plains. Fresh types of plants succeed each other at different altitudes owing to these variations in temperature, &c. Thus the trees disappear at 1000-1500 ft., sub-Alpine plants...
flourish up to 2000 ft., and above this range the Arctic and Alpine species.

Rainfall and Hills.—Hills exercise a decided influence in causing the moisture in the atmosphere to be condensed and precipitated as rain. The position of the range of hills in relation to the wind is important; rain being precipitated to the lee of the hills. When the axis of the range is oblique, the effect upon the air current is similar to that of a less steep slope, and more so than in the case of a range at right angles, and the air ascends more slowly, rain being precipitated over a wider area. The snow-line on a hill necessarily also affects the atmospheric conditions and rainfall in such regions.

The Exposure of Hills. — The direction of the hills is an important factor, especially in relation to the prevailing winds, causing different effects upon different types of vegetation. Plants with the grass habit are less affected than those having the heath habit, for instance, the latter forming crescentic patches under certain conditions. The vegetation on the lee side of a hill is much more luxuriant than that upon the windward side. But the existence of a series of winds blowing from different directions is liable to obscure the influence of prevailing winds. The effect of the direction of the range is again seen in the greater exposure of plants to the sun on the south and west sides, and their xeromorphic conditions of growth, less noticeable upon other aspects.

Effect of Hills upon Types. — As one ascends a hill from the surrounding lowlands, one can readily notice a difference in the characters of many common types of plants. Such a plant as the Common Dandelion, in the valleys, has a tall and thick scape with a large flowerhead. The radical leaves are long and broad, with few lobes, or lobes not deeply cut back. The achene is green as a rule. The root is thick and deep-reaching. The whole plant is, in other words, suited to conditions where there is a uniform and considerable supply of moisture, and a thick or deep soil. At 500-600 ft., the normal type of Dandelion is replaced by a form with a short narrow scape, a smaller flowerhead, and narrower, shorter, and more deeply-divided leaves. The fruits are reddish in colour. The root is short, often dividing at the extremity. The leaves are usually prostrate upon the surface, rarely becoming esquisetose or ascending.

The types to be met with upon hills differ to a great extent from those of plants found in the lowlands. There is an increase in the members of the grass type, the rosette habit, &c.

Aspect. — The chief types of natural habitat that affect aspect are sea-coasts, where cliffs have a definite aspect, hedgerows in fields, or roadsides.

It is estimated that a southerly aspect has the effect of an increase of 2 to 3 C. near the surface, and this is proportionally more at higher altitudes. Slope, moreover, and its direction have an effect upon the temperature of the soil; for radiation is more rapid upon a sloping surface than upon a flat surface. Hence the beneficial effect of a southerly aspect, especially in hilly regions.

As a rule the western and southern sides of a hill or mountain are more suitable for plant growth, as the first is more uniformly moist, while the second has a higher average temperature, and the thermal constants of plants on such aspects are greater. Aspect thus has an effect upon the dispersal of plants by natural selection, the sun-loving plants seeking the sunnier aspects, the cold-lovers being found upon the north and east.

Absence of Aquatic Vegetation upon Hills. — One result of the existence of hills is to delimit the areas given up to aquatic vegetation. For such vegetation is more or less entirely confined to plains, valleys, or lowlands generally.

The hygrophilous types, such as those that form part of the moorlands, peat-bogs, cotton-grass associations, and others formed by Carex, Rushes, some Grasses, &c., are not aquatic types in the strict sense.

Some exceptions must, however, be made to this general rule, for though lakes as a rule are lowland, yet there are a number of lakes, e.g., in Wales and the Lake District, that are distinctly of upland type. And there are many lochs and tarns in Scotland which have a characteristic vegetation.

Ascending and Descending Types. — Owing to the differences in temperature, effect of wind, &c., between the lowland and upland regions, there are several types of plant groups which may be distinguished as montane or descending and lowland or ascending. The montane plants are as a rule of wider range in the northern regions, and the lowland plants more widespread in the south.

The montane plants include, first of all, eu-montane species, chiefly of Arctic type, as the Cloudberry. They seldom descend below the Infer-Arctic Zone, or about 1300 ft., where the temperature is 39 F. to 42 F. In Britain the eu-montane group ranges between 2000 ft. and 3200 ft. The general montane group is found at altitudes between 2000 ft. and 1000 ft., and is most common in the north generally speaking, as Juniper, Whortleberry, Cowberry,
HINTS AND NOTES

The sub-montane group is found at altitudes between 500 ft. and 1000 ft., and in general these plants do not ascend above to the Infr-Arctic Zone or descend below to the lowlands. They include Baneberry, Globe Flower, Wood Geranium, Bird Cherry, Rowan, Myrrh, Melancholy Thistle, Wood Club Rush, &c. Some are maritime plants, as Thrift, Sea Campion. The pseudo-montane group includes plants intermediate between the descending and ascending species, which may grow in the lowlands and on the uplands, as Bog Violet, Sundew, Grass of Parnassus, Cranberry, &c.

The ascending species are more lowland types, and they include general-ascending and sub-ascending species, the latter rarely ranging above 30 ft., and including few northern types, as Rest Harew, Hare’s Foot Trefoil, &c. Some, however, are found at higher altitudes, such as Oak-leaved Mountain Aven, Gentians, Sheep’s Fescue, &c.

Habitats of Hillside Plants.—The habitats of plants that grow upon hills and dry pastures generally are less diverse than those which come under the other groups here dealt with. There is, however, up to the highest limits of cultivation, a certain diversity in wooded areas that counteracts the otherwise open character of the hillside, which is one of its most striking characteristics.

The type of habitat, apart from wooded areas dealt with in Section IV, is generally speaking pasture. It may be a calcareous pasture, as that favoured by Rock Rose, Hairy Violet, Silky Mountain Vetch, &c.; or it may be an upland neutral grass-land, where Dropwort, Field Scabious, &c., are found; or sandy, rather barren pasture, with Sheep’s Sorrel, Sheep’s Fescue, &c. The ground may be covered with rock fragments, with a shallow bare soil, and practically constitute a sandy heath, where Wild Thyme will grow.

Where the ground is largely waste upland Cotton Thistle will be found, and other plants of more or less casual origin, with ordinary pasture plants of the lowlands.

The wet hill pastures grade into moorlands, Cotton-Grass associations, or those made up of Sedges, Rushes, Grasses, and under favourable conditions Sphagnum bogs, &c. In ordinary wet upland pastures the Yellow Balsam and Gentians are found, with other hygrophilous or moisture-loving plants. These distinctions are important, as helping to determine the sequence of formations and the derivation of one from another.

Habitats of Hillside Plants.—The physical features of the habitat in the case of hills and dry pastures are as important as the other factors, such as climate, altitude, and soil. As a whole the tree type is less dominant, though Birch along with the sandy-soil form of the Oak, the Sessile Oak, the Pine, and the Yew are characteristic montane trees. The Box locally is also a hillside type.

Scrub, however, is frequent upon the hills on certain soils. The Juniper, for instance, rises to a high elevation, and though dwarfed when exposed is otherwise suited to the upland generally. The Ordinary and Dwarf Furze form wide associations, as does the Broom. Other members are the Sloe, Hawthorn, Spindlewood, Cornel, Buckthorn, Rowan, the last abundant in the cloughs of the Lake district.

The undershrubs, such as Whortleberry, Ling, Heather, Crowberry, Cranberry, &c., form also wide associations with a typical habit or growth form, the heath habit. The adaptation of these plants to the special conditions of wind force is highly important, and should be studied in detail.

The dry-soil conditions in a large measure give rise to numerous groups with the rosette habit, such as Hawkweeds and Dyer’s Weed, &c.

Many trailers are found in this type of habitat, such as the Rock Rose, Thyme, &c. These like the undershrubs are specially adapted to the particular wind conditions. The grass habit is largely represented, being well suited to the exposed character of hills. All these adaptations are in the main induced by the physical features of the hills and dry pastures.

Height of Plants on Hills and Pastures.—It was remarked in Section IV that the upper limit of the tree zone in woodlands is largely influenced by the wind. This fact is shown by the manner in which trees are dwarfed in exposed upland situations, or are even (as again by the sea-coast, where wind is the cause also) bent in the direction of the wind, the branches spreading out horizontally in the opposite direction to the prevailing wind; so that not only is height influenced, but also direction of growth. The scrub is similarly affected when growing on hillsides, shrubs such as Hawthorn or Sloe being reduced in height.

The trailing plants that grow on hills are also more prostrate than when growing in the lowlands. The Grasses are as a rule less tall than the lowland types, and amongst them there are allied species of lowland distribution that are normally more lofty, as Fescue Grass or Heath Hair Grass.

Flowering Seasons of Hillside Plants.—
As a hill is ascended the temperature is lowered by 1° F. for each 300 ft. Hence the montane species of flowering plants require a longer period of sunny weather before the thermal constants demanded by each species are respectively reached. The persistence of moist conditions or rainfall may also retard flowering to some extent, as also the effect of exposure and the wind. All these circumstances contribute towards the generally late-flowering seasons of the plants of the hillside, a fact easily demonstrated by a comparison between a lowland and an upland meadow; and the well-known purple tint of the moors late in the summer or in autumn is a familiar illustration of this fact on a wide scale.

The chalk hills of Boxhill and elsewhere furnish an example of the early flowering of a hillside plant, the Box. This may be due to the close habit of growth of the Box, the sheltered character of the habitat, and its southern origin and distribution. The Hairy Violet, another chalk species, like all the Violets is early, flowering also in June. In May the Rock Rose, Kidney Vetch, Clary, and Sheep's Sorrel are in flower, all but the last, it should be remarked, being chalk plants.

June, however, is the principal month for the hillside plants to flower. Then we may find the following: Touch-me-not, Rest Harrow, Silky Mountain Vetch, Sainfoin, Dropwort, Oak-leaved Mountain Avens, Wild Thyme, Musk Orchid, Fragrant Orchid, Sheep's Fescue. Many of these, again, are limestone or chalk plants. In July, Musk Mallow, Hare's Foot Trefoil, Salad Burnet, Field Scabious, Ploughman's Spikenard, and Cotton Thistle flower, and the Gentians do not bloom till August. On the whole it is thus to be noticed that hillside plants flower late.

Duration of Hillside Plants. — There are several reasons why the duration of hillside plants should be more or less uniform. In the first place, the late flowering of the plants of upland regions, which has already been pointed out, necessitates this; for it is impossible for plants that are subjected to conditions prevalent in highland regions to mature in the same manner as those that grow in the lowlands. Hence it is that with a few exceptions the upland plants are perennial. They form frequently wide associations, which are generally made up of perennial plants, such as Grasses, Sedges, Heaths, &c.

At higher elevations there are not many plants of annual or biennial duration; for the ground is not open or broken, but taken up more or less continuously by plants of vigorous dominant growth. Cotton Thistle, the common Gentians, Touch-me-not, and Hare's Foot Trefoil are annual or biennial. It is thus clear that the hillside plants have adapted themselves to perennial conditions as a result of the factors that govern the upland floral regions.

The Pollination of Upland Plants. — The uplands consist largely of pastures, and there is as a consequence a parallel between the conditions for insect life on the hills and the lowlands, where pastures are also predominant. The hills are, in fact, as much alive with the busy hum of the insects in spring and summer as the lowland meadows. This may be seen, indeed, in the existence of a large number of insect pests that live as larvae upon the hillside plants.

The openness of the hillside contributes to the prevalence of insect life, for insects can wander at will unimpeded by any barriers as in woodlands, or where the type of habitat is restricted as in the case of a cornfield, a bog, heath, &c. The hillside plants as a whole have brilliantly-coloured flowers, conspicuous and attractive, as Rock Rose, Marsh Mallow, Kidney Vetch, Sainfoin, Field Scabious, Clary, Musk Orchid, Fragrant Orchid, &c.

Salad Burnet, Sheep's Sorrel, Sheep's Fescue are pollinated by the agency of the wind.

The Dispersal of Seeds of Hillside Plants. — The exposed nature of the uplands would at first sight appear to be a factor in the dispersal of hillside plants. As a matter of fact, upon the uplands there are extensive associations of a single species, such as Ling, Whortleberry. These as a rule occupy the higher zones, where the less dominant types are as a whole absent.

There are, however, wide associations, as in wet and dry meadows of Sedges, Rushes, Grasses, &c., at lower altitudes. Some of these may grow in such association, as Matweed, &c., as to exclude other types of plants with a different growth-habit. But even here, usually lower down there is a noticeable intermingling of other species. Amongst those with seeds dispersed by the wind are Weld, Rock Rose, Hare's Foot Trefoil, Sainfoin, Dropwort, Salad Burnet, Oak-leaved Mountain Avens, Ploughman's Spikenard, Cotton Thistle, Sheep's Sorrel, Musk Orchid, Fragrant Orchid, Sheep's Fescue, and some of these are dispersed in part by their own mechanism to a shorter distance.

Some are dispersed by animal agency, as Dropwort, Field Scabious. The Hairy Violet is assisted by ants in the dispersal of its seeds. In Touch-me-not and Rest Harrow special contractile tissue enables the seeds to be jerked when ripe from the pod, as also in Kidney Vetch, Silky Mountain Vetch, and Box.
Soil and Upland Plants. Hills, as has been explained, are largely the result, apart from denuding agencies and river development, of uplifts or rearrangements of the crust, thus causing a diversity of rocks to be exposed at the surface. Many types of rock may thus outcrop within a short distance, and the plants of a single hill or mountain may thus be of very diverse types. As explained also elsewhere, the older sandy or siliceous types are mainly developed in the west and north, though modern arenaceous rocks occur in the east and south also. Central England, as a whole devoid of hills, is largely made up of clays, loams, marls, and eastward there are calcareous rocks and chalk, with peaty conditions in the lowlands.

The Pennine Axis, and other regions in the west, and Lake district are made up of limestone.

The plants that are described are found upon all these types of soil. Weld, Rock Rose, Hairy Violet, Kidney Vetch, Sainfoin, Dropwort, Salad Burnet, Wild Thyme, Clay, Box, Musk Orchid are found largely on limestone or chalk, though sandy soil also suits some of these. A sandy soil suits Marsh Mallow, Rest Harrow, Hare’s Foot Trefoil, Field Scabious, Cotton Thistle, Sheep’s Sorrel, Sheep’s Fescue. But Hairy Violet may be found on a sandy or a humus soil. Humus also suits the Gentians and Fragrant Orchid. Touch-me-not requires peat like the last to some extent. Silky Mountain Vetch requires a rocky stony soil.

Method of Survey.—The reason for the separation of hills, &c., from other types of habitat being mainly one of altitude, the method of survey in this case must be, in order to obtain satisfactory results, carried out by surveying zones of altitude. That is to say, a region from 100 ft., and so on upward, should be marked off by aid of an aneroid, or orographic maps, or contours on an ordnance map. The altitudes of plants found between such zones will then be obtained, and it will be possible to determine by such data the exact range upward or downward of each species.

The mode of survey of each piece of ground as an area should be done in the case of the types so far described on those lines, whilst bog and heath and moor may be surveyed, as also any aquatic vegetation, on the lines of the method of survey described elsewhere. There may be pasture (usually predominant), or cornfield, or wood, or roadside and hedges, which should be studied as already suggested.

Other special points to be noticed, and of which data should be kept, are the effect of the wind force, the temperature, and the length of sunlight, rainfall, &c. The aspect and slope, the latter given in angles, and the character of the soil, are all factors that should be noted and put down. The dry or wet character of the soil is important, and advanced students may estimate the water content. Any points that may be noted as to the influence of one species upon another are also of the highest importance.

SECTION VIII

LAKES, RIVERS, STREAMS, DITCHES, AND WET PLACES

Terrestrial and Aquatic Vegetation.—Water has a more uniform temperature than the soil, and thus aquatic vegetation is more or less constant, for the chief zones of latitude. But adaptation to an aquatic life necessarily involves particular habits, &c. Many water plants are found all over the world. This may be due in part to the migration of water-fowl.

Aquatic plants form open associations, but are not in this case so subject to the encroachment of other plants, except riparian types; and it is here that the invasional factor comes into play. Some plants in fact are amphibious, and can live in water and on land.

Water plants derive their air through the water, so that they have wide air-spaces. The leaves are thin and much divided, because the light coming through the water is already diffused or broken.

Some aquatic plants float freely upon the surface, as Duckweed; others are rooted in the mud, as Water Lily, and raise their leaves above water; whilst others are submerged. There are those that grow half in and half out of water, or at the margin. Thus the vegetation of the water exhibits every transition to that of the land.

Hydrophytes or True Aquatic Plants.—Aquatic
plants are distinguished from land plants in being submerged wholly or in part in water. There are also moisture-loving plants (see below), from which they are distinguished, hence the term Hydrophytes. Certain modifications, briefly mentioned in Section I, are required by water plants to fit them for life in water.

The watery element necessitates the increase, in size and number, of the air-spaces. The chlorophyll granules are aggregated in cells nearer the surface than in land plants to accomplish photosynthesis more effectively.

Water plants have a thin cuticle which is not cutinized or waxy, so that absorption takes place at all points, and stomata are not required as a rule, or where present are on the upper surface, and do not open and close.

The stems of water plants, owing to the support received from the water, do not require thickening, or a series of vessels of woody elements (xylem) for the conduction of water from the root to the rest of the plant, as absorption is possible at all points, so that the supporting tissues are reduced; but as it is necessary for the plant to convey food from the leaves the phloem is well developed.

Since absorption is not confined to the roots, these are also not well developed, and may be absent, as in Bladderwort, or where present be merely organs of attachment, or serve to maintain equilibrium.

Whilst many aquatic plants have primitive characters, some have highly-organized flowers, as Water Butternuts, and these are probably derived from earlier land types and have adapted themselves vegetatively to life in the water. A large proportion of Monocotyledons (over 30 per cent) are aquatics.

Hygrophilous Types.—Between land plants that do not need a considerable amount of water and those that are aquatic there are intermediate types, which are distinguished owing to their demand for a greater or less amount of moisture. Those that are intermediate, such as meadow plants, woodland plants, cornfield plants, are Mesophytes, requiring a medium amount. There are others that require a larger amount of moisture, such as marsh plants and wet meadow types, and the riparian types of aquatic plants.

Marsh plants, like water plants, are not able to transpire readily, and have emergency exits for the expulsion of water in drops at special points.

Zonal Character of Aquatic Vegetation.—Aquatic vegetation shows a well-marked zonation or arrangement of different types in zones or parallel bands. This applies whatever be the character of the aquatic habitat—lake, river, &c.—though there may be an absence of one or more types, and the one may take the place of the other, showing the manner in which aquatic vegetation may invade the land, or vice versa. Of freshwater types of formation there are four main divisions. These are based upon the relative force of the current, or the richness or otherwise of the water in mineral salts.

Thus there are slow-flowing rivers which are rich in mineral salts (alkaline), and these are usually lowland. Then there are stagnant or foul waters, which are usually devoid of flowering plants, and are colonized by Blue-green Algae, as sewage waters. Some nearly stagnant waters may be rich in lime, and contain a characteristic phanerogamic flora. Where the water is poor in mineral salts, as in lakes and tarns in upland regions, usually on siliceous rocks, certain rare and local types, as Quillwort, Lobelia, Shore Weed, &c., grow. These upland lakes are usually moorland highland lakes. There are also quickly-flowing streams on hill slopes, which may either be rich or poor in lime, and each has its own particular flora.

In all these cases the plants show a zonal arrangement. In the middle grow the plants that float or have floating leaves, as Duckweed, Water Butternut. Around the central zone grow half-submerged or totally submerged types, as Pondweed, Hornwort, &c.; whilst in what is called the third or Reed Swamp association grow the Reeds, Rushes, Sedges, Purple Loosestrife, &c., which are only half-submerged.

Uniformity of Conditions, or Diversity.—Water preserves a more or less uniform temperature, and is less modified than land by the alternation of summer and winter, so that there are no aquatic Tropophytes, in the same sense at any rate as with land plants. The conditions of light are more or less uniform in freshwater formations, but are influenced by the weather in the shape of clouds, fog, and extremes of sunshine.

Water and its Effect upon Plants.—Water may vary in respect of its constituent salts, and be either in general salt or fresh water. There is also an intermediate type which is neither saline nor fresh, but brackish, as along the coast in salt marshes or estuaries.

Fresh water may be hard or soft, poor or rich in mineral salts. The water of upland lakes is usually poor in mineral salts, but peat bogs are usually charged with humous acids and acid in reaction. Other upland waters situated upon siliceous sandy rocks are poor in mineral salts, and clear or pure. It is in such pools or lakes that Desmids are especially
abundant. Diatoms, which require water with a good deal of mineral salts (alkaline), are found in more lowland situations.

Flowering plants are equally susceptible to differences in the water. The Stoneworts or Charas-luxuriate in water highly charged with carbonate of lime, and help to precipitate it, as do some mosses.

Water may also vary in temperature, but in the British Isles there is little variation in this respect. Sea-water, however, is more constant in temperature than other waters, and is seldom frozen. The water of lowland ponds and lakes is not so readily frozen as that of highland lakes, &c. The depth of the water naturally influences the temperature, hence the zonal arrangements of plants, which are connected with the individual thermal constant.

The state of motion of the water again is important. When motionless it may be actually foul, or merely stagnant, and in the first case few flowering plants will live in it. But some plants require stagnant, motionless water, as Bladderwort. Naturally such waters are relatively rich in mineral salts, and so are those that move but slowly, in which the pondweeds luxuriate. The quickly-moving waters are far less rich in salts, and so are the upland lakes and tarns.

Much depends upon whether water is of aerial origin, or telluric, or underground. The aquatic element, beneficial as it is in many respects, however renders transpiration difficult, and the supply of oxygen is small except in running water; hence the distinctions between aquatic associations due to the aerating power of water.

Then, again, light is impeded, and no light penetrates at the greater depths. The character of the light is also different, for red and yellow rays are absorbed, and the light alters from white at the surface to a green colour below, hence the apparent colour of clear water is green, or, as in the case of the still deeper sea, blue. Hence the colour types of marine algae, red, brown, and green, the green colour in the first two being masked by colouring matter, anthocyan, &c.

Altitude of Aquatic Vegetation.—There are distinct zones of altitude of the different types of aquatic vegetation. The maritime vegetation or marine plants grow at sea-level. It is important to remember that inland water finds its own level and flows, unless enclosed as in a pond, lake, loch, lough, or tarn, regularly by a series of stages to the sea from the highest points to lower levels.

This gives a division into highland and lowland aquatic vegetation. In the highland loch are found such plants as Airlwort, Alternate-flowered Water Milfoil, Starwort, Lobelia, Bladderwort, Shoreweed, various types of Pondweeds, Spike Rush, Floating Burwart, Pillwort, &c., and White Water Lily, Floating Marswort, Amphibious Knot Grass, and other Pondweeds are floating types; whilst in the Reed-swamp grow Bog Bean, Floating Bur Reed, Common Spike Rush, Bulrush, Prickly Twig Rush, Sedges, Reed, Manna Grass, &c.

There are the upland quickly-flowing rivers, which again are poor as a rule in mineral salts, further differentiated by relative altitude. The lowland rivers are more or less stagnant or slow-flowing, and are richer in mineral salts. They form in the first case tracts like the Norfolk broads, very little above sea-level. The slow-flowing rivers are intermediate in altitude, and their vegetation differs from the last, being much richer in the forms of plant life.

Transition of Aquatic to Marsh or Bog Vegetation.—Aquatic vegetation is distinguished by the immersion of the plants entirely, or nearly so, in water. The land vegetation forms the opposite extreme, for water there, except in low-lying areas, does not lie near the surface except on clay soils. Thus the relative lie of the ground, and the porous or non-porous character of the soil, determines largely the gradation from a dry to a wet meadow. Between these two types—aquatic and land plants—lies an intermediate series, the Hygrophiles or marsh plants and wet meadow types, into which the former may merge.

Thus an aquatic formation may, through the marginal reed swamp, become a marsh formation laterally; the latter may also, where peat is formed to a considerable depth, and the lime salts are gradually lost, become a bog or fen. The aquatic and fen or bog formations on a large scale are largely transitional in East Anglia, and the preference of each for alkaline water renders such transitions easy. Highland bogs, however, are poor in lime and richer in humous acids.

Drainage and Aquatic Vegetation.—Temporarily a dry season or drought, especially in the case of pools or ponds, has a great effect upon the vegetation. Pools may dry up, as they have done almost everywhere, and a relic of a bog flora, with Sundew or Butterwort, disappear for ever. The sapping of trees may artificially cause desiccation over a wide area, and cause the disappearance of marsh or aquatic plants in much the same way; whilst on the contrary, the destruction of a forest naturally and the waterlogging of the area may give rise, as has occurred over and over again in upland areas, to a bog. But by far the most potent factor in disturbing the
stability of aquatic formations is the drainage of land. It may, of course, incidentally produce fresh aquatic formations, as ditches and drains (and artificial canals are of the same type). But in very low-lying areas the formation of dikes or drains, and the withdrawal of large sheets of water and their conduction into definite and restricted areas, destroys aquatic vegetation. This is what has occurred in the Fens, causing the disappearance of wide areas of aquatic, marsh, and fen vegetation.

**Lakes, Ponds, Pools, and Reservoirs.** Enclosed tracts of water are as a rule still waters. But there may be an inflowing and outflowing stream, regulated frequently by a sluice. The disturbance of such waters is effected as a rule solely by the wind, or by springs from beneath or at the sides. Such tracts of water are normally sweet, though stagnant, but may be rendered foul by the percolation of sewage, by cattle, by waterfowl, or by the decomposition of leaves in the case of lakes, &c., in wooded areas.

Lakes are either upland or lowland, and highland with a peaty bottom, or lowland and non-peaty.

Ponds when stagnant may have a floating association of Lesser Duckweed only, with marginal wet-soil types, Rushes, Sedges. A clearer pool may have either Stonewort or Nitella on the bottom. Canadian Waterweed, Pondweeds, Water Lily, Water Buttercup, Manna Grass, Horned Pondweed, Celeriac-rooted Crowfoot, Amphibious Knotgrass, and be lined with Sedges, Rushes, Skullcap, &c.

The zonation typical of the aquatic vegetation is in a lake, pond, &c., cyclic or elliptic. A highland lake as mentioned contains few types, whilst a lowland lake richer in mineral constituents contains, in addition to the above, such plants as *Hippurus* (Mare's-tail), Hornwort, Milfoil, Bladderwort, Water Soldier, Starwort, &c., submerged or nearly submerged; whilst floating forms include also Frogbit, Arrowhead, &c.; and in the marginal reed swamp also, Purple Loosestrife, Great Hairy Willow Herb, Creeping Jenny, Marsh Woundwort, Great Water Dock, Reed Mace, Bulrush, and Reeds.

Reservoirs are artificial or natural, and are usually of lowland type with little or no peat, but occasionally along the margin, Shoreweed, Pillwort, &c., may be found. *Hippurus*, or Mare's-tail, is common in such aquatic habitats.

**Rivers, Canals, &c.**—The aquatic vegetation of rivers differs little from that of streams, except in the greater width of the former, and the usually greater depth of the water. There are quickly-flowing rivers poor in mineral salts, and slow-flowing rivers richer in mineral salts in solution. The former are upland and the water hard as a rule, the latter lowland and the water soft.

Some peculiar types are more at home in slow-flowing water than in still waters; but they exhibit different adaptations, having ribbon-shaped leaves in this case, as in the Arrowhead; and so does the common Pondweed of the pond in running water. Here also grow *Ranunculus circinatus*, Water Dropwort, Canadian Waterweed, Bur Reed, Shining Pondweed, Perfoliate Pondweed, Bulrush, and at the margin Brooklime, Water Cress, Scorpion Grass, Marshwort, Great Hairy Willow Herb, Starwort, &c. Few floating-leaved types occur except where the marginal vegetation deflects the course and force of the current, as Water Lily, Duckweed, Amphibious Knotgrass. In the reed swamp many plants occur, as Meadow Rue, Meadow Sweet, Water Betony, Sweet Flag, Bur Reed, &c. Such plants occur also in canals.

In swift-flowing streams with no lime-salts in solution occur *Ranunculus Lenzorbran* and *R. hederaceus*, with Manna Grass, Starwort, &c.; and in those with lime salts in solution other types occur.

**Streams.**—Streams may be either upland or lowland. The former are the beginnings of rivers, and form torrents, cascades, and waterfalls, in which chiefly ferns luxuriate, and lower cryptogams. In the lowlands streams form the tributaries of rivers, being fed by ditches and springs, between which they are intermediate. The stream may, as in the case of a river, form a boundary between meadows or pastures, and is thus frequently planted with low bushes; and in this way there is little or no scope for the reed swamp association, and in its place grow shade plants or hygrophilous types.

There is usually too little water in a stream for the lowest zones of aquatic vegetation, but occasionally Stoneworts may be found, though, as they prefer standing water, and streams are frequently quick-flowing, they are not general in streams. But in the lowest zones there is frequently a close growth of the Canadian Waterweed.

The chief pondweeds in a stream differ from those in the river, being composed of such species as Opposite-leaved Pondweed, *Potamogeton crispus*, small forms which do not require deep water. These have floating leaves. The Amphibious Knotgrass is less common in streams than in rivers, and so are the Duckweeds. Water Buttercups are perhaps more frequent in streams than in rivers.
the forms in the latter being larger. Rarely Water Lilies occur where the stream is wider at a bend. Manna Grass is abundant, and Flote Grass (Catabrosa aquatic) is not uncommon.

In what corresponds to the reed swamp may be found Meadow Rue, Water Cress, Great Yellow Cress, Purple Loosestrife, Great Water Chickweed, Great Hairy Willow Herb, Water Bedstraw, Fleabane, Coltsfoot, Butterbur on the banks. Scorpion Grass, Water Betony, Musk, Brooklime, Mints, Gipsywort, Skullcap, Yellow Flag, Bar Reed, Water Plantain, Sedges, and Phalaris arundinacea.

Ditches.—The ditch is largely artificial, and thus no measure of the true aquatic vegetation of a district even on the small scale on which it is developed. It is thus of relatively modern date. But it is of importance as showing the types of vegetation that have once flourished in the district, for ditches afford the last resorts of the hygrophilous types that have been driven from the wet meadows, once marshes, &c.; whilst a few are relics of true aquatic vegetation.

The types of aquatic plants found in ditches are restricted in character. They include chiefly plants that grow in the reed swamp, and in fact the whole ditch may be filled up with such plants as Marsh Marigold, Water Cress, Great Water Chickweed, Great Hairy and other Willow Herbs, Water Bedstraw, Fleabane, Hemp Agrimony, Coltsfoot, Water Figwort, Marsh Thistle, Scorpion Grass, Brooklime. In some ditches Frogbit used to grow. Gipsywort may occur here and there, and Amphibious Knotgrass, the terrestrial riparial type. It is rarely that such large plants as Yellow Flag, Phalaris arundinacea, and Reed grow in ditches, indicating vestiges of more extensive aquatic vegetation. Wood Club Rush is more frequent. Duckweeds may fill up a stagnant ditch almost entirely. Frequently Marshwort (Silvum erectum), numerous Sedges, and some moisture-loving Grasses, as Manna Grass, Pot trivialis, &c., may be found in a ditch. Starwort, and even Canadian Waterweed, Water Violet, Milfoil, and Hornwort may be found in ditches of a particular type.

Wet Places.—There are certain spots, usually low-lying, or hollows at higher altitudes, that preserve a type of vegetation which exhibits a marked difference to that of the surrounding higher and drier ground. They may be the relics of former aquatic vegetation, of a marsh, a bog, or a wet heath, and as a whole are hygrophilous types. They may differ little in general character from a wet meadow, but usually contain some distinctive species that stamp the flora as something more specialized.


A number of these are members of different formations, but all agree in requiring a moist habitat.

The Habits of Aquatic Plants.—The great difference between soil, which is a solid immobile substratum, and water, which is a liquid mobile solution, naturally enables one to distinguish as a rule between a land and a water plant at sight, even when the material is a dried herbarium specimen, since the difference in habitat is closely correlated with a marked difference in habit. The chief points of difference are the reduction in the roots, which are long and thread-like, or borne in whorls around a creeping rhizome, or subaqueous stem, or even absent.

The stems and branches also are slender, herbaceous, differing in structure, and show every sign of reduction, being seaweed-like in habit in the case of submerged types, and in erect half-submerged types seldom thick or woody. The leaves differ in form, texture, and arrangement, being adapted to a floating or streaming habit, or of the grass type in the reed swamp as a rule. Riparial types of plants are most nearly akin to terrestrial types.

The flowers also are seldom brilliant, and are frequently reduced or apetalous, many types of aquatic plants relying mainly on vegetative reproduction.
The adaptations to aquatic conditions in internal structure have been referred to. The adaptations in external form or leaf arrangement are exemplified by the finely-divided or dissected foliage of Water Buttercups, Water Dropwort, Water Violet, Milfoil, Hornwort, Bladderwort. The carbonic acid gas in water is more abundant but less available, hence the dissected type of leaf, which also offers less resistance to the current, and a greater relative surface exposed to the light, and for the absorption of oxygen. The ribbon type of leaf is an adaptation to the currents, and is found in Water Plantain, Arrowhead, Flowering Rush, &c.

Another type is the clustered awl-shaped leaf, as in Water Lobelia, Shoreweed, Pillwort, &c. Floating leaves may be orbicular, as in some types of Water Buttercup, Water Lilies, Frogbit, or ribbon-shaped, as in Manna Grass, Bar Reed, Bulrush. The Water Buttercups and some other types have two types of leaves, adapted to either the submerged or floating position.

The Height of Water Plants.—The aquatic plants have different conditions to contend with in regard to the height to which they usually grow. A land plant, whether it be a shade plant or a sun plant, obtains the necessary light, and other factors essential for growth and nutrition, more or less directly. It has no great period of subterranean existence to outlive after the seed has germinated before it reaches the surface and the light. Nor is the light variable in the character of the rays absorbed, or in intensity to any considerable extent.

Aquatic plants, on the other hand, have to struggle upwards in the dark after germination, and the young shoots have to make some growth before they can obtain even a moderate degree of light. Hence they must attain a certain height under water before their chief functions can be adequately performed. This tends to make the submerged types generally of a uniform height in each zone, and those that struggle upward to put forth floating leaves also attain a more or less uniform length or height. Except in the case of the half-submerged types of the reed swamp, few become erect either below or above water.

The tallest plants, ranging from 3 to 10 ft., grow in the reed swamp, and are erect or nearly so. But the floating plants and submerged types may attain a great length, though the visible height above water is trivial in comparison.

The Flowering of Aquatic Plants.—As in the case of all moisture-loving plants, the season of flowering of aquatic plants is on the whole

late. The riparian plants, the least immersed in water, flower relatively early in the year. The immersion of aquatic plants in water, colder than air, is responsible for the late stage at which the respective thermal constants of each plant are reached. It is an interesting fact that a large number of marsh and aquatic plants have the leaves and stem coloured red by anthocyan, which transforms the light rays into heat.

The earliest flowering aquatic or riparian types are Coltsfoot and Butterbur, and Snakeweed Fritillary, which flower in March. In April a small number of others first commence to bloom, as Water Pencil, Scorpion Grass, Crack Willow; and these, save the first, are riparian, or but slightly submerged, if at all.

In May, Meadow Rue, Water Cross, Water Betony, Brooklime are in flower. The following are found in flower in June, when the temperature is much higher, viz.: Yellow Water Lily, Great Water Cress, Creeping Jenny, Musk, Skullcap, Amphibious Knotgrass, Yellow Flag, Sweet Flag, Duckweed, Water Plantain, Flowering Rush. July is the principal month for aquatic plants to flower, and then one may find the blooms of the White Water Lily, Great Water Chickweed, Purple Loosestrife, Great Hairy Willow Herb, Marsh Bedstraw, Three-lobed Butterbur, Water Ragwort, Mint, Gipsywort, Frogbit, Reed Mace, Bar Reed, Arrowhead, Bulrush, Wood Club Rush, Reed. In August, Hemp Agrimony and Fleabane first come into flower.

The Duration of Aquatic Plants.—The great difference between land and water plants has an important effect upon the duration of the latter and their mode of seeding.

It is much more difficult, in fact, for an aquatic plant to germinate, put forth aerial shoots, branches, leaves, flower, and finally fruit in a single season, flowering late as such types do, and beginning to grow upward late.

The marsh plants and Hygrophytes generally are similarly retarded. It is therefore unlikely that many aquatic plants should be annual. For the possible success of the flowering cycle, and maturing of seed, may not eventually result in the propagation of a new plant from seed next spring. Therefore the provision of perennial underground organs or roots or rhizomes is a great assistance to aquatic plants. The time taken in developing these must equal the ordinary life of an annual.

Moreover, the reproduction of aquatic plants is very largely vegetative. Resting buds or hibernacula are formed in winter by Frogbit, Pondweeds, &c. Naturally the aquatic element is for these purposes a distinct advantage. Normally, of course, growth is going on
during the summer months, and the winter is, as in the case of most other plants, a period of rest. The vegetative cycle is broken in winter by the elaboration of such special structures. Many plants simply sink to the bottom, and in the spring rise again to the surface. The hibernacula drop off and sink to the bottom till the spring.

Water Lilies die down to the rhizome. Only a small percentage of aquatics are annual or biennial, as Duckweed, Horned Pondweed and Awlwort.

The Pollination of Aquatic Plants. — The aquatic habitat of water plants affects all the phases of their life history. This applies not only to their vegetative organs, but also to the reproductive processes, or devices for the continuity of the species.

Some few aquatic plants hardly raise their flowers above water, or not at all as in the case of Zostera, and in Vallisneria, a sub-tropical plant which has been found in the Canal at Manchester. The rest are more or less normal, the reproductive parts of aquatic plants being less altered than their vegetative portions. But there are some features in which they differ from land plants. Thus a number of them have very small (reduced) flowers, and few are sweet-scented. A large proportion have white or yellow flowers. The plants in the reed-swamp association are the most diverse, and most closely allied to land plants.

Beetles help to pollinate the White Water Lily, and many are pollinated by small flies, as Water Plantain. Whilst cross-pollination is effected by insect agency in the majority of cases, a number are more liable to be self-pollinated, as Great Yellow Cress, Great Water Stitchwort, Three-lobed Butterbur, Yellow Loosestrife, &c. Heterostylism is found in Purple Loosestrife and Yellow Loosestrife, which are trimorphic. In Great Hairy Willow Herb and Creeping Jenny the anthers and stigma are ripe together. The Marsh Bedstraw, Great Water Stitchwort, Brooklime, Amphibious Knotgrass, Flowering Rush, ripen their anthers first, before the stigma. Butterbur, Frogbit, and Reed Mace are dicocious. Coltsfoot, Bur Reed, Bulrush, and the Reed mature their stigma first. Duckweed and Arrowhead are monococious, and the former is pollinated by aquatic insects. The following are wind-pollinated: Crack Willow (visited also by bees), Reed Mace, Frogbit, Bur Reed, Sweet Flag, Bulrush, Wood Club Rush, and the Reed.

The Dispersal of Seeds in Aquatic Plants. — The aquatic character of the habitat introduces new features into the mode of dispersal of the seeds. The seeds of submerged and floating plants must in these cases germinate in the mud at the bottom. Heavy seeds are more likely to be deposited not far from the plant, sinking to the bottom. But in some the seed-coat contains air vessels and the fruit or seeds float along, some even germinating at the surface of the water. In this case wind and water currents enter into their mode of dispersal. Seeds of half-submerged plants in the reed swamp, which may fall into the water, are of this type, and one may note sometimes a scum of small seeds that have been drifted together by capillary attraction, and driven to the margin to germinate in the mud on the banks. The Water Lily seeds are surrounded by a spongy aril with air spaces, and at first float up to the surface. Afterwards, when the aril has rotted, the seeds fall again to the bottom.

The fruits or seeds of the following are dispersed by special agencies of the plants themselves: Meadow Rue, Water Cress, Great Yellow Cress, Great Water Stitchwort, Purple Loosestrife, Marsh Bedstraw, Water Betony, Musk, Mints, Gipsywort, Skullcap, Fritillary, Wood Club Rush, Water Fennel, White and Yellow Water Lily, Brooklime, Amphibious Knotgrass, Bur Reed, Sweet Flag, Duckweed, Water Plantain, Arrowhead, Flowering Rush, Bulrush, are chiefly dispersed by aquatic agency, in some cases also by the wind. The wind assists Great Hairy Willow Herb, Hemp Agrimony, Fleabane, Three-lobed Butterbur (also, owing to its hooked fruits, dispersed by animals), Coltsfoot, Butterbur, Water Ragwort, Marsh Thistle; also Yellow Loosestrife, Creeping Jenny, Crack Willow, Frogbit, Yellow Flag, Reed Mace, and the Reed. Water Fennel, Scorpion Grass, Bur Reed, may be largely dispersed by animals.

The Soil Equivalents of the Aquatic Habitat. — Though true aquatics, especially free floating types, are independent of soil, they, like the submerged and floating types which are anchored in mud or sand or gravel, &c., are to some extent influenced by the character of the substratum.

Since the soil brought down by rivers and streams is of a particular character, it is natural that plants which live in the reed swamp, or upon the banks of low-lying ground, should be dispersed elsewhere where the conditions are similar.

At the same time there is a considerable amount of peat or humus formed along a river margin, which is usually black and amorphous, and this is another requirement of such plants. Others are addicted to a clay soil. Meadow Rue, Water Cress, Great Water Stitchwort, Purple Loosestrife, Great Hairy Willow Herb,
Marsh Bedstraw, Hemp Agrimony, Fleabane, Coltsfoot, Butterbur, Water Ragwort, Marsh Thistle, Yellow Loosestrife, Creeping Jenny, Scorpion Grass, Water Betony, Musk, Mint, Gipsywort, Skullcap, Amphibious Knotgrass, Crack Willow, Yellow Flag, Fritillary Rush, Reed, require either sand, clay, or peat.

Methods of Survey.—The particular form of aquatic vegetation will at once determine the mode of survey. In a pond or lake the vegetation is generally concentric, hence the mapping must be done on such lines; whilst in a river, stream, or ditch it forms more or less parallel bands or zones, and should be done by making cross-sections (as indeed may be done in the first case).

The division of aquatic vegetation into zones of floating, submerged, and reed-swamp associations renders it necessary to study them by these zones. Any one may be studied by itself, or all the zones together. In either case the dominance of any particular plant should be noted.

Such points as the character of the mineral salts in the water should be studied by advanced students.

The rate or character of the current should be noticed. The juxtaposition of the different societies should be noted at different points.

In the case of wet places they may be studied in the same way as meadows and pastures, and the tape or stakes may be used for marking out squares to be studied one by one in detail.

The zones that lie deepest in the water can only be studied by aid of a boat, and this may be a difficulty not easily overcome. The dredge may be used to examine not only the lowest zones of flowering plants but also the plankton, which occurs at the surface.

SECTION IX

WASTE PLACES

Artificial or Natural Character of Waste Places.—The term waste ground or waste places is capable of more than one meaning. There are comparatively natural types of waste land, which, although following the destruction of forest lands originally, may be in their present stage untouched by man. But these types are hardly, if at all, represented in this country; and to all intents and purposes waste places denote pieces of ground that are associated with cultivation.

Open Character of the Ground.—The waste places, as implied by the Latin names of many of the plants that are found there—e.g. arvensis, found on ploughed land; agrestis, cultivated land; sativus, segetum, sown—are characterized by their association with the plough or the harrow, &c. Watson called plants of cultivated ground agrestal, including Papaver, Agrostemma, Bromus secalinus, Veronica agrestis; but these are more especially cornfield weeds. They share the same character, however, in growing upon open ground that is liable to be broken up and disturbed, and from which close-growing, spreading, and tenacious types, such as Grasses and other meadow plants, are continually being ousted.

The plants thus have to compete with less severe conditions, and their struggle for existence is far less arduous. Waste ground possesses the same character, being open and frequently new ground, upon which may appear in their proper rotation algae, mosses, and flowering plants, or the latter may predominate.

It is natural that the relative openness of such stations may differ considerably, for if once allowed to return to a more natural and permanent condition the alien types disappear, and Grasses, &c., take their place; and the persistence of particular types in spite of this is a mere matter of adaptiveness, which some plants possess in a remarkable degree.

Chersophytes.—The name Chersophytes is given to plants that grow in regions where there is a sufficiently moist climate to admit the existence of forest land or scrub, and on which, after this has been destroyed on dry soils, perennial dry-soil types may grow. They, however, are not steppe plants, though they may resemble them. In the eastern counties, which like the rest of the country were subjected to steppe conditions following glacial conditions, certain plants that may be regarded as steppe plants occur. And steppe conditions are akin to desert conditions, which are similar in the character of the habitat to sand-dune formations, widely represented along the British coasts, both types of
formation (included together as Cheno phytic) being dry-soil types. The Grape Hyacinth
(Ajacaria racemusum) is a steppe plant.

The longer vegetative period and greater
degree of humidity of cheno phytic vegetation
distinguish it from the steppe formation, and
the bulbous and tuberous plants of the steppe
are absent.

A type of meadow in the Alps is characterized
by the dominance of Festuca varia wiaca and
Kalcia vallesiana. This last has recently
been recognized in this country. It also
includes Poa bulbosa. The Brone meadow
on the Alps is dominated by Bromus erectus,
common on certain dry calcareous pastures
in this country also, and with it it also grow
Galium Mollugo, Festuca rubra, F. ovina, F.
pretensis, Caix verna, Prunella vulgaris,
Salvia pretensis, &c. These occur in similar
situations in this country.

Bushland or thorn bushland on dry soil
consists of Barberry, Hawthorn, Rose,
Bramble, or Juniper, and in Scotland of
Gorse. This is due to destruction of forest
in humid areas on dry soils. The affinity of
this natural waste ground to waste places in
the ordinary sense is clear. Fern heath with
Gorse occurs in the south of England. These
formations agree in the dry character of the
soil and modified surface features.

Hedgerows, &c., near Villages, Boundaries
of Cultivated Tracts.—Taking first the areas
immediately around the habitations of man,
who is the chief agent in the introduction and
dispersal of alien plants, there are the hedge-
rows and other kindred spots in close prox-
imity to villages or towns, or the boundaries
of cultivated tracts, where certain plants are
usually to be found in a large number of
similar spots, which occur around almost
every village or town.

The Greater Celandine is one of these
plants. Go where one will, it is nearly always
possible to discover somewhere on the im-
mediate outskirts of a village, in the hedge of a
garden, or at the base of a loosely-made wall,
a number of individuals of this plant. It is
common on sloping banks where other plants
do not grow, and where the soil is bare of
vegetation. Its acrid juices may make the
soil unfit for other plants around it. Gout-
weed and Tansy are further examples.

Borage, Comfrey, and Bittersweet occur in
more open spots away from hedges, close to
villages and gardens. These plants undoub-
tedly owe their dispersal to artificial
causes, being used as remedies for various
complaints from the Middle Ages down to the
present time.

Bases of Walls, &c.—Walls, which will be
described in greater detail in Section XII,
are in themselves artificial, and support a
number of characteristic mural plants that
grow in the crevices or on the top, depending
upon the rupestral type of habitat. At the
base of walls, whether in villages or other-
wise, a certain type of habitat develops,
which supports a typical florula akin to that
of waste ground. The soil at the base is
usually open. Water drips from the wall-top,
forming hollows and loosening the soil. This
is inimical to some plants, exposing their
rootlets. Fragments of the brick or stone
break off, or sand-blasts caused by sand from
the macadam may undercut the materials.

Weeds are removed, especially grass, and
quickly-growing annuals and some ubiquitous
perennials take their place. The roadscraper
disturbs the ground periodically. Shepherd's
Purse is one of the most common types, growing
at the base of the wall on open ground,
and in a variety of similar spots, as on soil
denuded for stone heaps, farmyards, &c.
Common Mouse-ear Chickweed (also a plant
of dry pastures) likewise frequents this habitat.

Common Chickweed is another familiar weed
along the roadside at the bottom of walls.
Cut-leaved Dead Nettle often grows at the base
of a wall where there is a good thick deposit
of road grit. The Hedge Mustard is another
plant that is especially fond of this habitat.
The Great Plantain, Veronica agrestis, Wall
Speedwell (also mural), and Barley Grass may
also be found in such situations. The last is
especially characteristic.

Sandy Wastes, Dunes.—Certain areas with
a loose sandy soil occur here and there which
may be described as waste ground, in the
sense that they are not open to cultivation
and are left in a more or less derelict condition.
The plants that grow in such places are
usually characteristic of dry sand soil. They
include such plants as Stork's Bill, Musk
Thistle, mentioned here, and others such as
Lotus tenuis, Fuller's Teasel, Evening Prim-
rose, Hare's Foot Trefoil, Bird's Foot Trefoil,
Vernal Whitlow Grass, Cornflower, Mallow,
and many other plants of doubtful origin, such
as Treacle Mustard, Lepidium Draba, Sisym-
brum panonrium, &c.

This type of mixed association is similar to
the vegetation that may establish itself upon a
fixed dune after the fixation of the sand by
Marram has been completed. When this is
the case a large number of inland plants
commence to appear, and the ordinary mari-
time vegetation of the sand dunes, which is
not very extensive (in species), tends to dis-
appear.

The effuse or much-branched Oraches,
Atriplex patula and A. hastata, find a suitable habitat in the loose sand; and other common types are: Festuca rubra, Ononis repens, Lotus corniculatus, Erodium cicutarium, Convolulis arvensis (now rare inland), Rumex crispus, Senecio Jacobaea, Taraxacum erythro-spermum, Hypochaeris radicata, Sambucus nigra, Trifolium repens, T. pratense, T. arvense, Rubus rusticannus, Potentilla reptans, P. ausitana, Sedum acre (mural), Galium verum, Crepis viridis, Hieracium Pilosella, Leonotodon antumnalis, Carlina, Cnicus arvensis, Myosotis collina, Thymus Serpyllum, Holcus mollis, Cyngoglossum officinale, Anthyllis vulneraria, Entodon bicornis, the last common upon the Lancashire coast. The origin of these plants is diverse, many coming from pasture or arable close to the sea.

Cart-roads.—A cart-road is very similar to an ordinary roadside, along which, as has been shown (Section VI), a number of plants are dispersed by artificial agency. The highway, however, is regularly made up with macadam, whereas the cart-road is more or less left to itself, and the ruts and middle way alone are regularly used, whilst the intervening spaces are grass-grown, or loose or broken. Upon such spots a number of plants grow which are foreign to the pasture through which such cart-ways are made to reach the highway; also along roads that are primarily used for agricultural purposes.

Naturally the character of the weeds so dispersed depends largely upon the character of the arable or pasture. It is an interesting study to trace the distribution of such weeds from their probable source, and the process by which this has been accomplished. The White Campion is one of the most prevalent plants distributed by this means. Viper's Bugloss is a hardy one plant which is frequent upon chalky soils, but may be found elsewhere distributed by farming operations. The Corncockle, now rare in cornfields, is to be found by the side of a cart-track, or more frequently in some districts in or near a fowl-run, dispersed in foul corn. On sandy soils Knotted Hedge Parsley is often to be found on the side of cart ruts, its usual habitat being a hedge bank.

Melilot is found on towing-paths and in other waste places. Mayweed is a common straggler along the cart-road. Wormwood is conspicuous in hedges along the borders of arable fields or the roads that lead from them. The Burdock, Chicory, Yellow Toadflax, and Hemp Nettle are others that should be mentioned here.

Railway Embankments, Canal Banks.—One of the most potent factors in the distribution of weeds of cultivation and aliens is the railway or the canal. The railway embankment, especially in low-lying areas, forms a direct barrier to the dispersal of seeds blown by the wind across country. The embankment, which is often lofty, thus tends to accumulate or "make a corner in" the seeds so dispersed. And although a great number of such seeds doubtless do not come to maturity, yet a large proportion evidently do survive; and once they have gained a foothold manage to persist in a remarkably successful manner.

The same remarks apply to a canal, which, though not usually cut through embankments, affords the same means of dispersal, though the plants dispersed are not usually of the same species.

The mode of dispersal along railways and canals is difficult to determine. Many plants, apart from the part played by the track as a barrier, are dispersed by falling out, or blowing out, of seeds from goods wagons. In the upkeep of the line, or the canal, horse traffic is responsible for the dispersion of fodder plants. The goods yard and the coal wharf are centres of distribution of such plants, and so are colliery sidings. The gardens maintained by railway employees along the line are also important factors in the spreading of plants along the line. Plants commonly found on railway banks are the Toadflaxes (including hybrids), Melilot, Mountain Crane's Bill, Euphorbia Cyparissias, Anthyllis Vulgaris, Lamb's Lettuce, Brassica Napus.

Stackyards and Farnyards.—As the stonehouse of the crops, a stackyard is a centre of dispersal for the majority of agrestal plants, which grow up with the corn, and are cut with it, the seeds falling out during cartage, or in the winnowing or threshing being blown out in the process. The area around a stack is open, being kept clear of weeds, so that there is every possibility of the successful germination and growth of such plants.

The farmyard forms a similar dumping ground for a number of pasture and arable soil plants that grow luxuriantly in the open ground, or near manure-heaps. The origin of such weeds differs from that of those of the stackyard to some extent (or rather the indirect dispersal). Primarily they come from the meadow (as hay), or from the cornfield (as straw). Hay is used as fodder for live-stock, and in this way seeds in the refuse, or in the carriage of hay from the stack to the stable or cowshed, get dispersed. The same applies to straw. But the refuse hay and the straw used for bedding are utilized as a sort of binding for manure, and in this and the latter, when turned out in the farmyard, seeds retaining
vitality occur, and germinate on the moist and warm manure-heap. Apart from this, the wind-scattered seeds previously mentioned tend to grow luxuriantly in the refuse manure-scattered here and there.

The following plants are characteristic: Shepherd's Purse, Common and Round-leaved Mallow, Mellilot, Black Mustard, White Mustard, Burdock, Spear Thistle, Chicory, Hawksbeard, Dairy Maid's Dock. Others are Scarlet Pimpernel, Veronica Taurinafortii, Corn Sow Thistle, Poppies, Charlock, &c.

Gateways.—The relationship of gateways to the highways, and their characteristic floras, have already been mentioned (under Section VI); but gateways are not confined to highways, though they are naturally more frequent there than elsewhere, comparatively speaking.

The plants that occupy such ground owe their position on both sides of the gateway to their dispersal by much the same method as plants along the cart-road. The fellinging of live stock around a gateway is again a constant source of distribution of plants characteristic of this type of artificial habitat.

The following plants are generally to be found in proximity to gateways, viz.: Knotgrass, Great Plantain, Charlock, Wart Cress, Dairy Maid's Dock, Scentless Mayweed, Burdock, Groundsel, &c.

Quarries, Open Workings, &c.—The quarry is an artificial exposure of rock, or loosely compacted or clayey beds, which is opened up for economic purposes. Compared with natural exposures of rocks in cliffs, or upon hills, or other places where there is a natural outcrop, the flora is on the one hand similar, or on the other dissimilar.

The similarity is due to the colonization of such exposures by plants native to the particular type of rock or soil. The form of the exposure determines the type of plants that will more or less naturally find a foothold there. In some cases crevice plants, or those that grow upon bare patches of rock, quickly appear, and flourish as luxuriantly as in natural exposures. The presence of springs or the dripping character of the rock will determine the presence of others. The dissimilarity between the flora of a quarry and that of a natural exposure of rock, &c., is due to the presence of numerous weeds or plants, alien to the locality or rock soil, which occur in varying proportions in the former type of habitat.

The mode of introduction of such plants is not easy to determine, for this may be diverse. It is highly probable, however, that the wind plays a considerable part in this respect. Rocks-faces act as barriers to the further dispersal of wind-sown plants, as to the dissemination of the fruits and seeds. Probably the plants more or less native to the district are dispersed by this means. But in a quarry there are frequently a number of other plants, obviously brought from a distance—in some cases foreigners or true aliens—that are undoubtedly brought by other agencies.

Chief amongst these is the horse traffic in quarries, and the dispersal of fodder plants for this reason. Birds may disperse some plants with indehiscent fruits, as quarries are favourite resorts of birds. Foxes and other mammals, e.g. rabbits, may do the same by carrying the seeds or fruit in the mud on their feet, in these last two cases from no great distance.

Deadly Nightshade is sometimes found in quarries. Other plants are Dyer's Weed, Rose-bay, Anthyllis, Barbarea precoc, Mellilot, Flax, Senecio viscosus, Hare's Foot Trefoil, Trifolium incarnatum, T. ochroleucon, Lucerne, &c.

Allotments, Gardens, &c.—Allotments and gardens are cultivated tracts which, however, have waste places contiguous to them, and the weeds in the garden are eradicated and turned out, unless they are burnt as manure, and perpetuate themselves upon the outskirts. The garden is a particularly suitable spot for the growth of the less sturdy, succulent herbaceous annuals with more dominant and vigorous plants that form wide associations. Their occurrence or frequency even in such spots is largely sporadic, their societies being small and discontinuous, and as a rule they do not form wide or large or permanent associations.

The worst conditions that such plants have to contend with are periodical multi-annual eradication and the dominance of the cultivated plants. All the other conditions make for their perfection, and it is surprising that they have retained, so far as we know, their characteristics under such artificial conditions.

There are a large number of plants common to garden ground, such as Wormwood, Groundsel, Milk Thistle, Mistletoe, Red Dead Nettle, White Dead Nettle, Fat Hen. Other common types are Cut-leaved Dead Nettle, Grey Speedwell, Henbit Dead Nettle, the terrestrial form of Amphibious Knotgrass, Fool's Parsley, Orache, Creeping Thistle, Twitch, Annual Meadow Grass, &c.

Manure Heaps, Kitchen Middens, &c.—Apart from the manure heaps that are found in farmyards, there are others in fields, &c., but both agree in the conditions which give rise to the appearance of the plants that are especially found in such places. To a slight extent a manure heap acts as a barrier to, or receiving-house for, the seeds of plants blown thither by the wind. But this does not account for the
large number of alien plants that occur upon
the manure heaps. Doubtless these are partly
brought there in excreta; but others are de-
rived from sweepings mixed with the manure,
with garden seeds, &c. And some plants may
also owe their occurrence to the fact that a
manure heap is used as a refuse heap, and
large numbers of plants may thus become
established which may be found in the village
or town of the district.

On manure heaps such lovely flowers as
Glaucoma phaniticum, Rumex hybrida occur;
also Raphanu, Canary Grass, and the Little
Nettle. Kitchen middens or waste heaps often
found near houses or old ruins, where there is
frequently a black soil, due to the accumulation
of refuse in one spot, are characterized by
plants that have in the past been used for
herbal remedies or in medicine, as Hound's
Tongue, Henbane, Belladonna, Black Night-
shade, Thorn-apple, &c.

The Habits of Waste-ground Plants.—Various
factors enter into the characteristic habits of
waste-ground plants. The richness of the soil
may, as upon manure heaps, &c., cause the
plants to have a diffuse, much-branched habit.
The height is in this case greater than usual.
Such plants as Common Mallow and Fat Hen
often attain a great size. The soil of a garden
has the same effect. The openness of the soil
is one cause of this.

The hedge plants have the pyramidal or
versely pyramidal habit, as Greater Celandine,
Goutweed, Tansy, &c.

The rosette habit is a common one where
many plants grow close together, and where
light is not very well diffused. Such plants as
Shepherd's Purse, Musk Thistle, Chicory,
Mullein, &c., have this habit. This also is an
advantage where the soil is dry. Common
Mouse-ear Chickweed has a grass habit, with
the leaf margins recurved, and with a hairy
stem.

Many plants have the trailing or prostrate
habit, but these are not found in the habitats
in which many plants grow closely associated
as a rule. They occur on sandy wastes, as
Stork's Bill, or on banks, as Creeping Toad-
flax, or on gateways, as Knotgrass. The
succulent Dead Nettles have stems at first
prostrate, which helps to strengthen the stem.
Burdock, Milk Thistle, Belladonna, are bushy
in habit.

The Height of Waste-ground Plants.—
Growing under variable conditions as regards
the habitat, and the mode of association of the
components of each flora, waste-ground plants vary a great deal in the height to which
they are capable of attaining. This is largely
dependent upon habit, and the relation of the
latter to light. For where plants vary in re-
spect of height, it is usually where the plants
grow close together and have no elbow-room
that they grow tall and rank, whilst where
the ground is less occupied they are bushy and
not so tall.

From 1 in. to 3 or 4 in. is an unusual height,
but is the usual limit of the trailing plants, as
Stork's Bill, Knotgrass, Creeping Toadflax,
though they may sometimes reach a much
greater height. Six inches to a foot is the
normal height of the rosette plants and those
with a grass habit, as Shepherd's Purse, Mouse-ear, Chickweed, Stinking Mayweed,
Groundsel, Hawksbeard, Henbane, Toadflax,
Purple Dead Nettle, White Dead Nettle, Good
King Henry, Wall Barley; but they may also,
under abnormal or especially favourable con-
ditions, become much taller.

Greater Celandine, Goutweed, Tansy, Musk
Thistle (to 3 ft.), Hound's Tongue, Viper's
Bugsuss, Fat Hen, Dairy Maid's Dock (to 3
ft.), range from 2 ft. upward, the habit being
pyramidal. Others are 3 ft. or more, as
Burdock, Spear Thistle, Chicory, Belladonna;
whilst Mallow, Melilot, are 4 ft. or more, Milk
Thistle 5 ft., Mullein 6 ft., Bittersweet as much
as 20 ft., being a climber.

Flowering Seasons of Wayside Plants.—The
waste place is, as a rule, a dry habitat. The
soil is sandy, seldom clayey. Everything in
the habitat tends to promote the early flower-
ing of the plants. But contrary to what we
should expect, the majority of the plants do
not bloom till fairly late. But there are two
features that are connected with waste-ground
plants and their flowering that to some extent
explain this.

Few, except the larger woody plants, as
Mallow, are perennials. And in general it
may be stated that the plants that are peren-
nial flower early, annuals later, and biennials
still later.

Another feature is the almost perennial
flowering period of some plants, as Shepherd's
Purse, Groundsel, which may be found in
bloom almost any month, and much the same
may be said of Mouse-ear Chickweed, Hawks-
beard, Purple and White Dead Nettle, &c.

Relatively few flower in April, as Stork's
Bill and White Dead Nettle generally, and
Knotgrass. In May, Greater Celandine, Mallow,
Goutweed, Purple Dead Nettle, Good
King Henry, flower. In June the majority
come into bloom, as Mouse-ear Chickweed,
Melilot, Stinking Mayweed, Spear Thistle,
Hawksbeard, Hound's Tongue, Bittersweet,
Belladonna, Henbane, Toadflax, Dairy Maid's
Dock, Wall Barley. A number do not even
flower till July, such as Tansy, Burdock,
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Musk Thistle, Milk Thistle, Chicory, Viper's Bugloss, Mullein, Creeping Toadflax, Fat Hen. These later-flowering plants bear more flowers or florets than the earlier-flowering plants, which opens up a hitherto unrevealed principle.

The Duration of Waste-ground Plants.—Intimately connected as the flowering periods and duration of all plants are, as has been seen in the case of the groups of plants chosen to illustrate each habitat, no section reveals this more forcibly than the present one.

The plants that make it up are of four types: annuals, biennials, biennials, and perennials, and the three former greatly exceed the last. It is to be emphasized here that the annuals do not bloom till June. They have to produce from seed all the organs necessary for plant-life with growth and power of reproduction; whereas perennials have a root and rootstock and stem base already made, and in some cases the leaves persist, or at least the branches, whilst a fresh stock of radical leaves often arises in autumn to protect the new aerial stem or shoot of next year, e.g. Sisymbrium, Barbarea, Bellis, Ranunculus, &c., and in a mild winter these survive, and serve as an asset in spring.

The annual plants described are Shepherd's Purse, Mouse-ear Chickweed, Mellow, Stinking Mayweed, Groundsel, Musk Thistle, Hawkweed, Purple Dead Nettle, Fat Hen, Wall Barley. The biennial plants are Burdock, Spear Thistle, Hound's Tongue, Viper's Bugloss, Mullein, all plants that are clothed with down or hairs. Milk Thistle and Henbane are triennial. Belladonna is also apparently biennial in some cases.

The perennials include Greater Celandine, Mallow, Stork's Bill, Good King Henry, Thistle, Chicory, Bittersweet, Belladonna (usually), Creeping Toadflax, Toadflax, White Dead Nettle, Good King Henry, Dairymaid's Dock. It is curious that in some genera only one species, e.g. Good King Henry, should be perennial, the rest annual. It is highly probable that all were perennial at first.

Pollination of Waste-ground Plants.—The mixture of waste-ground plants, which in many cases consists of plants distributed owing to certain properties they possess, causes a considerable diversity in their degree of attractiveness to insects, apart from the possession of honey, pollen, or sweet juices.

As a whole the flowers may be said to be conspicuous and brilliantly coloured, and some, as the Mallow, are wide open and large. Rather large flowers or flowerheads are also not uncommon, as in Greater Celandine, Mellow, Tansy, all yellow, Musk Thistle, Spear Thistle, Milk Thistle, Chicory, Viper's Bugloss. Three poisonous plants, Bittersweet, Belladonna, Henbane, have noxious aromas, and so has Hound's Tongue, and abnormal colours. The closed flowers of the Toadflaxes, and hooded flowers of the Dead Netles, are all adapted to insect visits.

Shepherd's Purse and Mouse-ear Chickweed, with inconspicuous small flowers, are adapted equally to self- or cross-pollination, and Stork's Bill also, as well as Groundsel. Goutweed, Stinking Mayweed, Burdock, Hawkweed, all have more or less conspicuous, though not such brilliant or large flowers. In Mouse-ear Chickweed and Mallow and Stork's Bill the anthers are ripe first. The Musk Thistle is a dicotyledon plant. In the Purple Dead Nettle the anthers and stigma mature simultaneously, and the same applies to Knotgrass, which has also cleistogamic flowers. The Goosefoots, Fat Hen, and Good King Henry, the Dairymaid's Dock, and Wall Barley are pollinated by the agency of the wind. The rest are adapted to insect visits, or failing such they are in some cases self-fertile.

The Dispersal of Seeds of Waste-ground Plants.—The diversity of habitats of waste-ground plants is perhaps correlated with the different modes of dispersal of the seeds. As a whole the habitats are not open, and require special means for the dispersal of the seeds. The prevalence of annuals demands the production of a large number of seeds, and a large proportion of the plants, as the Docks and Goosefoots, produce a considerable number of flowers. The gregariousness of many of the plants also within limited areas has an important bearing upon the mode of dispersal.

The agency of man in distributing such aliens independently of the mode of dispersal to a large extent determines their distribution. Railways and canals are important agents in dispersal; but principally there is the carrying on of agriculture and the carriage of crops from one spot to another, from the field to the stackyard. The manuring of ground also plays an extensive part in the spreading of aliens or other types of waste-ground plants.

Some plants depend upon their own mode of dispersal, as Greater Celandine (which is also dispersed by ants), Shepherd's Purse, Mallow, Stork's Bill (in which the seed are dispersed by an elastic movement, and in which the long awn is hygroscopic), Mellow, Viper's Bugloss, Henbane (also wind-dispersed), Mullein, Creeping and Common Toadflax, Purple Dead Nettle, White Dead Nettle, Fat Hen (also wind-dispersed), Good King Henry (also wind-dispersed). In many cases the seeds of fruits are small; and in other cases, as in numerous Composites, provided with hairs and dispersed
by wind, as Mouse-cle Chickweed, Goutweed (flattened fruits), Stinking Mayweed (winged achenes), Tansy (achene membranous), Groundsel, Musk Thistle, Spear Thistle, Milk Thistle, Chicory, Hawksbeard, Knotgrass, Dock, Wall Barley.

The burrs of Burdock are hooked and catch in the wool of sheep, and on recoiling are shot to a distance away. Hound's Tongue, Bittersweet, and Belladonna, are also dispersed by animal agency.

The Soil of Waste Places.—The artificial character of waste ground to some extent causes the plants that colonize it to become independent of soil conditions. The variety of habitat ensures the variety in the soil as a whole. The proximity of some types of habitat to farmyards, and manure heaps in particular, and the dominance of luxuriant, sturdy weeds upon them, may be due to the ousting of weaklings, or to the antipathy of other plants for richness of soil with abundance of nitrogenous materials.

Quarries cut out of solid rock are excavated in various rocks giving diverse types of soil, and the alien plants grow upon the waste materials, which have little effect upon them apparently.

By far the greater number of waste-ground plants described in this chapter are usually found upon sandy or loamy soils. A few require some proportion of humus whilst tolerating a sandy soil. These are, in general, hedgerow plants, as Greater Celandine. Some require clay or humus, as Goutweed, Spear Thistle (clay or sand), Purple Dead Nettle (clay), White Dead Nettle (clay or sand), Dairy Maid's Dock (clay or humus).

Stork's Bill and Hound's Tongue, whilst growing on sandy soil, are frequently Halophytes, growing on sandy coasts in many districts. Viper's Bugloss, Creeping and Common Toadflax, grow also upon chalk or limestone, but on waste ground frequently upon sand.

Methods of Survey.—Owing to the ephemeral character of waste ground there is not the same necessity to map exactly the vegetation of such tracts where plants vary from year to year, e.g. gardens, &c. But certain places are more permanent than others, and in such cases a survey may be made, as in the case of pastures and meadows.

The mode of studying hedgerows near villages is similar to that of hedgerows in general (see Section VI). Sandy wastes may, however, be carefully surveyed, square by square, as in the case of fields and other permanent continuous types of vegetation.

Cart-roads can be dealt with in the same ways as roads, the casuals being especially noted. Railway embankments, canal banks, may be treated much in the same way as pastures, but the actual occurrence of the casuals or aliens is the particular object in view.

Quarries should be studied to show the native flora and the casual flora under separate heads. The influence of the rock soil on the former should be studied carefully.