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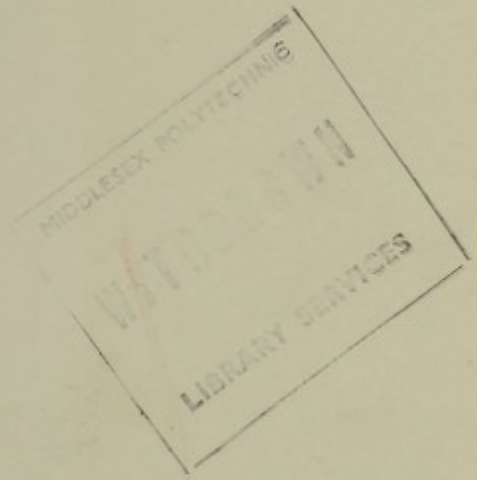
BRITISH
FLOWERING
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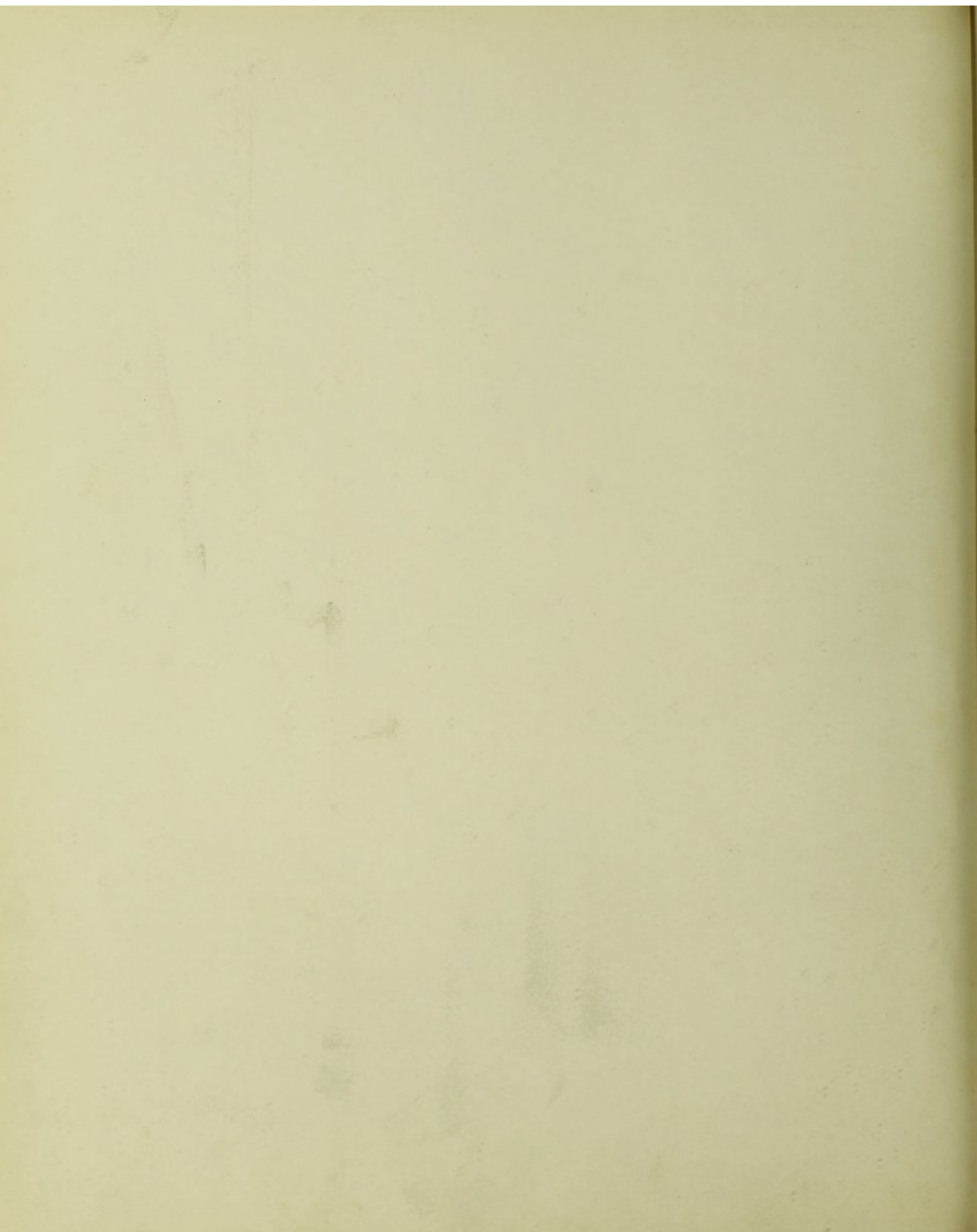
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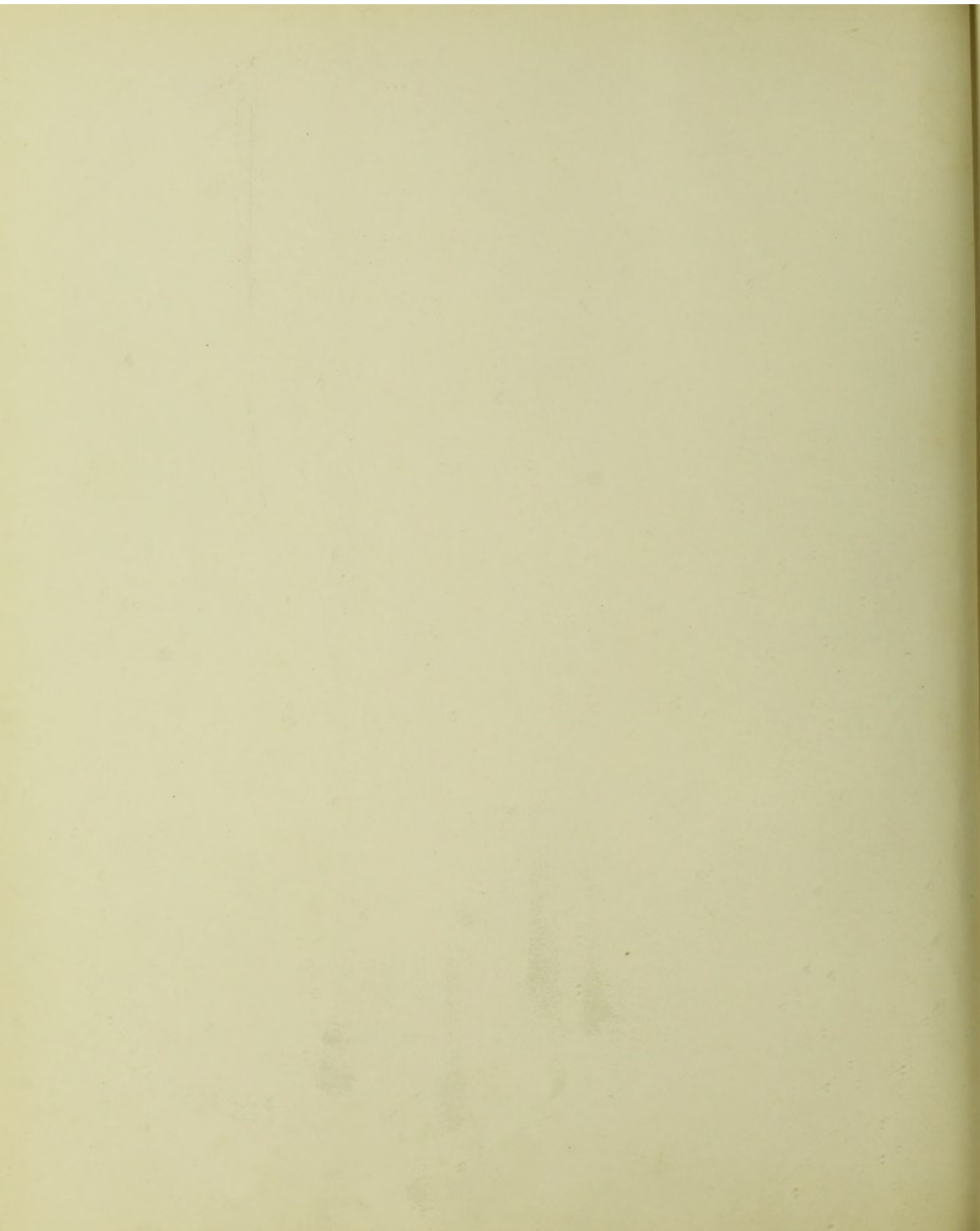
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BRITISH
FLOWERING PLANTS

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BRITISH FLOWERING PLANTS

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MRS. HENRY PERRIN

WITH DETAILED DESCRIPTIVE NOTES
AND AN INTRODUCTION BY

PROFESSOR BOULGER, F.L.S.

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LXVII.—THE WHITE WATER-LILY.

Nymphaea alba Linné.

GREAT interest attaches to the Order *Ranales*, the tenth among Dicotyledons in Engler's sequence, on account of the varied types of plants which it comprises, their many primitive characters, and the relationships they suggest to Gymnosperms and to Monocotyledons. It includes plants of all sizes and of all climes, many aquatics, but some shrubs adapted to quite dry conditions. The parts of the flower may be more or less completely spiral, or *acyclic*, *hemicyclic*, or whorled (*cyclic*): the primitive polysymmetry may give place in some forms to specialised monosymmetry: the perianth may be uniform (*homochlamydeous*) or differentiated into calyx and corolla (*heterochlamydeous*), and ranges in colour from the primitive greens, yellows, and whites to the higher reds, purples, and blues: the stamens are generally indefinite in number, but their insertion ranges from the primitively hypogynous to more or less complete epigyny; and the carpels vary from an indefinite number, free and arranged spirally, to whorls of some smaller number down to five, three, or one, with a certain amount of cohesion. The embryo is in most of them small and imbedded in copious fleshy albumen. Among the fifteen Families comprised in the Order are the *Lactoridaceæ*, which consists of the one species, *Lactoris fernandeziana* Philippi, confined to the island of Juan Fernandez; the shrubby *Calycanthaceæ*, including the Allspice and Wintersweet, in which all the floral organs are spirally arranged and graduate into one another; the apparently geologically ancient *Lauraceæ*; the arborescent and perhaps equally ancient *Magnoliaceæ*, in which some botanists see a close approximation to *Cycadeæ*; the Water-lilies; the *Ranunculaceæ*; and *Berberidaceæ*.

The Family *Nymphaeaceæ*, though not an extensive one, is cosmopolitan and of considerable structural and physiological interest. They are perennial aquatic plants, usually with rhizomes imbedded in the mud; submerged, floating, or rarely aerial leaves, orbicular in outline and involute in vernation; and solitary flowers, often large and fragrant. In the perianth various curious modifications of a spiral arrangement occur, and the outer green leaves or sepals graduate into petaloid leaves and these again into stamens. Petals and stamens are alike inserted on a fleshy hypogynous disk which grows up round the numerous carpels more or less imbedding and uniting them. There is generally a sessile stigma, consisting of as many radiating lines of viscid surface as there are carpels, and the indefinite ovules are scattered over the inner surfaces of the carpels, as they are in *Butomus*. The ripe seeds have an unusual structure, there being a minute dicotyledonous embryo imbedded in an endosperm filling the embryo-sac, which is in turn imbedded in a similar external food-store or *perisperm*.

Most completely aquatic plants are glabrous and have leathery leaves with a slimy surface. Their petioles and peduncles contain no woody tissue but numerous



THE WHITE WATER-LILY—continued.

air-vessels. An incomplete dissection led to the embryo-sac in Water-lilies being mistaken for a single cotyledon, so that these characters, together with the lily-like texture of their flowers to which they owe their name, suggested that the Family might be monocotyledonous.

The genus for which Linné adopted the name *Nymphaea* from Theophrastus, or rather the chief part of it, was named by Richard Antony Salisbury *Castalia*, with an allusion as Classical as the earlier name. It has a stout, starchy rhizome which has been used for food. In this is stored the food-reserve manufactured by the floating leaves which has all to travel from the surface of the water to the bottom and back again to the flower, fruit, and seeds. The circular leathery leaves are cordate at the base and have their stomata on the upper surface, which is protected by a coating of wax from being wetted. The under side of the leaves is often red or purple from the presence of *anthocyan*, a colouring-matter which converts light rays into heat and thus assists in the chemical processes or *metabolism* in the leaf. The young leaves rise erect from the water with their two sides rolled inwards like scrolls, and as these unroll they fall flat upon the water.

The floating blossoms are, of course, out of reach of crawling insects, and their fragrance attracts flies and beetles. They are open from about seven in the morning to four o'clock in the afternoon; and if not pollinated on the day of their first expansion they close and sometimes sink slightly, only to re-expand on one or more succeeding days. As Tom Moore well put it—

" Those virgin lilies all the night
Bathing their beauties in the lake,
That they may rise more fresh and bright
When their beloved sun's awake."

Their four outer perianth-leaves in our British species (*N. alba* Linné) are green externally. Though usually regarded as a calyx, they have been explained as a bract with both margins outside, two lateral bracteoles, and one sepal with both margins inside the bracteoles. There are four outer petals alternating with the so-called sepals, four inner ones alternating in turn with the outer ones, and these eight form the starting-points of eight spiral series, generally of four petals each, the inner ones narrowing. Then follow from fifty to a hundred spirally-arranged stamens with white petaloid filaments and long linear yellow anthers, which bend over the stigma and, when insect visits fail, ensure self-pollination. In the centre of the flower from fifteen to twenty carpels are imbedded in the fleshy disk and form the globular fruit which ripens under water. As each seed is surrounded by a spongy *aril* which becomes mucilaginous, and bubbles of air are imprisoned between the aril and the seed; when the fruit rots, the seeds float to the surface, are carried down stream, and, as the air escapes, sink to the mud below.

LXVIII.—THE YELLOW WATER-LILY.

Nuphar luteum Sibthorp and Smith.

THOUGH classed by Linnæus under his genus *Nymphaea*, the Yellow Water-lilies are quite sufficiently distinct from our White Water-lily and its many near allies to justify their generic separation. The Arabic name *Nauphar* or *Nyloufar* seems to have belonged originally to the pink-tinged White Lotus of the Nile (*Nymphaea Lotus* Linné). It appears in Greek form as *νούφαρ*, *nouphar*, in Dioscorides, and as *Nénuphar* is still used in France for Water-lilies in general. It was applied to the Yellow Water-lilies by Sir James Edward Smith in the "Floræ Græcæ Prodromus" in 1808.

There are some seven species in the genus, all natives of the Northern Hemisphere. They have submerged leaves as well as floating ones. The former are thin and almost colourless, consisting of little more than two layers of epidermis with veins between them: the latter resemble those of *Nymphaea*, but in our species are smaller. As the submerged leaves have no cuticularised thickening of their surfaces they may serve to absorb water, as is the case with those of Bladder-worts and other rootless aquatics, the water absorbed being also a means of introducing air into the plant.

The flowers do not float like those of *Nymphaea*, but project a little above the water. Their distinctly alcoholic smell, combined, perhaps, with the flask-like form of the fruit, has earned the plant the name of Brandy-bottle. Their five or six outer perianth-leaves are arranged *quincuncially*, as are the sepals of *Caryophyllaceæ*, that is to say two leaves have both margins outside, two have both inside, and one has one outside and one inside; and, as they are incurved, they make the flower into a golden globe. Within this calyx are from thirteen to twenty spirally-arranged, small, obovate, yellow petals, which secrete honey near the base of their outer, or lower, surfaces. These are followed by an indefinite series of stamens, also spirally arranged, so that the outer thirteen of them alternate with the petals, the next thirteen alternate with the first, and so on. Both petals and stamens in *Nuphar* are more distinctly hypogynous than are those of *Nymphaea*. The filaments are short and flattened and the anthers are linear.

The superior ovary is distinctly syncarpous, and the number of rays in the stigma ranges in the genus from eight to thirty; but in the common British species, *N. luteum* Sibthorp and Smith, there are seldom less than thirteen or more than twenty. In this species they do not extend quite to the margin of the stigmatic disk. The stigma is in a receptive condition when the flower expands, the outermost anthers maturing a little later, while the large size and roughened surface of the pollen-grains point to the entomophilous character of the flower. As in *Nymphaea*, the chief insect-visitors are flies and beetles.



THE YELLOW WATER-LILY—continued.

The globular fruit is more flask-shaped than that of *Nymphaea*, and its popular name *Water-can* recalls the fact that among ancient Romano-British pottery we have watering-pots with the rose at the top, apparently antedating those in which it has travelled round to the side, as in our modern metal vessels. These fruits do not rot under water as do those of the White Water-lily, but break off, float to the surface, and then break up into their constituent carpels. The contained seeds have no aril as have those of *Nymphaea*; but, whilst the carpels are floated by means of air secreted in cavities in their pericarps, the seeds sink immediately they are liberated by the decay of the carpel that encloses them.

There is a considerable amount of tannic acid in the plant, especially in the rhizome and leaves, so that it has been employed as an astringent in dysentery, hæmorrhage, etc. An infusion of the rhizome in milk is stated to be fatal to cockroaches; and the flowers with their alcoholic perfume are used by the Turks in the preparation of a sherbet-like cooling drink, which, by a corruption of the Arabic name Nuphar, is known as Puffer.

Our common species occurs more generally than the White Water-lily, and grows, perhaps, more freely in the stagnant and muddy waters of ponds. Thus whilst *Nymphaea alba* is known to the Germans as *Seerose*, or Lake Rose, *Nuphar luteum* is termed *Teichrose*, or Pond Rose.

In the common species, which is generally distributed throughout the British Isles, the flowers are from two to three inches across. A smaller species, *Nuphar pumilum* Smith, occurs at Ellesmere in Shropshire and in various small lakes in Scotland, where it was first recorded by Borrer in 1811, from the foot of Ben Chonachan. It has small flowers, with short anthers and only eight to ten stigmatic rays, which extending to the margin give a toothed edge to the stigmatic disk.

Another small form, described as *Nuphar intermedium* Ledebour, with flowers about an inch and a half across, from ten to fourteen stigmatic rays, and a wavy margin to the disk as in *N. pumilum*, has been described from one or two localities in the North of England and in Scotland, as well as on the Continent; but it is stated on apparently good grounds to be a hybrid of the other two, perhaps a seedling of *N. pumilum* pollinated by *N. luteum*, so that it has been re-named *N. luteo-pumilum* Caspary.

LXIX.—THE MARSH MARIGOLD.

Caltha palustris Linné.

WHEN, in 1773, Antoine Laurent de Jussieu chose the Family *Ranunculaceæ* to illustrate for the Académie des Sciences his uncle Bernard's views as to the principles of the Natural System of classification, he could not have made a better choice. Although they all agree in having numerous hypogynous stamens, which would put them in Linné's thirteenth Class, *Polyandria*, in the absence of cohesion or adhesion between their floral organs, and in the presence of albumen in the seed, they vary so greatly in the number of their carpels that they would fall into various different Linnæan Orders, and so much in habit, in leaf-form, and in floral symmetry that no previous botanist would have ventured to group them together. When, however, they have been so grouped together, on purely anatomical grounds, we find the classification justified by the presence of similar acrid properties not only in the herbaceous majority but also in the exceptionally shrubby genus *Clematis*.

Though most abundantly represented in the cold and Temperate regions of the Northern Hemisphere, the Family is practically cosmopolitan. It comprises nearly a thousand species in about thirty genera, and fifteen genera and some forty-eight species of these are British.

Most members of the Family are, as we have said, herbaceous, but perennial. They have sympodial rhizomes under ground and the branching above ground is also cymose. The leaves are usually scattered, with sheathing bases and deeply divided blades. The parts of the flower are arranged spirally, with the usual accompaniment of an indefinite increase in their number; but the perianth and the carpels are sometimes whorled and are then made up of fewer leaves. The perianth is often petaloid, and the presence of distinctly differentiated calyx and corolla is exceptional. The flowers are nearly always perfect, and polysymmetry is the rule, though interesting monosymmetric flowers occur in the Monkshoods and Larkspurs. Honey is generally present, and the anthers mature before the stigmas and burst outwards, or *extrorsely*, in succession. There is, however, as we shall see, an interesting series of adaptations to insect visits, becoming gradually more complete.

The character of the carpels, and the number of the ovules they contain, afford the best basis for the subdivision of the Family into Tribes. They vary in number from one, two, three, or five to an indefinite number, being whorled when few and spiral when numerous, and seldom show any cohesion; but they may contain numerous ovules, in which case they split open, when ripe, down one side, each forming what is termed a *follicle*, or they may contain only one ovule and then each forms an indehiscent *achene*.

The Tribe producing follicles, or carpels with many ovules, is known as *Helleboreæ*; that producing achenes, as *Anemoneæ*. The former includes the Marsh Marigolds, Globe-flowers, Hellebores, Love-in-a-mist, Winter Aconite, Baneberry,

THE MARSH MARIGOLD—continued.

Columbines, Larkspurs, and Monkshoods ; whilst *Anemone*, *Clematis*, *Ranunculus*, *Thalictrum*, and *Myosurus* are the chief genera in the latter.

The genus *Caltha*, the name of which (derived from the Greek κάλαθος, *kalathos*, a cup, and suggested by the form of the blossom) dates from Pliny, is but a small one, comprising some sixteen species ; but they are widely distributed in the colder and Temperate regions of both the Northern and the Southern Hemispheres. This alone is an argument for the great antiquity of the type. One Antarctic species, *C. dionæefolia* Hooker filius, has leaves the form of which closely resembles those of the Venus's Fly-trap (*Dionæa muscipula* Ellis) of Carolina, and they may have a similarly complex physiology.

As is commonly the case in this Family, the tap-root in *Caltha* ceases to elongate and is replaced by a bunch of unbranched fleshy root-fibres, and the main stem forms a short horizontal rhizome. The leaves are chiefly radical and are palmately-veined and cordate at the base. The inflorescence consists of a few large flowers with a deciduous petaloid calyx of five yellow or white sepals, which are imbricate in the bud. There are no petals, but from five to ten carpels, spirally arranged, each containing a double row of ovules. Honey is secreted by the bases of the carpels, and the fresh fragrance of the blossoms belongs apparently partly to this honey and partly to the copious pollen of the many stamens. Most of the species of the genus are semi-aquatic or marsh-plants and are glossily glabrous. This striking lustre, the rounded leaves, and the golden-yellow blossoms of our common Marsh Marigold suggest, indeed, a relationship to the Lesser Celandine closer than actually exists. It is a singular fact that the burnished, golden, rounded sepals of the larger plant cannot be considered closely homologous with the similarly coloured but pointed petals of the smaller.

The large kidney-shaped leaves of our British species (*C. palustris* Linné) have long stalks, membranous stipules, and a toothed margin, and its flowers are from one to two inches across. Its honey is abundant and is secreted in two shallow depressions at the base of each carpel. Being in no degree concealed it is the food of flies and beetles as well as of bees. Several varieties have been described with smaller blossoms, of which the most marked is the Scottish *C. radicans* Forster, which roots at its nodes. There are also double-flowered forms in cultivation.

When, from the end of March into May, as Tennyson says,

"The wild marsh marigold shines like fire
In swamps and hollows grey,"

its conspicuousness earns for it a great variety of popular names, most of which, such as *Horse Buttercup*, *Gilty-cup*, and *King-cup*, are of obvious significance. The northern names *Gowan*, *Gowland*, and *Golland* merely refer to its golden colour ; while the very general *Blobs* or *Water-Blobs* and the obsolete *Bassinet* refer to its globular buds, "blob" being connected with "bubble," and "bassinet" being a basin-shaped cap or helmet.

LXX.—THE GLOBE-FLOWER.

Trollius europæus Linné.

NEARLY related to the Marsh Marigolds are the Globe-flowers, forming the small genus *Trollius*. There are about a dozen species; but only one is British, and this is confined to the moist air of the north and west of our islands. On the Continent it is mainly a northern species, and in Scotland it occurs up to altitudes of 3,300 feet, luxuriating in permanently moist soil and well-shaded spots, but not apparently much restricted as to the nature of the sub-soil on which it occurs.

The genus consists of erect perennial herbaceous plants with the short rhizome so frequent in the Family to which it belongs. The leaves are scattered and palmately lobed; and the flowers terminal, large, globular, and yellow or lilac. There are from five to fifteen petaloid sepals, imbricately arranged, incurved, and deciduous, and about as many petals. These are small and narrow, with a very short claw and a strap-shaped blade having a honey-secreting depression at its base. The stamens are very numerous; but the carpels may not exceed five in number. They each contain numerous ovules, which become three-sided seeds with a leathery testa, arranged in two rows.

The origin of the name *Trollius* is interesting. It is first used, so far as we know, in the sixteenth century, by Conrad Gesner, the many-sided naturalist of Zurich, who has been called "The German Pliny." Another writer says, however, that on Mount Pilatus, near Lucerne, and not very far distant from Zurich, the plant is known as *Troll Blume*. The word *trol* is said to be Old German for a globe, being cognate to such words as "trundle," and such an etymology commends itself to our acceptance as being in harmony with most of the other names of the plant. Dr. Prior, however, derives the name from the Swedish *troll*, Danish *trold*, Frisian *trol*,

"a malignant supernatural being, a name corresponding to Scotch *Witches Gowan*, and given to this plant on account of its acrid, poisonous qualities."

The North-Country names *Lucken*, or *Locken*, or *Lockenty*, *Gowan* mean the locked or closed golden flower and refer to the incurved perianth-leaves. They are, however, often applied to the Marsh Marigolds, as, perhaps, in Allan Ramsay's lines:—

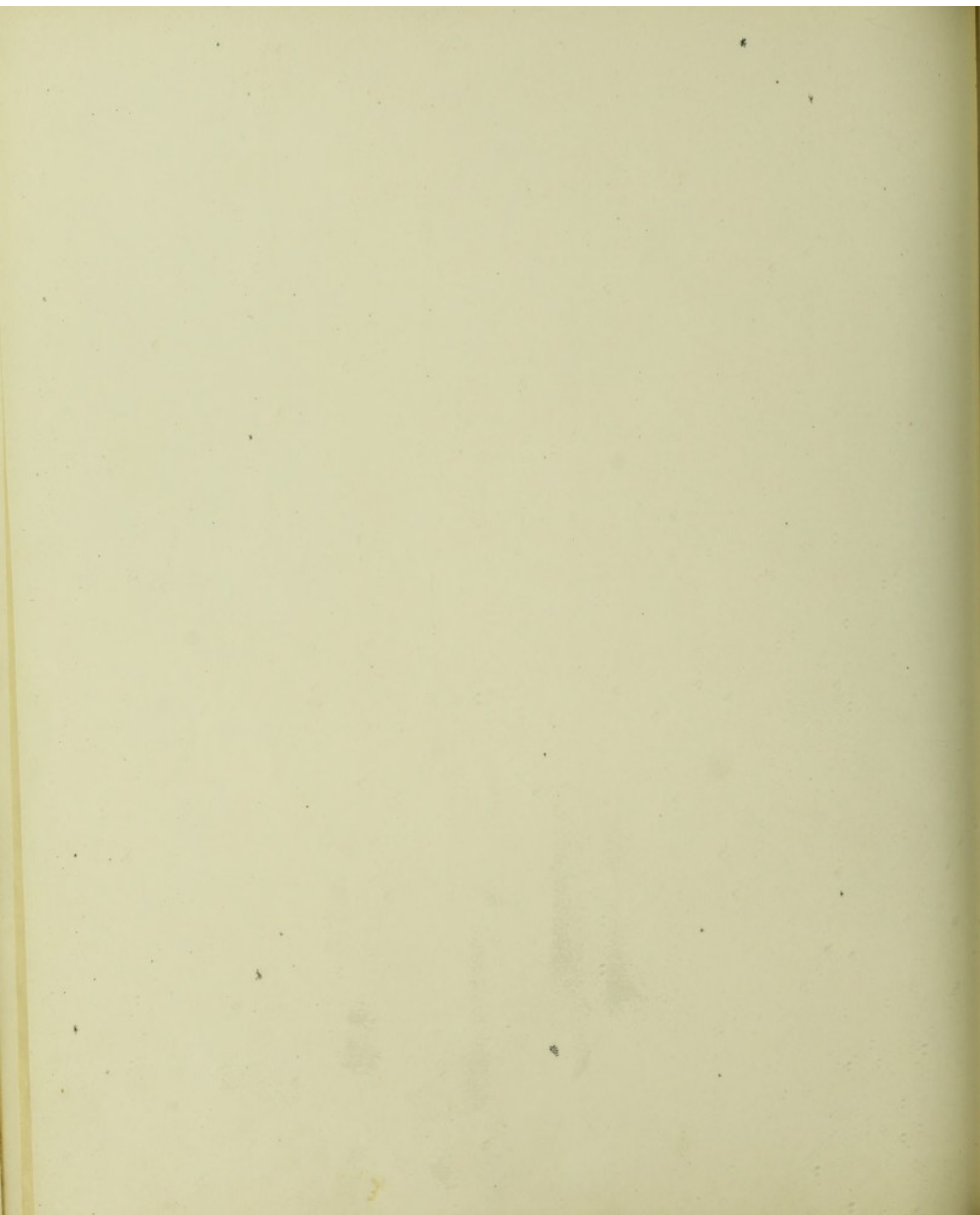
"We'll pull the daisies on the green
The lucken gowans frae the bog."

The earliest record of our British species, *Trollius europæus* Linné, is apparently Gerard's, in his "Herball" of 1597, where he speaks of

"*Ranunculus globosus* . . . in most places of Yorkshire and Lancashire"

It is a handsome plant, one or two feet high, with deeply palmately, five-lobed root-leaves, much resembling those of the Common Buttercup, but glabrous, as is the rest of the plant. These root-leaves have long petioles and their segments taper downward with a wedge-like, or *cuneate*, outline, and a cut and serrated margin.





THE GLOBE-FLOWER—continued.

The cauline leaves are few and are smaller and sessile, but otherwise similar. The pale yellow flowers are an inch or an inch and a half in diameter and are slightly scented. The orbicular, concave sepals nearly conceal the petals and, as they never open out to any great extent, the stamens and carpels are protected by them. In wet weather the flower closes still more, and at no time are insect-visitors very numerous. As the flower is *homogamous* or *synacmic*, *i.e.* the stamens and stigmas maturing simultaneously, it is probably very frequently self-pollinated.

The follicles are transversely wrinkled and have a keel, and a beak-like apex ; and the three-sided seeds are smooth, black, and polished, but have rows of fine dots along their tough outer coats. The smoothness of such seeds, perhaps, facilitates their escape from the shrivelling ripe follicles ; whilst the tough, polished testa prevents water from resting on them, and so protects them alike from rotting or from too early germination. The plant flowers in June, July, and August, so that its fruit ripens in early autumn ; but germination does not usually occur until the spring.

Both this species and several of its congeners, such as *T. asiaticus* Linné and *T. caucasicus* Stevens, are cultivated as hardy herbaceous plants for the sake of their flowers. Much as they resemble the genus *Ranunculus*, they, like the Marsh Marigolds, are at once distinguished by their many-seeded carpels, which, as we have seen, form dehiscent follicles instead of indehiscent achenes.

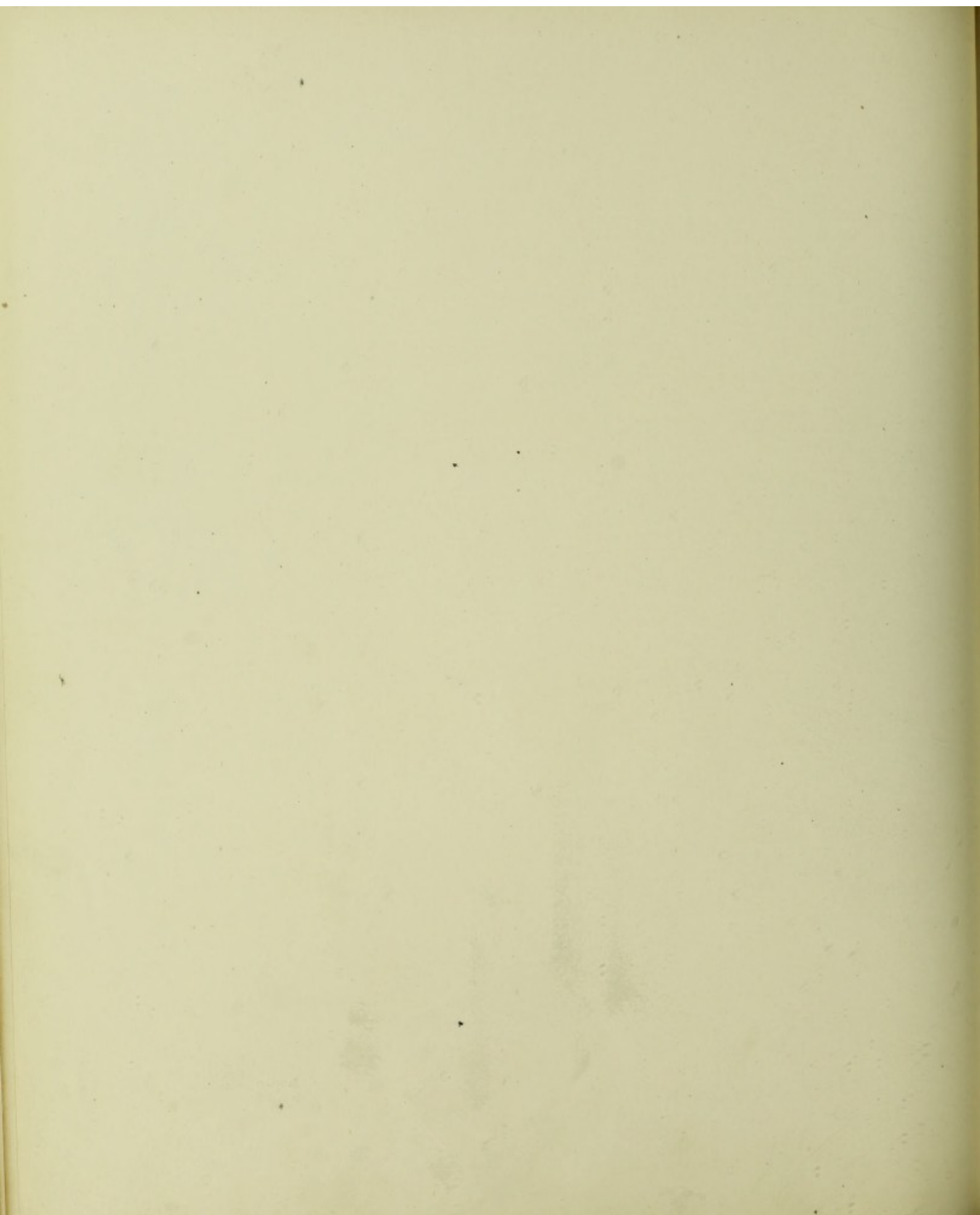
LXXI.—THE WINTER ACONITE.

Eranthis hyemalis Salisbury.

AN examination of the career of Richard Antony Markham (who took the name of Salisbury after arriving at man's estate), which after this lapse of time is naturally impartial, compels us to recognise that we can more easily respect his talents as a botanist than his character as a man. He seems frequently to have appropriated the results of the work of other botanists and to have hurriedly published descriptions of their discoveries under names of his own devising. This aroused so much feeling against him among his contemporaries that they did less than justice to his undoubted critical acumen. Salisbury was born at Leeds in 1761 and died in London in 1829. He is said to have been descended from Henry Lyte, the translator of Dodoens's "Herball" in the time of Elizabeth. On its foundation he became the first secretary of what is now the Royal Horticultural Society; and for a time he owned the house and garden at Mill Hill which had belonged to Peter Collinson, the correspondent of Linnæus, and which now forms part of Mill Hill School.

The genus *Eranthis* was described by him in the "Transactions of the Linnean Society," in 1807, its name being formed from ἦρ, *er*, or ἔαρ, *ear*, Spring, and ἄνθος, *anthos*, a flower, or more probably from the verb ἀνθίζω, *anthizo*, I strew with flowers. It comprises some half-dozen species of small herbaceous perennials, natives of the Northern Temperate regions of the Old World. They have a short, thick rhizome, or row of tubers, to which one is added annually; and the palmately-lobed radical leaves are more delicate in texture than those of the genus *Helleborus*. Their flowers are solitary, terminal, and pale yellow, and are surrounded at a very slightly lower level with a whorl of three deeply-cleft sessile leaves, which are variously termed an involucre, as in *Anemone*, or involucriform cauline leaves. There are from five to eight imbricate, narrow, petaloid, and deciduous sepals; while the petals are represented by a few small tubular nectaries or honey-leaves. These have a slender stalk or *claw*, somewhat as in the Christmas Rose (*Helleborus niger* Linné), this stalk being as long as the upper tubular part; but this tube is two-lipped, each lip being notched or *emarginate*. It has been plausibly suggested that the shorter inner lip represents the little scale which in the Buttercup covers over the nectary at the base of the petal, and that in this genus this scale is *adnate* by its margins to the petal, thus forming a honey-containing tube. It is an interesting fact that in Goldilocks (*Ranunculus auricomus* Linné) a series of modifications of the base of the petals has been observed, some of which exhibit a bifid inner adnate scale very similar to that in *Eranthis*; whilst in flowers of the Winter Aconite itself we may often see all kinds of gradations between these tubular petals and the flat, scaleless sepals. The stamens are numerous and spirally arranged; and there are five or six distinct, many-ovuled carpels having a short





THE WINTER ACONITE—continued.

stalk. These form in the fruit stage a ring of dry follicles splitting down their inner sides so as to discharge the numerous rounded smooth seeds.

Eranthis hyemalis Salisbury is a native of Western Europe from Belgium southward ; but, though often naturalised in our parks and plantations, or occurring on banks as an escape from cultivation, it has no claim to rank as a truly indigenous British plant. Its flowers appear from January to March, in advance of the radical leaves, but beautifully set off by their glossy green frill-like involucre. Though remaining incurved, the golden sepals expand to an inch or more in diameter ; and, as the plants are seldom more than four inches high and grow naturally in a crowded patch, they are thus very conspicuous. There are from six to eight oblong sepals in the calyx, and the petals are much shorter and inconspicuous. At that early season of the year the chief insect-visitor is the honey-bee. The subsequently-developed leaves are long-stalked, orbicular, and deeply cut into from five to seven linear-oblong, obtuse lobes.

Poor John Clare, the Northamptonshire peasant-poet, with his usual accuracy of observation, notes the

" Buttercup-like flowers that shut at night,
With green leaf furling round its cup of gold " ;

and unquestionably, whether in our gardens or in a quasi-wild state, at a somewhat dull season of the year, the sprightly yellow blossoms and polished foliage form a pleasing harbinger of Spring.

Eranthis luxuriates in moist leaf-mould ; and, like its contemporary, the Snowdrop, is tolerant of a considerable amount of shade. It will grow, however, in any soil and is perfectly hardy ; but to be effective should certainly be planted in masses. It can be well grown, like Crocuses, Snowdrops, or Daffodils, in lawns, as it will be over early when it is desirable to trim the first Spring growth of the grass.

It has been given the name Aconite from the resemblance of its much-lobed leaves to those of that nearly related genus, and it has shared with it the name of *Wolf's-bane* ; and has also been termed *Winter Hellebore*. It is also stated to be known as *Winterling* ; but, perhaps, it has never been sufficiently well known or valued to receive many genuinely popular appellations.

LXXII.—THE COLUMBINE.

Aquilegia vulgaris Linné.

IN floral beauty and botanical interest alike no genus of the *Ranunculaceæ* surpasses *Aquilegia*.

A considerable degree of poetical imagination is evinced in the scientific and popular names borne by the group. *Aquilegia*, first used apparently by Tragus, alias Jerome Bock, in the sixteenth century, is said to be derived from a fancied resemblance of the incurved nectariferous spurs of its petals to the claws of eagles, from the Latin *aquila*. Lobel and Pena who, in their "Adversaria" of 1570, first record it as a British plant, use the form *Aquilina*; and the same notion is expressed in such popular names as *Cock's-foot* and *Hawk's-feet*. On the other hand, the undoubtedly ancient name *Columbine*, from the Latin *columba*, a dove, is based upon the very different notion that the petals of the flower if reversed resemble a nest of young doves, or, that if we pull off one petal with a sepal on each side of it we get the figure of a hovering dove with expanded wings. Such names as *Cullavine*, *Cullanby*, *Curranbine*, and *Colourbine* are, of course, mere phonetic corruptions of *Columbine*, with an attempt in the last at an etymological explanation. *Culverwort* would seem to be a sixteenth-century translation of *Columbine*, since, as Henry Lyte puts it in his "Herball" (1578), the flowers

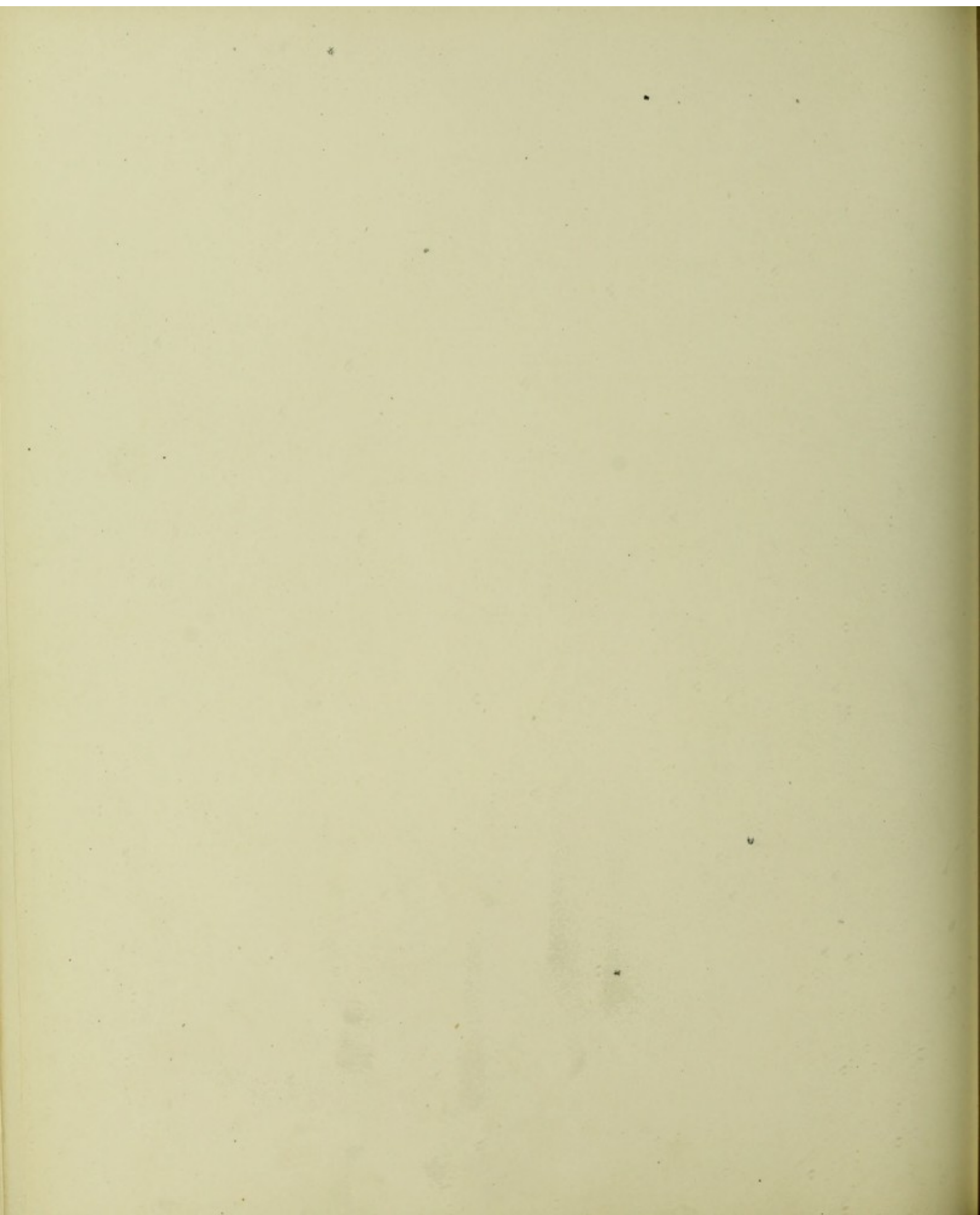
"Do seeme to expresse the figure of a dove or culver."

The Gaelic *Lus a cholamain* has the same significance. It is strange, however, how universal comparisons between this flower and various bird forms seem to be; for the Norfolk name *Hen and Chickens* is said to be derived "from the resemblance of the spurs to chickens drinking." The two related names *Boots and Shoes* and *Lady's Slippers* both belong to Cornwall; whilst in French we have *Gants de Notre Dame* and in German *Narrenkappe*, i.e. fools'-caps. So many resemblances tempt one to refer to Hamlet's cloud which resembled a camel, a weasel, and a whale; but we have yet another in Clare's lines:—

"The columbines, stone-blue, or deep night-brown,
Their honeycomb-like blossoms hanging down,
Each cottage garden's fond adopted child,
Though heaths still claim them, where they yet grow wild."

The genus consists of a considerable number of species of erect perennial herbaceous plants, natives of the North Temperate Zone, eight occurring in Europe; but only one in the British Isles. Their leaves are bi-, or tri-, ternately compound; and the large and conspicuously coloured flowers are borne either solitarily or, on slender drooping stalks, in a somewhat complex branch-system or panicle. A remarkable range of colour is presented in the flowers of the various species—white, light and dark true blue, violet, yellow, scarlet, pink, light or dark brown, the sepals and petals in some species being of two very distinct hues. The flowers also





THE COLUMBINE—continued.

exhibit a very perfect pentamerous eucyclic symmetry, having five petaloid sepals, five of the remarkably spurred petals, sometimes fifty or more stamens, all in alternating whorls of five each, and five carpels. The sepals are generally pointed, the petals rounded at the apex, and the latter are prolonged backward into spurs sometimes very long and straight, or in other species, such as our own *A. vulgaris*, hooked at the extremity towards the central axis of the flower. Honey is only secreted in the lower part of these spurs, which commonly exceed fifteen millimetres, or three-fifths of an inch, in length, and are only just wide enough at the entrance to permit the insertion of the head of a humble-bee. Only the long-tongued genus *Bombus* can reach the honey; but individual bees seem to discover the possibility of getting it by boring a hole through the base of the spur from the outside; and the hive bee (*Apis mellifica* Linné) will avail itself of holes so made. The stamens are protandrous and some of those towards the centre of the flower are aborted.

In the fruit stage the flower-stalk ceases to droop, so that the follicles, then held erect, open only along the upper part of their inner sides, and, as the withered stalks are jerked stiffly by the wind, only a few at a time of the numerous black, shining, smooth seeds are thrown out.

Our species, *A. vulgaris* Linné, is absent from Scotland and the extreme north of the Continent; but is abundant in woods in some parts of England, more especially, perhaps, on a calcareous sub-soil. When truly wild it is apparently either blue, dull purple, or white-flowered. It grows two or three feet high and bears a rosette of long-stalked root-leaves which are bi-ternate with three-lobed, crenate leaflets, glaucous above and sometimes hairy or reddish on their under sides. The stamens mature and dehisce in succession; but the innermost ones are reduced to broad, wrinkled, white antherless filaments. The stout cylindrical follicles are hairy, apparently as a protection against the rotting action of rain-water, which does not wet them.

Under cultivation Columbines exhibit a great variety of abnormal and double forms of flower; and not only have several very beautiful long-spurred species been introduced into our gardens, but numerous hybrids have also been raised. The geographical distribution of the genus being what it is, it will be realised that these are hardy forms, an ordinary light moist garden soil being generally suitable for all of them. As Parkinson says, the Columbine has long been

“Carefully nursed up in our gardens for the delight both of its forme and colours.”

LXXIII.—ANALYTICAL DRAWINGS OF
THE WATER-LILY AND BUTTERCUP FAMILIES.

(*Nymphæaceæ* and *Ranunculaceæ*.)

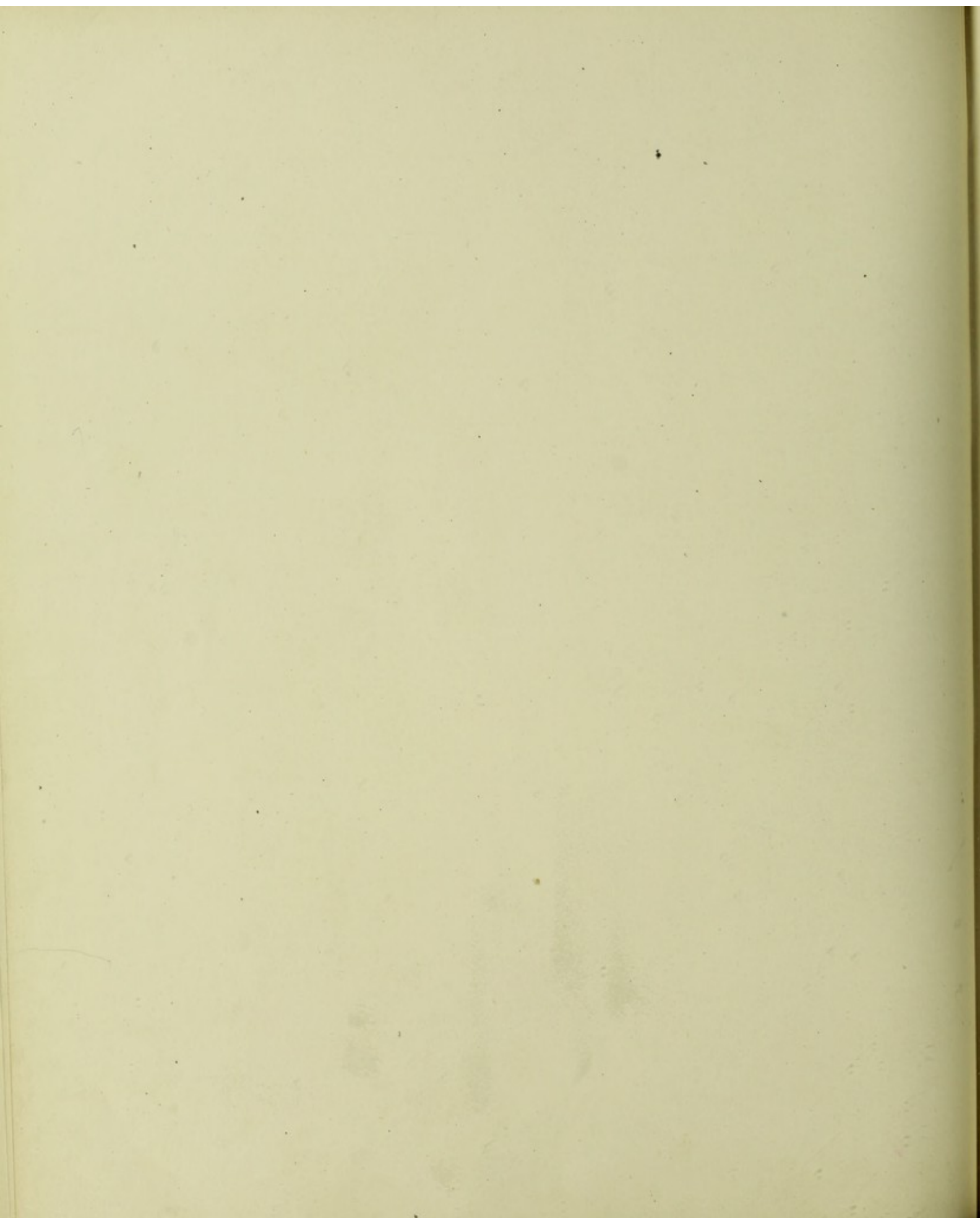
THE Order *Ranales* is interesting alike for the beauty of many of its members and for its primitive floral structure which has led to its general recognition as one at least of the chief starting-points in the evolution of Flowering Plants. Not to speak of such beautiful exotics as the Magnolias and the Allspice tree (*Calycanthus floridus* Linné), our own Water-lilies, Buttercups, Anemones, and Columbine are all unequalled in their special charms. The spiral arrangement of the parts of the flower and the gradation of petals into stamens indicate the primitive character of both Water-lilies and *Ranunculaceæ*; while not only the texture of the petals of the former but also various internal features in the herbaceous stems of many members of the Order, and some details as to their cotyledons and other characters of their embryos, have suggested affinity with Monocotyledons. Alike in *Magnoliaceæ* and *Nymphæaceæ*, moreover, there are cases of a ternary symmetry in the flower which point in the same direction.

Fifteen Families are included under the Order *Ranales*, the common characters of which appear somewhat vague and mostly negative. Though often spiral, *i.e.* acyclic, polysymmetric, and differentiated into calyx and corolla (*heterochlamydeous*), the perianth may be whorled (*cyclic*), monosymmetric, or homochlamydeous: the stamens are usually numerous and hypogynous; and the carpels, though varying indefinitely in number, are usually, but not always, free from one another. Of the fifteen Families, three have British representatives—the *Nymphæaceæ*, the *Ceratophyllaceæ*, and the *Ranunculaceæ*. The *Ceratophyllaceæ* are a Family consisting of a single genus *Ceratophyllum*, with only two or three species, but of cosmopolitan distribution. They are known from their divided, translucent, tough submerged leaves as Hornworts, and are among the very few Flowering Plants which produce pollen adapted for fertilisation under water. They are not represented here.

The *Nymphæaceæ*, another cosmopolitan Family of aquatic plants, comprises some sixty species in eight genera, of which last *Nymphæa* and *Nuphar* are the only two natives in Europe, with three species each. In Britain we have but one species of *Nymphæa* and two of *Nuphar*. The whole Family is characterised by its large, solitary, and generally floating, blossoms.

The White Water-lily (*Nymphæa alba* Linné), represented by the first line or figures on our Plate, has the largest individual flowers of any British plant. Figs. 1, 2, and 3 represent a series of stamens from the outer part of the flower inwards, gradually narrowing so as to become less petal-like. Fig. 4 is the gynæceum, on the disk enclosing the sides of which the petals and stamens are inserted. Fig. 5 shows it in longitudinal, and Fig. 6, in transverse, section. The ovules are scattered over the whole inner surface of the carpels.





ANALYTICAL DRAWINGS OF THE WATER-LILY AND
BUTTERCUP FAMILIES—continued.

In the genus *Nuphar* the parts of the flower are in fives, instead of in fours; and the petals and stamens are distinctly hypogynous, being inserted upon the floral receptacle, instead of the apparently epigynous insertion in *Nymphaea*. The Yellow Water-lily (*Nuphar luteum* Sibthorp and Smith) is represented by the second row of figures, Fig. 1 being a petal; Fig. 2, an organ showing the transition to the stamens; Fig. 3, a stamen; Fig. 4, the gynæceum, with withered filaments; Fig. 5, a cross section of it; and Fig. 6, a ripe fruit, with the persistent calyx.

So interesting is the Family *Ranunculaceæ* that we have chosen for illustration and analysis no less than thirteen types, so that they have to be divided between two Plates. The Family comprises nearly a thousand species in about thirty genera. Of these 175 species in 26 genera are European and 39 species in 11 genera are British. They fall into two main divisions or Sub-Families, according as the fruit is made up of many-seeded follicles, or of one-seeded achenes. The four types chosen for illustration here, represent the former, and are all included in the Tribe *Helleboreæ*, which have generally nectariferous petals and extrorse anthers.

The Marsh Marigold (*Caltha palustris* Linné) is represented by the third line of figures, Fig. 1 being a flower as seen from above; Fig. 2, the essential organs, *i.e.* the stamens and carpels; Fig. 3, a single stamen showing the nectariferous gland at the base of its filament; Fig. 4, a group of fruits, the product, that is, of several distinct flowers; and Fig. 5, the follicles of a single fruit dehiscing down their inner margins.

The fourth line of figures represents the Globe-flower (*Trollius europæus* Linné). Fig. 1 is a flower seen from below; Fig. 2 is a flower in longitudinal section, well illustrating hypogynous insertion; Fig. 3 is a petal showing the "nectary" at its base; Fig. 4, a stamen; and Fig. 5, an immature gynæceum, in which the stigmas remain distinctly visible.

The fifth line represents the Winter Aconite (*Eranthis hyemalis* Salisbury), Fig. 1 showing the flower in section with the involucre or epicalyx below it; Fig. 2, the involucre alone; Fig. 3, a petaloid sepal; Fig. 4, one of the stalked nectariferous petals, natural size; Fig. 5, the same enlarged; Fig. 6, the fruit with the involucre; and Fig. 7, a follicle in longitudinal section.

The last row of figures represents the Columbine (*Aquilegia vulgaris* Linné), Fig. 1 being a petaloid unspurred sepal; Fig. 2, a spurred petal; Fig. 3, the stamens; Fig. 4, a single stamen when its anther is dehiscing; Fig. 5, the gynæceum; Fig. 6, an unripe fruit (*follicetum*); Fig. 7, a follicle; Fig. 8, a follicle in longitudinal section; and Fig. 9, a ripe fruit.

LXXIV.—THE PASQUE-FLOWER.

Anemone Pulsatilla Linné.

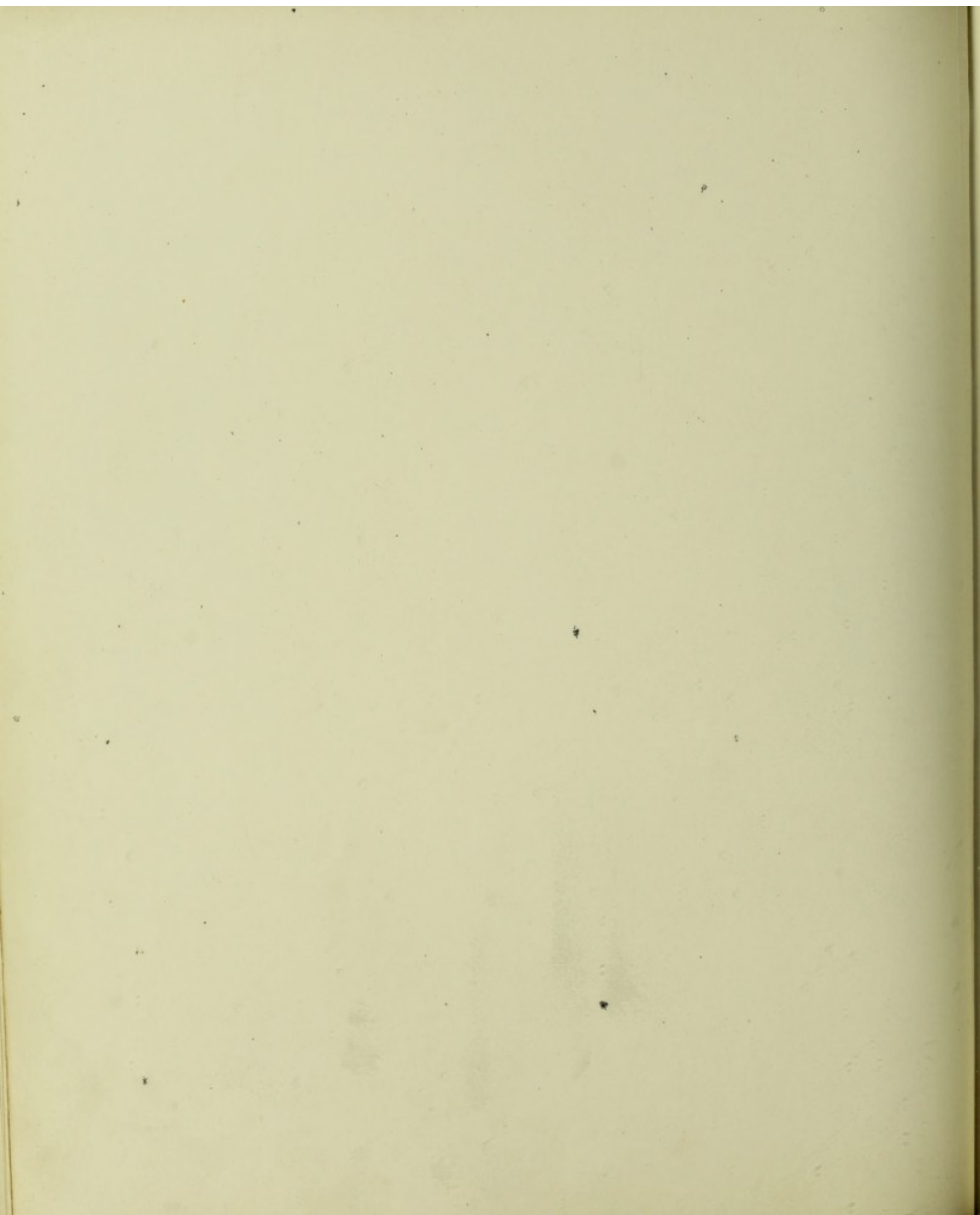
WHILST those types of the Family *Ranunculaceæ* that we have already described agree in having more than one seed in each carpel, so that the fruit is made up of dehiscent follicles, the genus *Anemone* and those which follow agree in having but one ovule in each carpel, so that in the fruit stage the latter becomes an indehiscent achene.

Anemone agrees with several other genera, such as *Ranunculus*, *Myosurus*, and *Thalictrum*, in being herbaceous and in having the sepals imbricate; and in some of its allies, as in the genus itself, the leaves are all radical, there is an involucre below the flower, and the sepals are petaloid and thus perform the attractive function of the petals which are absent. As a genus it may be characterised as consisting of scapigerous herbs with a perennial rhizome; leaves all radical and lobed, often deeply; flowers mostly solitary or in few-flowered cymes; involucre of three leafy bracts in a whorl, generally some little distance below the flower; petaloid sepals from four to twenty in number, longer than the stamens; petals absent, or at most represented by the conversion of some of the outer stamens into stalked nectariferous glands; and a head of numerous carpels with persistent styles. The genus comprises some ninety species, natives of extra-tropical regions both north and south of the Tropics, which possess in a marked degree the acidity so general in the Family.

Three sub-genera or sections of the genus have been made: *Pulsatilla*, in which the outer stamens have no anthers and are converted into nectaries, while the achenes are each terminated by a long feathery tail or awn formed from the persistent style; *Anemone* or *Eu-anemone*, in which all the stamens bear anthers, the achenes are terminated by short styles, and the involucre is distant from the flower; and *Hepatica*, differing only in having the involucre so close beneath the flower as to be mistaken for a calyx. This last sub-genus, though familiar in our gardens, is not represented among British plants.

Although, like those of most of the other members of the Family, the flowers of *Anemone*, in the arrangement, insertion, and want of cohesion between their parts, represent an unspecialised type, and although they are destitute of perfume, they include a wide range in colour and in adaptation to insect-visitors. The sepals may be the primitive yellow of the Buttercups, Globe-flowers, Marsh Marigolds, and Winter Aconite, white, pink-tinged, scarlet, blue, or violet, which last-mentioned colour is commonly associated, as in Columbines and Violets, for instance, with elaborate structural adaptations for insect-pollination. In some species, such as *A. japonica* Siebold and Zuccarini, and the beautiful *A. coronaria* Linné of Italian meadows, two or more of these colours occur as varieties without other differences. The white or pale pink blossoms of the Wood Anemone contain no honey, but are visited for the sake of their pollen by short-tongued insects of a low type: those





THE PASQUE-FLOWER—continued.

of the *Hepatica* are pink or blue and are visited by bees; whilst the long, bell-shaped tube made by the bright violet sepals of the Pasque-flower enclose honey secreted by the staminodes, as well as abundance of pollen, and are visited mainly by bees.

This beautiful species, one of the most attractive of British flowers, is not common. Not growing in Scotland, Ireland, or Wales, it occurs chiefly on upland grass land on calcareous soils, though it does well in any ordinary garden mould. Its stout, woody rhizome grows deeply into dry rubbly ground, and sends up a rosette of bi-pinnate leaves with pinnatifid leaflets and very narrow linear segments; but these leaves do not attain their full size until after the plant has flowered. Gerard expressly says that he was "moved to name" the plant Pasque-flower or Easter-flower (from the Hebrew *pesach*, or pass-over, Greek *πάσχα*, *pascha*, French *pâques*) from its seasoning of blossoming, April or May.

The whole plant—leaves, flower-stalk, involucre, and even the outer surfaces of the six sepals—is grey and silky, with long, soft, thickly-set hairs, which form an admirable background for the imperial purple of the inside of the corolla and the mass of golden anthers. In the bud stage the flowers are pendulous; but when the blossoms first open, writes the late Lord Avebury:—

"they face the sky, and the stalks are quite short. The stigmas are numerous and ready for fertilisation. After two days the peduncle has elongated, the flower inclines slightly, and the anthers begin to open. The sepals, which are concave, have grown longer, and thus protect the pollen more effectively. The flower closes in the evening, and thus some of the pollen is deposited on the sepals. After another two days the stalk is ten or even twenty times as long as it was at first, and the flower hangs over by day as well as by night. The sepals have more than doubled in length, and have become convex instead of concave. If not already fertilised, the stigmas are almost sure to receive pollen from the sepals when the flower closes at night."

The involucre consists of three bracts resembling the foliage-leaves but slightly united at their base. The six sepals are pointed and in two whorls of three, and reach an ultimate length of an inch and a half; and, when they have fallen, the peduncle elongates yet more, bearing aloft the head of achenes, the feathery awns of which may also reach an inch and a half in length.

The name *Pulsatilla*, from the Latin *pulsare*, to beat, was first used by Dodoens, and seems to have the same significance as *Anemone*, from the Greek *ἄνεμος*, *anemos*, the wind, Pliny saying of some plant so known that it

"Hath the propertie to open but when the wind doth blow."

LXXV.—THE WOOD ANEMONE.

Anemone nemorosa Linné.

ALTHOUGH poor stunted specimens of this delicately tinted flower may be found among grass on wind-swept hill-sides, it is seen at its best under the partial shade of the leafless boughs of our Spring woodlands. It seems most probable that the names *Anemone* and Wind-flower were originally applied to an entirely different plant, possibly, as Dr. Prior suggested, a species of *Cistus*. The delicate, fugacious petals of these shrubs, which are often white with a blood-red spot at the base, seem to agree far better with the legendary origin of the *Anemone* than does our pale, blushing wilding. Theocritus compares the *Anemone* with the Rose, and an ancient annotation of his poems adds :—

“Anemone, a scentless flower, which is reported to have sprung from the blood of Adonis.”

Bion, the follower of Theocritus, as translated by Andrew Lang, writes :—

“Woe, woe for Cytherea, he hath perished, the lovely Adonis !
A tear the Paphian sheds for each blood-drop of Adonis, and tears and blood on the earth are turned to flowers. The blood brings forth the rose, the tears, the wind-flower.”

Ovid's “*Metamorphoses*” were, however, the source of much mythology in ages that knew but little Greek, and in Golding's sixteenth-century translation his comparison of the flower of the *Anemone* to that of the Pomegranate runs as follows :—

“Of all one colour with the blood, a flower she there did find,
Even like the flower of that same tree, whose fruit in tender rind
Have pleasant graines enclosed—howbeit the use of them is short,
For why, the leaves do hang so loose through lightnesse in such sort,
As that the windes that all things pierce with everie little blast
Do shake them off and shed them so as long they cannot last.”

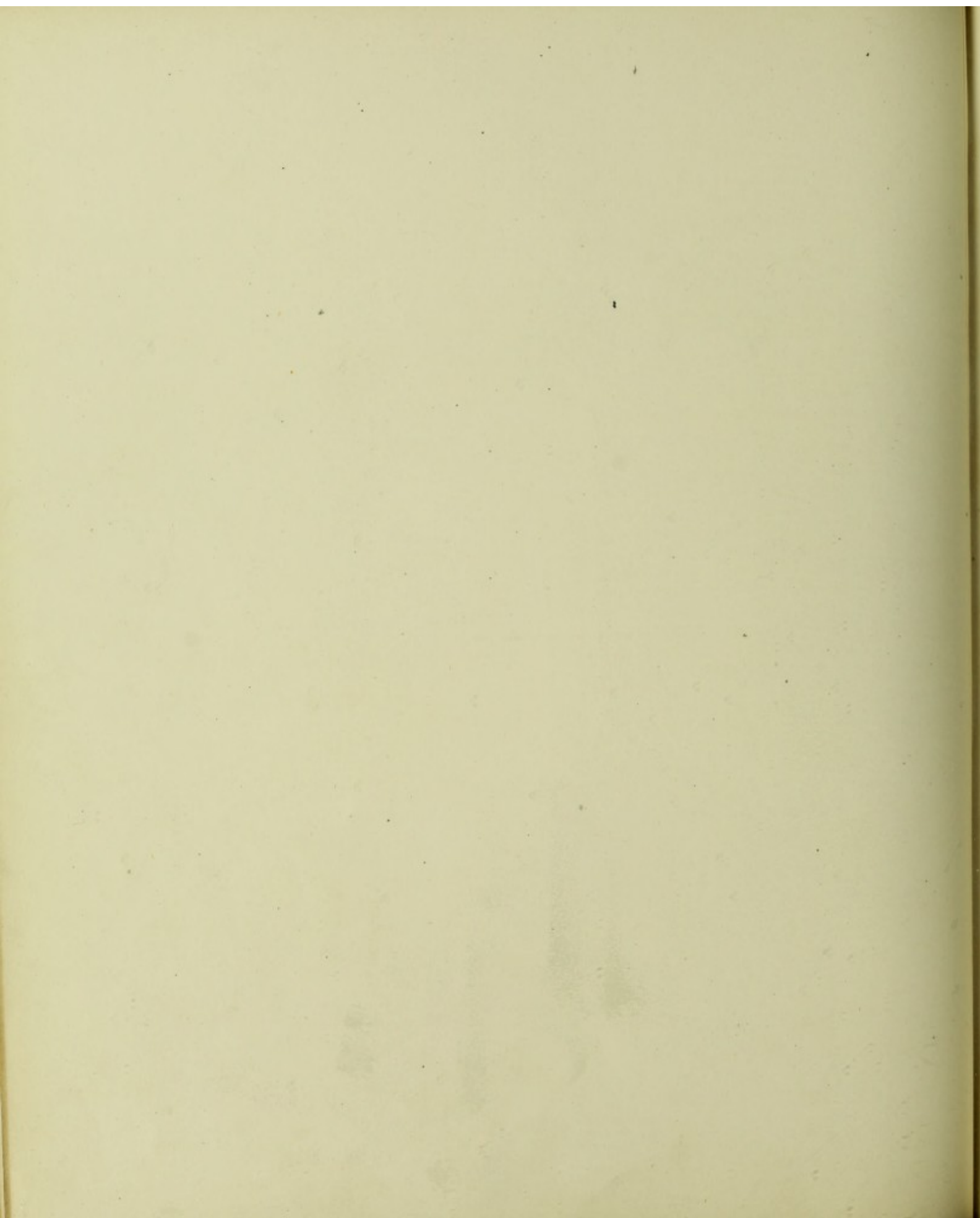
On this Dr. Prior cruelly suggests that Venus's tears might well be compared to a Wind-flower, as they were probably soon blown away.

We have, however, taken the word *Anemone* into our language, throwing the accent back from the third to the second syllable and thus making the long *o* of the Greek ἀνεμώνη into a short one, and have long ago transferred both it and its translation *Wind-flower* to this genus of *Ranunculaceæ*.

This widespread species *A. nemorosa* Linné, which is none the less beautiful because it is common, is one of the few plants which is able to grow under beech trees. The explanation of this, as in the cases of Snowdrops, Primroses, Wild Hyacinths, Wood Sorrel, and a few others, is that there is an underground perennial rhizome, or other form of enlarged stem, in which food is stored by leaf-action during the previous season, so that the early-flowering, low-growing species can run through all the above-ground portion of its life-history before the beech comes into full leaf.

The rhizome of this species is not, however, very thick. It is nearly cylindrical, horizontal in direction, and woody ; and sends up the radical foliage-leaves and flower





THE WOOD ANEMONE—continued.

stalks some distance apart. The leaves rise on slender petioles and are mostly ternately divided into sessile, irregularly-lobed, cut, or pinnatifid leaflets, of a somewhat sombre shade of green, slightly hairy on the margins and chief veins. In June, after the flowers are over, it is not uncommon to find the under surface of the leaves covered with the little pale yellowish cups of a parasitic fungus, the White-spored Cluster-cup (*Æcidium leucospermum* DC.), which also occurs on their upper surfaces. Dillenius, who, in 1724, edited Ray's "Synopsis," describes and figures a leaf so attacked as a fern, under the name *Filix lobata, globulis pulverulentis undique aspersa*, adding that he found it in the hortus siccus of Jacob Bobart the younger, who was Superintendent of the Oxford Botanical Garden from 1680 to 1719, labelled as the *Conjurer of Chalgrave's Fern*. Chalgrave is probably Chalgrove, not far from Oxford, memorable for the skirmish in which John Hampden received his death wound; but we know nothing more of the "Conjurer."

The three stalked, involucre bracts half-way up the flower-stalk closely resemble the foliage-leaves in form and colour; whilst the six, or less commonly five to nine, oblong sepals are white, or more or less deeply tinged with pink, or, in the rare variety *Robinsoniana*, with blue. The sepals are free from hairs and ultimately spread out horizontally. Drooping in the bud, the flowers rise erect in fine weather, opening from March to May; but bend downward in dull or wet weather, at night, or after pollination. This seems in this case to serve mainly as a protection for the pollen, as the flower seems to contain no honey and to be only visited by the lower types of insect—flies, beetles, and short-tongued bees—for the sake of its pollen.

The stamens all bear anthers; and the stigmas terminating the short, straight styles come to maturity at the same time as does the pollen, so that the flower may often be self-pollinated. The ovaries are downy; but the styles do not elongate into tails as in the Pasque-flower.

Beautiful as is this simple, blushing, little wild flower, a more lasting blossom with its own distinct beauty of form is produced by a double variety, frequent in gardens, in which the stamens are replaced by a dense white tuft of narrow petals.

LXXVI.—TRAVELLER'S JOY.

Clematis Vitalba Linné.

IT is not at first sight very obvious why a group of plants with woody stems, often reaching considerable dimensions, and with opposite, clearly compound leaves, such as are the species of the genus *Clematis*, should be classed with the scattered-leaved herbaceous remainder of the Family *Ranunculaceæ*. The coloured calyx and absent corolla, the indefinite stamens and carpels, the absence of cohesions among the floral organs, and the acrid juice are, however, sufficient reasons; and, when we consider the long tail-like persistent styles which characterise this genus and some species of *Anemone*, the alliance between these two genera appears very close. The main distinction indeed is that the sepals in *Clematis* meet in the bud without overlapping, *i.e.* are *valvate*, whilst those of *Anemone* and the rest of the Family are imbricate.

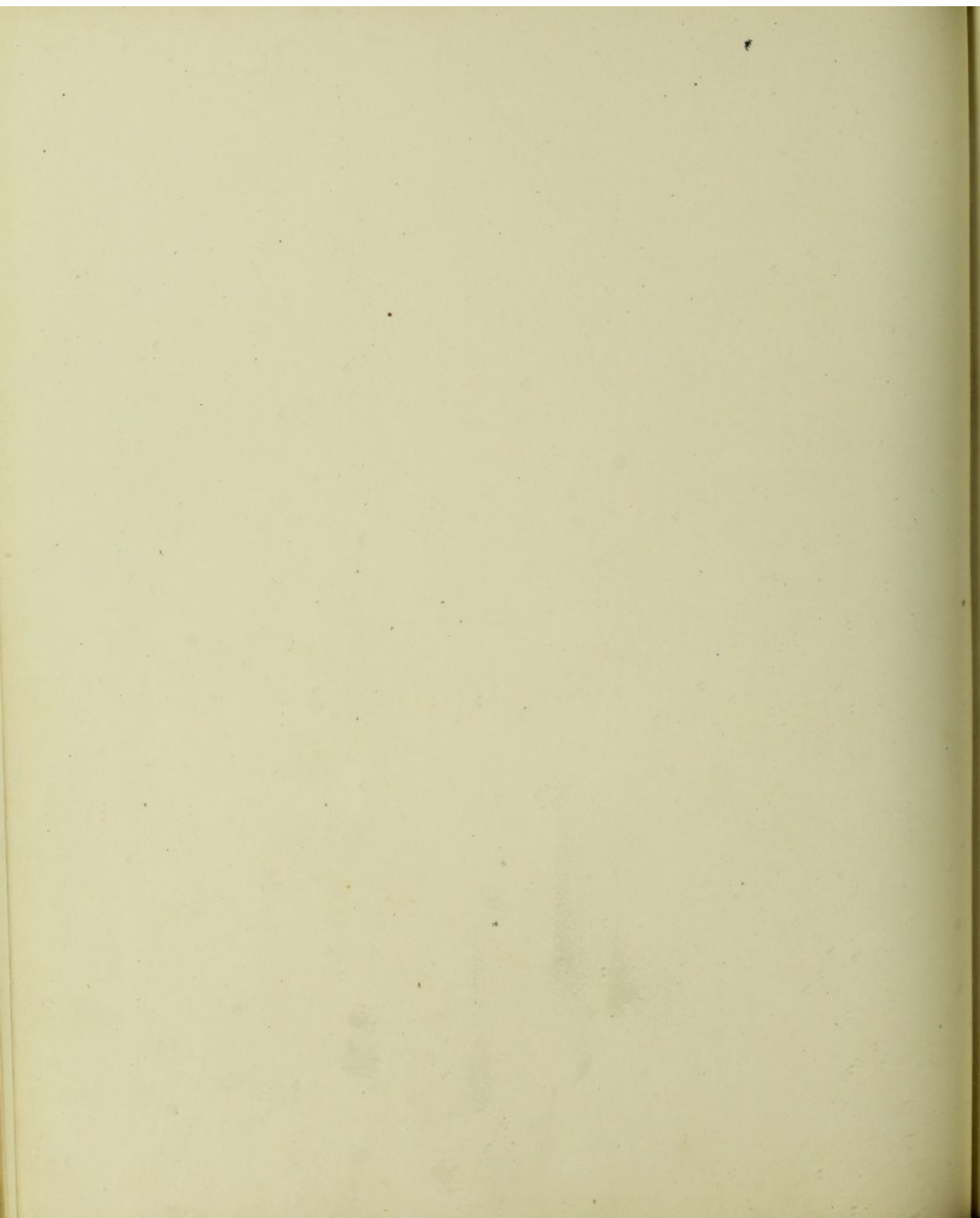
In early spring the apparently lifeless tangle of twisted, grey, rope-like stems of our wild species, ragged with long strips of separating bark and hung with tough, wiry loops of the persisting leaf-stalks, some of the withered brown leaves of the previous year, and shabby tufts of the feathered fruits, puts forth rapidly elongating and gracefully curving shoots. These young stems are six-angled, dark olive-green, and slightly downy. Their young leaves unfold early in a vivid green, the uppermost only pinnately-lobed, or made up of three delicate ovate leaflets with downy under surface, but the fully-developed ones bi-pinnate, with from five to nine leaflets, each three or four inches long, on long slender stalks. Well did Gerard speak of it as

“Decking and adorning waies and hedges, where people travell, and thereupon I have named it the Traveller's Joie.”

One of the most interesting features in the genus *Clematis* is the method of climbing. The lower surface of the leaf-stalk is sensitive to contact, and some of these petioles thus become curved once or twice round any stem which they touch, whether of their parent plant or of any other. So tight is their grip that they sometimes strangle the supporting stem to its death; and, having twined round such a support they, unlike our garden *Nasturtiums*, become rigid and woody and persist for several years. Darwin, who suggested that we have here a first stage in the evolution of leaf-tendrils, pointed out that the leaves that have twined in this way have fewer and smaller leaflets than those which do not, as if they were on the way to lose their leaf-blades altogether.

In May and June the cheery upstart gains the new beauty of blossom; but the open branching clusters of greenish to cream-white flowers, though giving off a faint almond-like perfume, have no honey. As in wind-pollinated flowers generally, the stigmas mature a little before the anthers; but flies and bees visit the blossoms for the sake of their pollen, so that the plant is, no doubt, often cross-pollinated by their means.





TRAVELLER'S JOY—continued.

It would seem to be in spring and summer that the plant most deserves the name of Virgin's Bower, also bestowed upon it by Gerard, probably intending a courtly compliment to Elizabeth ; but it is even more conspicuous in autumn when each little shaggy achene in its fruits ends in the long curling white plume which has earned such local names as Grey-beards and Snow-in-harvest, as well as the more general Old Man's Beard.

The acrid juice of the plant causes it to be used as a vesicant by beggars on the Continent to produce alarming-looking sores and so excite commiseration, whence is derived the French name *Herbe aux gueux* ; and the use of the tough stems to bind faggots is probably the origin of such English popular names as Hag-rope (hedge-rope), Bindwith, and Withywind.

Like many other climbing plants whose stems are liable to sharp bends which would close small vessels, *Clematis* has numerous vessels in the wood of its stem with large transverse diameters. Country lads have long ago discovered that this structure makes the stem "draw" well when lit, whence the use of it that has earned it the names Smoke-wood and Smoking-cane.

The name *Clematis* itself, dating from Dioscorides, is derived from the Greek κλήμα, *klema*, a vine-twig or tendril ; while the specific name *Vitalba*, coined by Dodoens from the Latin *vitis alba*, white vine, may well have been suggested by a line in Ovid :—

"Lentior et salicis virgis et vitibus albis."

Though most of the hundred and seventy species of the genus belong to the North Temperate Zone, the European species belong to the south rather than to the north of that continent. Our British species does not occur wild either in Scotland or in Ireland. It is apparently decidedly calcophile, though there is at present considerable doubt as to the interpretation of a plant's partial or entire restriction to calcareous soils. Traveller's Joy abounds in the hedgerows and other sunny spots on chalk or limestone, and when found on clay is a tolerably certain indication that the clay in question is either the Chalky Boulder-clay or some other bed in which there is a notable admixture of lime.

LXXVII.—THE WATER CROWFOOT.

Ranunculus floribundus Babington.

THE considerable genus *Ranunculus*, which gives its name to the Family *Ranunculaceæ* and to the Order *Ranales*, comprises some two hundred and fifty species and is wellnigh cosmopolitan, occurring in Arctic and alpine situations both north and south and on mountains under the Equator, but more especially in the North Temperate Zone. They are herbaceous and mostly perennial and acrid. The leaves are generally much divided in a palmatisect manner; and, as in all the Family, excepting *Clematis*, the sepals, which are usually five in number, are imbricate. There are usually five petals and they each have a honey-secreting gland near the base. The stamens are indefinite in number, and, though when the flower first opens the anthers are turned inwards, the filaments of each whorl in succession twist so that their anthers burst outwards. As in the Tribe *Anemoneæ*, there are numerous indehiscent one-seeded carpels which form achenes; but the genus differs from the other genera of that Tribe in having an erect or ascending, instead of a pendulous, ovule.

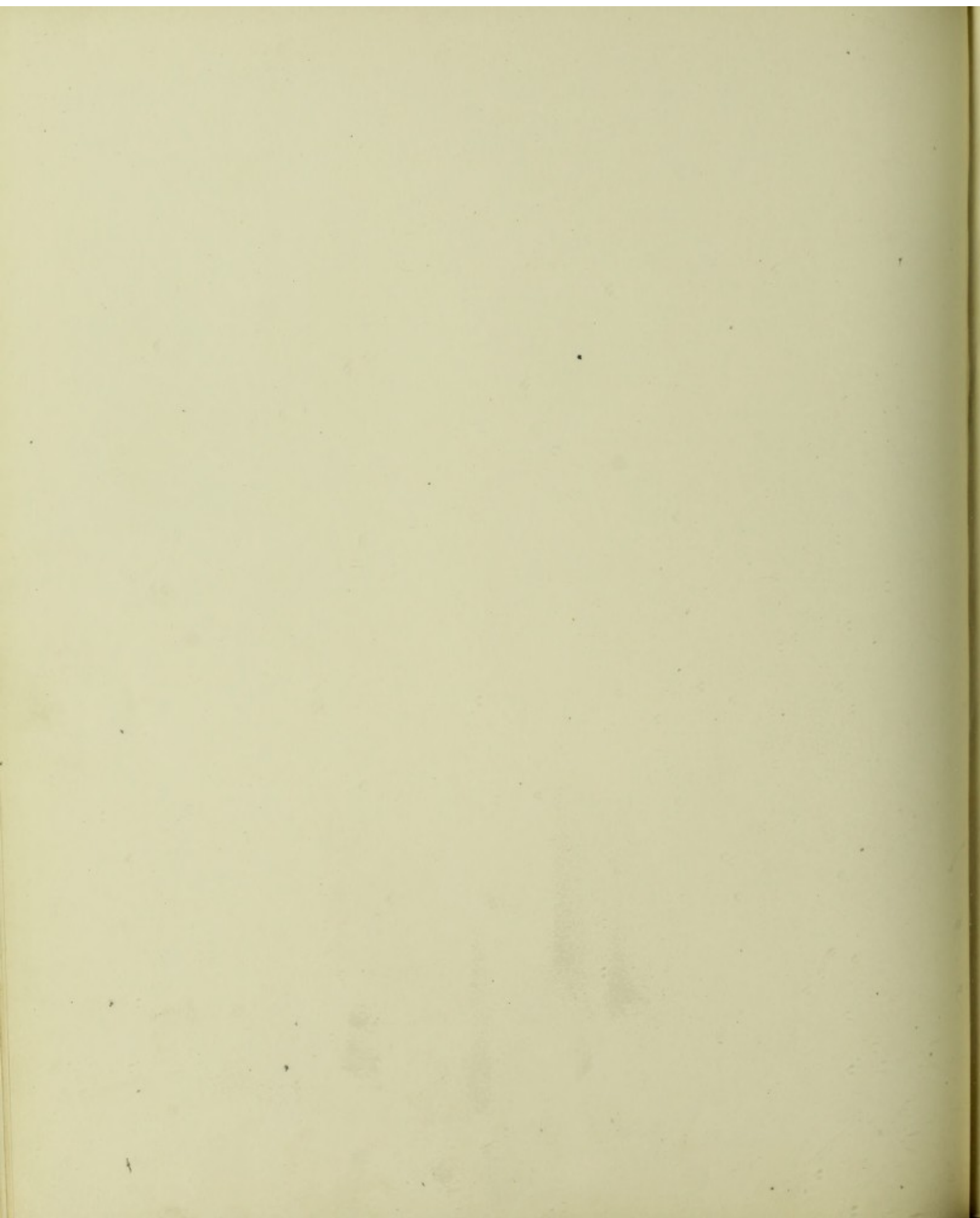
The name *Ranunculus* is used by Pliny. It is certainly a diminutive of *rana*, a frog; but is variously explained as referring to the moist situations in which most of the species grow and where young frogs are to be found, or to the season of flowering when frogs are young. The most common English names for the group are Buttercup (applicable only to the golden-flowered species) and Crowfoot, referring to the usually divided leaves.

There is a good deal to be said in favour of the division of the genus into three—*Batrachium*, *Ficaria*, and *Eu-Ranunculus*—though, as these all agree generally in the characters already mentioned, they may be treated merely as sub-genera. The *Ranunculi*, to which the Greek prefix *eu-*, which we may render as “strictly so-called,” is affixed, are terrestrial plants, with segmented leaves having little or no stipules, mostly yellow flowers, with five sepals, a scale covering the honey gland, and smooth, beaked achenes. De Candolle’s genus *Ficaria* has entire leaves, yellow flowers, generally three sepals, a scale over the honey gland, and unbeaked achenes.

Batrachium, proposed as a genus by Samuel Frederic Gray in his “Natural Arrangement of British Plants” (1821), (though the name was taken from the *βατράχιον*, *batrachion* of Dioscorides), consists of aquatic plants without the acidity of other *Ranunculi*; with some or all of their leaves submerged and cut up into many narrow thread-like segments, but with distinct membranous stipules; white petals with yellow bases and naked honey glands; and achenes marked with transverse wrinkles.

On account of the absence of acidity in these plants it has been suggested that they might be employed as fodder for pigs or cattle.





THE WATER CROWFOOT—continued.

While many terrestrial Ranunculi are hairy, these Batrachian forms, as they are termed, are—like most aquatics—glabrous. The flowers—in some forms at least—have a slight fragrance and are visited by various small water-frequenting flies. The occurrence of semi-transparent white petals with a yellow base in such widely distinct aquatic plants as this group and the Monocotyledonous Frog-bit (*Hydrocharis Morsus-ranæ* Linné) suggests that, perhaps, these colours are peculiarly attractive to such insects. As the flowers are usually protandrous they are, no doubt, generally cross-pollinated; but if the water keeps at so high a level that the blossoms are submerged, they remain closed and are self-pollinating.

Botanists differ widely as to the number of species to be recognised as distinct among these Water Crowfoots, all of which were lumped together as *Ranunculus aquatilis* by Linnæus. It has been suggested that, belonging as they do to a group the majority of the species in which are not aquatic, their aquatic habits have been only acquired at a comparatively recent date, and that for this reason they are a very variable or polymorphic series of forms, readily modifying many of their structural characters according to variations in their surroundings. In rapid streams, for instance, no floating leaves occur, the long dark olive-green tassels of submerged leaves in the waters of the Severn being, it has been plausibly said, the tresses of Sabrina in Milton's "Comus" that no summer drought is to scorch, while Tennyson also alludes to them as

"Those long mosses in the stream."

While these submerged leaves have earned for these plants, in common with several others, the name of *Water Milfoil*, the three-lobed floating leaves of some of the forms are sufficiently like those of *Anemone Hepatica* to have suggested that of *Water Liverwort*. Henry Lyte, in his translation of Dodoens's Herbal (1578), says that the apothecaries called the plant *Hepatica aquatica* and "very erroneously use it for Hepatica." While it is undoubtedly true, as Sir Joseph Hooker says, that some of the characters used to discriminate the forms are variable, and that some of them are adaptive, altering with changes in their surroundings, there are others which are neither variable nor adaptive; and every serious student of these "critical" groups, as they are called, recognises that they include a considerable number of allied but distinct types, though lumped under a common name by less careful scrutiny.

The form represented in our Plate, often covering standing waters with its numerous, rather large blossoms, which have their petals not in contact and each with nine or more veins, was described by the late Professor Charles Cardale Babington in 1855 as *Ranunculus floribundus*.

LXXVIII.—THE LESSER CELANDINE.

Ranunculus Ficaria Linné.

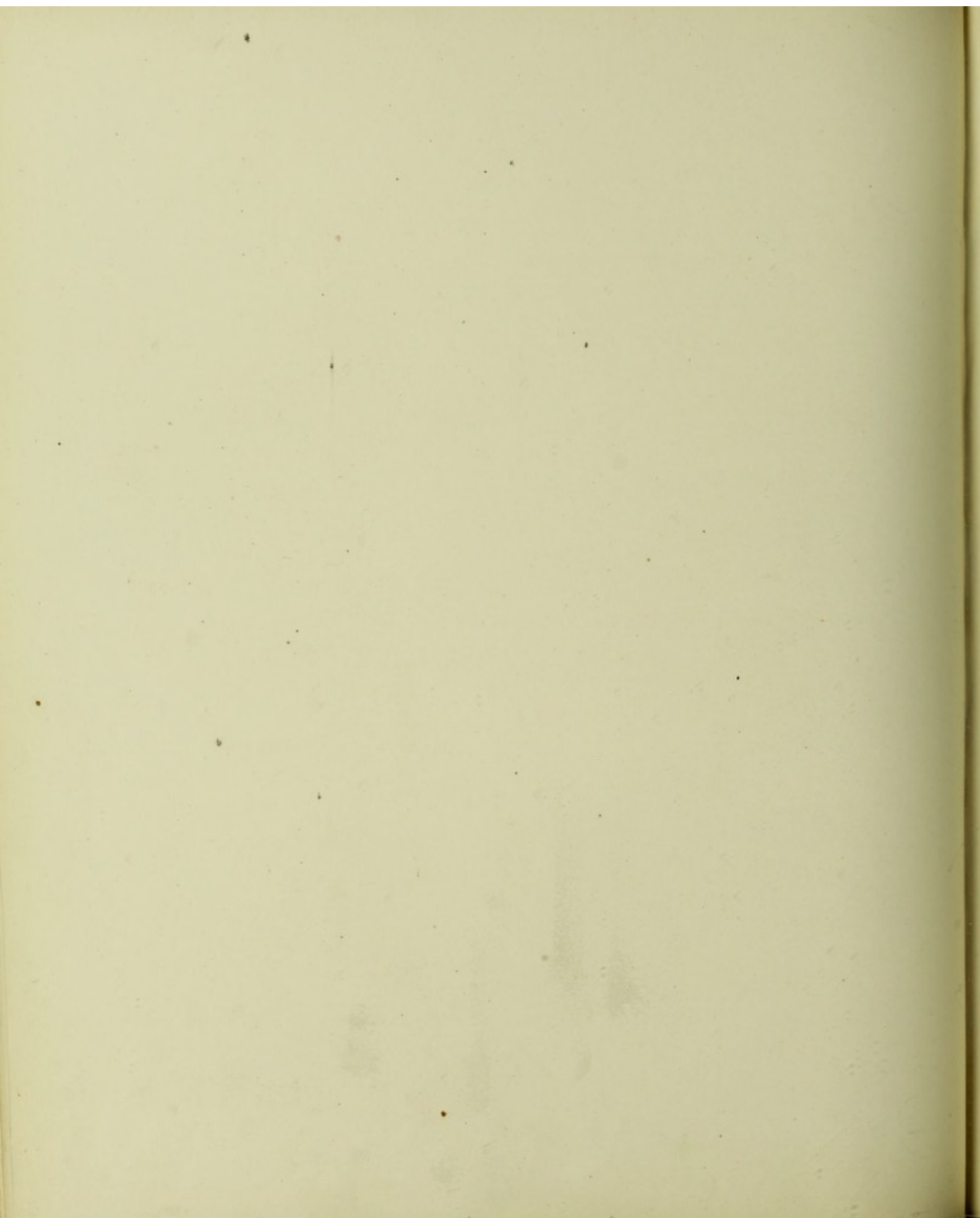
TO the evolutionist such taxonomic terms as species, sub-genus, genus, etc., are mere conventions expressing as nearly as we can make them varying grades of relationship or of remoteness of common ancestry. We may well, therefore, admit that there is a good deal to be said in favour of the treatment of the Section *Ficaria* of the genus *Ranunculus* as a distinct genus. The two or three species of this group, only one of which is British, are perennials with entire leaves, mostly radical, but with a few cauline ones in opposite pairs, from three to five sepals, from eight to twelve yellow petals, and small achenes. *Ranunculus ficarioides* Bory and Chambard (= *Ficaria peloponnesiaca* Nyman) is a form with crenate leaves, occurring in Greece; and the South European *F. grandiflora* Robert (= *R. Ficaria calthæfolia*) has flowers about two inches across and decidedly downy carpels. Our own species, the *Ficaria verna* of Hudson or *Ranunculus Ficaria* of Linné, which occurs from the Arctic Regions to North Africa, presents some well-marked variations to which names have been given.

Its root consists of a cluster of stout unbranched fibres, among which are the numerous white, fig-shaped tubercles, each from half an inch to an inch long, to which it owes the names *Ficaria* or Figwort. These partake of the acidity which characterises the whole plant and it may have given them some medicinal efficacy; but it was doubtless their form that led, under the doctrine of signatures, to their use as a remedy for hæmorrhoids, and to the name Pilewort.

The stem is generally very short, so that all the leaves may be radical; but it may elongate to several inches, bearing pairs of stalked leaves and sometimes rising erect; but more often prostrate and then often rooting from its nodes. Small tubers are not uncommon in the leaf-axils.

The leaves are heart-shaped and may be obtusely angular, wavy, crenate, or even deeply lobed, and their glossy bright green is sometimes splashed with the purplish black stains of anthocyan. This is, perhaps, more especially the case when the plant is growing, as it often does, in shady places. The petiole is longer than the blade, stout and dilated at the base into a membranous sheath. In the more common form (var. *divergens* Schultze) these sheaths are narrow, and the auricles of the leaves do not overlap; but in another, more luxuriant form (var. *incumbens* Schultze) the sheaths embrace the next innermost leaf-bases and the auricles overlap. As is often, but not always, the case with the acidity of the *Ranunculaceæ*, the pungency of these leaves largely disappears on boiling, and they are used for food in Sweden and Germany, the plant having in consequence such names as *Pfenningsalat* (Penny Salad), and *Scharbocks-Kraut* (Scurvy-grass) and *Löffel-Kraut* (Spoonwort), which it shares with *Cochlearia*.





THE LESSER CELANDINE—continued.

The brilliant golden star-like blossoms, among the earliest of the spring, appear from March to May, borne on long stout stalks which are axillary, although mostly rising as scapes from the suppressed stem. They are about an inch across, with three concave greenish sepals below and an array of sub-acute petals, generally nine in number, with that glistening coating of a varnish-like gum that throws a reflection of their yellow colour on to the chin when children try if they "like butter." In fading, the petals turn white and occasionally they are altogether absent. Honey is secreted by a gland at the base of each petal which is covered by a scale, as in other *Ranunculi*, and the flowers are freely visited by a variety of short-tongued insects. The stamens also mature their pollen before the stigmas are receptive, as is the rule in insect-pollinated flowers; and the opening and closing of the flowers, which usually occur about 9 a.m. and 5 p.m. respectively, also suggest dependence upon insects. Nevertheless the plant rarely sets seed, being propagated almost entirely by its tubers. These are produced in great numbers, so that it is said that, when exposed by the washing away of the soil by rain, they have given rise to the notion of its having "rained wheat."

Flowers are occasionally produced without stamens, and the achenes, which are slightly downy, are also sometimes clearly abortive. So abundantly, however, does the plant reproduce itself vegetatively that it often proves seriously detrimental to grass land on a moist soil. It is stated, however, that it can be got rid of by dressing the ground with coal or wood ashes.

Turner, the first of our botanists to mention the plant, writes in 1548 :—

"*Hirundinaria* called in grecke *Chelidonium* is of ii kyndes. . . The second kynde called in latine *Chelidonium minus*, is called in englishe *Fygwurt*, it groweth vnder the shaddowes of ashe trees. It is one of the fyrst herbes that hath floures in the spring."

Considering the charm of its golden stars in early spring it is remarkable that no poet seems to have sung the praises of the Lesser Celandine till Wordsworth wrote :—

"Ere a leaf is on a bush,
In the time before the thrush
Has a thought about her nest,
Thou wilt come with half a call,
Spreading out thy glossy breast
Like a careless Prodigal;
Telling tales about the sun,
When we've little warmth, or none.

* * *
Careless of thy neighbourhood,
Thou dost show thy pleasant face
On the moor, and in the wood,
In the lane :—there's not a place,
Howsoever mean it be,
But 'tis good enough for thee."

LXXIX.—THE GREATER SPEARWORT.

Ranunculus Lingua Linné.

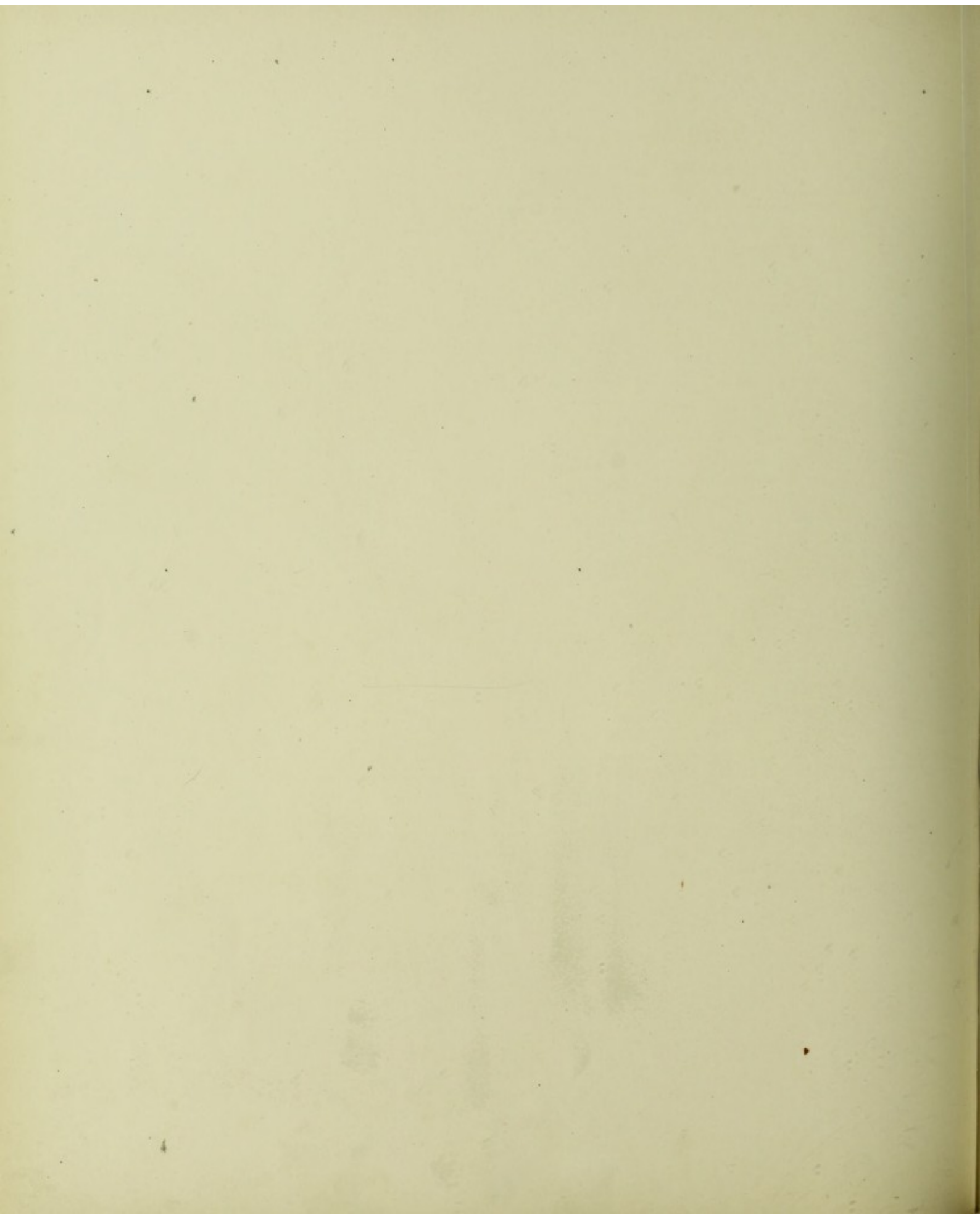
THIS handsome plant, the largest of our British species of *Ranunculus*, is not common, although it is pretty generally distributed throughout Britain. Thus, out of the 112 counties and vice-counties of approximately equal size into which Hewett Watson divided our island, and those more immediately adjoining it, this species has been recorded in seventy-seven, whereas fifty is, perhaps, an average number. It occurs over northern and western Asia, down to the Himalaya, and throughout Temperate Europe; but is not recorded from Scotland north of Aberdeen, and is only local in its occurrence in Ireland. It grows in ditches and marshes, and in the Norfolk Broads is characteristic of the outer or "free water side" of the shallow-water Reed-swamp association of the ecologists, where it is accompanied by *Phragmites*, the large Willow-herb (*Epilobium hirsutum* L.), the Forget-me-not, Bittersweet, Yellow Iris, Branched Bur-reed, Great Water Dock (*Rumex Hydrolapathum* Hudson), and Bulrush (*Typha*).

It belongs, as do the two following species, to a Section or Sub-genus known as *Eu-ranunculus*, mostly perennial plants with leaves generally radical and exstipulate, the parts of the flower in fives, the petals yellow, and the achenes destitute of tubercles on their surface. Within this Section, the Spearworts are distinguished by their undivided leaves, of which the upper ones are lanceolate. The Lesser Spearwort (*R. Flammula* Linné) is much commoner than *R. Lingua* and in every way smaller; but large-flowered forms of the former, in which the blossoms reach three-quarters of an inch in diameter, are sometimes mistaken for the other species. *R. Flammula* is a very variable plant; but it always has furrowed flower-stalks and inflated short-beaked carpels, whereas *R. Lingua* has its flower-stalks free from furrows and a broad, strong, sword-shaped beak to its achenes.

A dense mass of fibrous roots adapt the plant to its situation in mud not often much disturbed by wind or currents; and, in addition to this tuft of roots at the base of the stem, others are often put out by the lower joints of the stem which may assume a more or less prostrate or ascending position.

The stem generally rises erect to a height of two or three feet and is stout and hollow. Both it and the upper aerial leaves that it bears may be either glabrous or densely covered with stiff adpressed hairs, though this hairiness and the presence of markedly distinct submerged leaves have been often overlooked by botanists when describing the plant. Thus Gerard speaks only of "long smooth leaves not unlike those of the Willow," though his editor Johnson says "leaves a little hairy." Linnæus briefly characterises the leaves as lanceolate; Lamarck and De Candolle in the "Flore Française" (1805) add that they are amplexicaul, *i.e.* sessile and more or less wrapped round the stem at the base; and Gray's "Natural Arrangement of British Plants" (1821) seems to be the first work to note the few slight teeth along their





THE GREATER SPEARWORT—continued.

margins. Bentham in his "British Flora" (1865) refers only to aerial leaves, which he describes as "glabrous with a few nearly parallel veins," as also does Hooker in his "Student's Flora," his full description being "leaves sessile, $\frac{1}{2}$ -amplexicaul lanceolate entire or toothed . . . 6-10 in. $\frac{3}{4}$ -1 in. broad, veins parallel or reticulated."

Nevertheless the presence of submerged leaves seems to have been observed at least as early as Caspar Bauhin, who writes in his "Pinax Theatri Botanici" (1623), "Folia prima aliquando subrotunda sunt." Parkinson also seems to have seen them, since in his "Theatrum" (1640) he says:—

"The Greater Marsh Spearwort hath a long joynted root, whence riseth up a thick joynted smooth stalke, two foot high, furnished with large and long shining and smooth thinner leaves, than in the next [*R. Flammula* L.], some being more than half a foote long and two to three inches broad, but smaller up to the toppe."

Two centuries later these submerged leaves were correctly described by Bromfield in his "Flora Vectensis" (1856), by Syme in "English Botany" (1863), and most fully by Roper in the "Journal of the Linnean Society" in 1884. They are seven to nine inches long, on sheathing petioles which are four or five inches long, the blades three or four inches across, ovate-oblong, obtuse, cordate at the base, entire or slightly undulate-crenate, rather membranous and semi-transparent, perfectly glabrous, reticulately veined, and remaining green throughout the winter. On the other hand, the aerial leaves are almost sessile, with sheathing bases, erect, lanceolate, six to ten inches long, about an inch across, very acute, with slight distant serratures, leathery, opaque, smooth or hairy with adpressed hairs chiefly on their under surfaces. Their venation adds to their many resemblances to the leaves of aquatic Monocotyledons, there being one principal midrib from which pairs of much finer secondary longitudinal veins arise at intervals converging at the apex of the leaf, while fine obliquely transverse tertiary veins complete the meshwork.

The handsome flowers are about two inches across, and have a copious secretion of honey from the large gland at the base of each petal. The stigmas mature before the anthers, which bend and burst outwards in succession; but, though pollination is mainly effected by flies, self-fertilisation may also occur. The carpels are compressed, with a flat margin and a minutely pitted surface.

The English name Spearwort obviously refers to the upper leaves, as does also the specific name *Lingua* that Linnæus borrowed from Pliny; but when Pliny says "there is herb called 'lingua' which grows in the neighbourhood of fountains," it is more probable that he was referring to the Hart's-tongue Fern than to this plant.

In spite of its aquatic habitat the Spearwort has the marked acidity of the Family, while the allied *R. Flammula* derives from this property its name, which signifies "a little flame."

LXXX.—GOLDILOCKS.

Ranunculus auricomus Linné.

IN the early days of April, before the majority of our trees have unfolded their leaves, many a dry copse or bank is enlivened by the bright green and gold of this unpretentious Buttercup. It can stand some shade or much sun, and rejoices in a moist loam rich with leaf-mould: it can hold its own among the young grass of spring, with Primroses, Lady's-smock, and Yellow Archangel; but it rarely occurs in actually marshy ground. From the situations in which it is often found it has been called the Wood Crowfoot. Tragus, Caspar Bauhin, and Morison were unquestionably justified in terming it *Ranunculus pratensis*, one of the meadow species, that is; but Fuchs, John Bauhin, and Ray showed, perhaps, more discrimination in styling it *sylvestris*, *sylvaticus*, or *nemorosus*, a native, that is, of woods or groves.

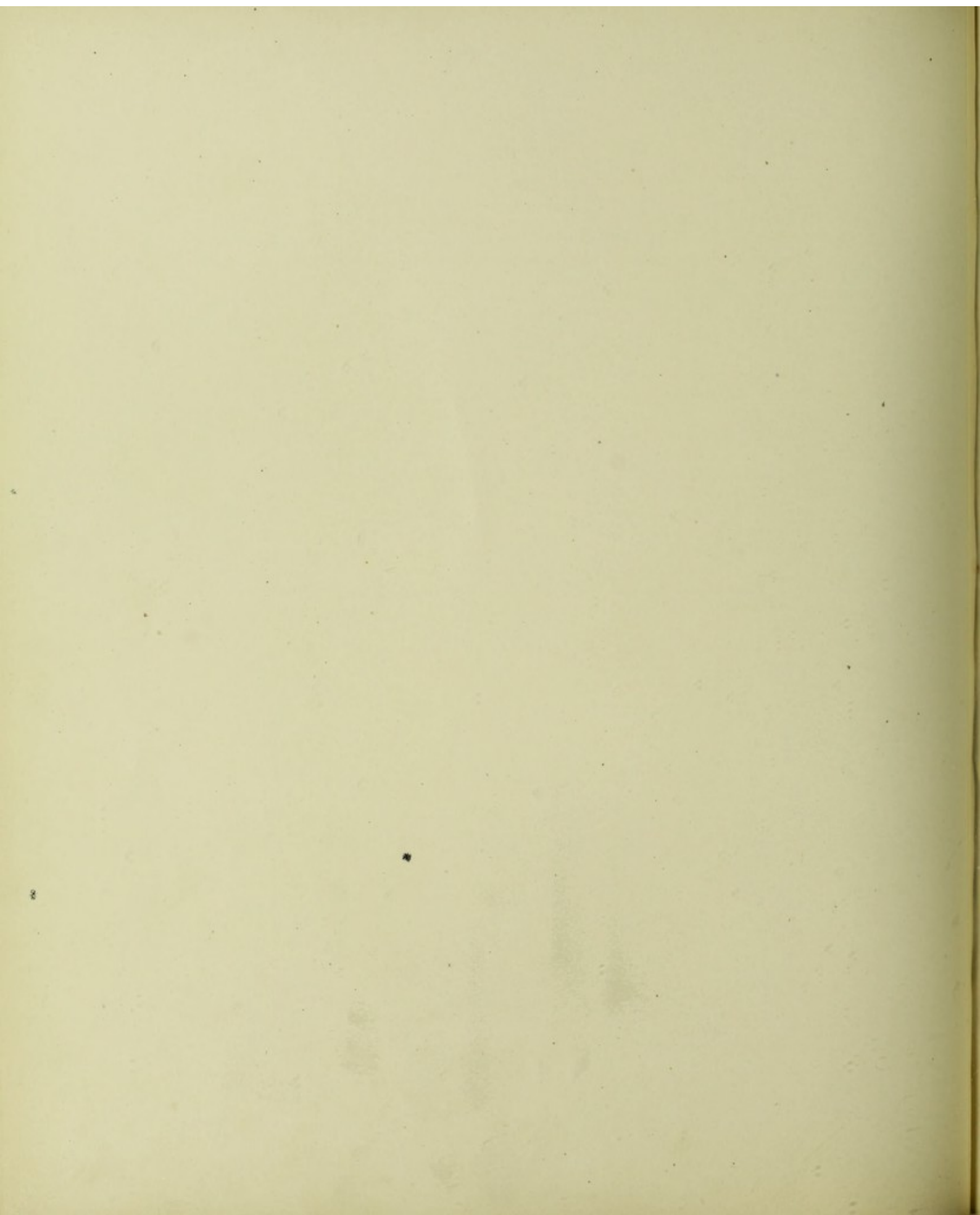
The exceptional absence of any acidity in its juice earned for it from several of these early writers the additional descriptive epithet *dulcis*, or sweet.

Species of *Ranunculus*, such as *R. Ficaria*, *R. Lingua*, or *R. Flammula*, with undivided leaves cannot be appropriately termed Crowfoots; but this species in this respect resembles the Buttercups rather than the Spearworts.

It is a perennial with a short rhizome giving off copious fibrous rootlets and long-stalked, rounded radical leaves, more or less deeply three- to seven-lobed. The lobes are obtuse, wedge-shaped, crenate or variously cut, and generally downy. The aerial stem branches and rises erect to the height of about a foot; and both it and its flower-bearing branches are round and not furrowed, and very often slightly downy with adpressed hairs on their upper parts. They bear leaves very different from those springing from the ground, being sessile and deeply divided into three or more spreading narrow linear segments.

The freely-produced blossoms are sometimes three-quarters of an inch in diameter, and the pale yellow colour of the calyx, and sometimes of the upper part of the flower-stalk, adds to the general yellow effect, and has thus secured for the species the specific name *auricomus*, from the Latin *aureus*, golden, and *coma*, hair, and its literal seventeenth-century translation Goldilocks. The sepals spread outwards but are never reflexed: they are downy and often fringed with hair, and are said to be more developed and more petaloid in texture when the petals are defective. The petals may be absent altogether, which is, perhaps, the distinctive character of what has been termed the variety *depauperata*; but though, if present, the individual petals are larger and brighter yellow than the sepals, we do not remember ever to have seen a blossom in which all five petals were present and equally fully and perfectly formed. There is normally a single nectariferous gland at the base of each petal, without the scale which in most species of *Ranunculus* protects the honey. As we said when speaking of the Winter Aconite, however, a large series





GOLDILOCKS—continued.

of aberrant forms of petal have been described in this species, with one or two scale-like processes, often adherent to the base of the petal, and sometimes with two honey glands, the whole series approximating to the tubular honey-secreting petal that is normal in *Eranthis*.

It is stated by Edgeworth that the stamens in this plant produce two different kinds of pollen ; but neither details nor explanation were given, so that it is a point as to which further information would be of interest.

A remarkable structural character is the presence of little cylindrical tubercles upon the floral receptacle which serve as stalks to the achenes. These last are compressed and downy, are surmounted by slender, tapering, hooked styles, and form collectively globose heads. The flowers are visited by a variety of insects, bees, flies, beetles, and moths ; but may also be sometimes self-pollinating.

With much the same general geographical range as *Ranunculus Lingua*, this species is more widely and more generally diffused in the British Isles, having been recorded from eighty-seven of Watson's 112 counties and vice-counties. At the same time, common as it is, its flowers being smaller than those of the ordinary Buttercups (*R. acris*, *R. repens*, and *R. bulbosus*) and its petals presenting the curious defectiveness which suggests a malformation or a poor specimen, Goldilocks does not often enter into the composition of a nosegay of wild flowers. When it does so, its juicy, quickly-grown stems soon collapse, though, like the Buttercups, they revive when placed in the flower-vase.

The popular name Goldilocks was formerly given to the slender hair-like stems of one of our larger mosses, *Polytrichum commune* Linné. It is locally applied to the Globe-flower (*Trollius*), and is also a book-name for the rare Composite *Chrysocoma Linosyris* Linné, otherwise known as *Aster Linosyris* Bernh., or *Linosyris vulgaris* De Candolle, being a literal translation of the name *Chrysocoma* (from the Greek χρυσός, *chrusos*, golden, and κόμη, *kome*, hair).

LXXXI.—THE MEADOW-RUE.

Thalictrum flavum Linné.

IT not infrequently happens that in Families, most members of which exhibit some particular grade of physiological organisation, some one exceptional type occurs that is apparently much lower or simpler. At first we are tempted to see in such cases survivals of some more primitive condition ; but in many cases more careful consideration shows that we are dealing with late secondary adaptation of a retrogressive character. Such seems to be the case with the self-pollinating Bee Orchis in a Family almost exclusively insect-pollinated, with the wind-pollinated Salad Burnets (*Poterium*) in the *Rosaceæ*, and with the Meadow-rues (*Thalictrum*) among the *Ranunculaceæ*.

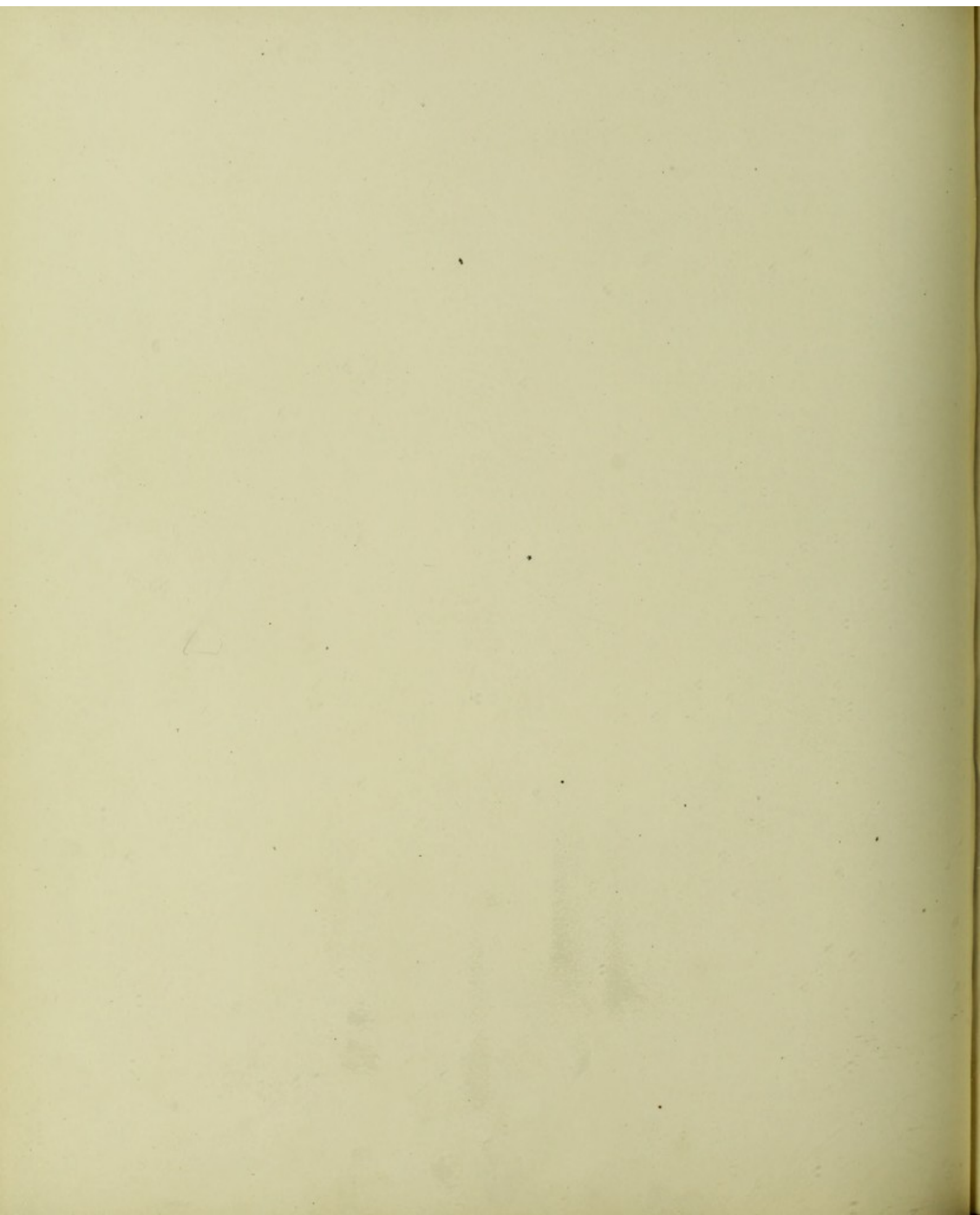
Thalictrum comprises from seventy to eighty species of erect perennial herbaceous plants belonging to the Temperate and colder regions of the Northern Hemisphere. They derive their popular name of Meadow-rue from the resemblance of their compound leaves, cut up as they are into wedge-shaped segments to those of the Rue, long familiar as a medicinal plant ; but this resemblance is one of form only, as they have none of the oil-glands and pungent volatile oil of the true Rue. The leaves are bi-, or tri-, pinnatisect and have sheathing stipules ; and the flowers are usually small, though often massed together, with imbricate, petaloid, deciduous sepals, and no petals, but numerous prominent stamens. The flowers are often polygamous, and it is apparently the case, as also in Hollies and Strawberries, that the American representatives of the group have the sexes more completely separated than they are in the Old World species, so that they are described as diœcious. There is no honey ; but some species are visited by insects for the sake of their pollen, whilst others are apparently, in the main, at least wind-pollinated. We have thus within the limits of a single genus much the same difference as that which distinguishes Willows and Poplars. The wind-pollinated species are, as is usual, protogynous ; but the facts that the anthers in all species dehisce successively and not simultaneously, and that the pollen is slightly coherent, suggest the descent of the existing species of the genus from an insect-pollinated ancestry.

The name *Thalictrum* occurs as *θάλικτρον*, *thaliktron*, in Dioscorides ; but it is doubtful to what plant he then referred, the Flixweed, *Sisymbrium Sophia* Linné, being suggested. The name would seem to be derived from *θάλλω*, *thallo*, I flourish. There is, however, much greater probability that Pliny uses the name, not only for the genus to which we now apply it, but for the species *T. flavum* Linné, of which we are now writing. He says :—

"The thalictrum has leaves like those of coriander, only somewhat more unctuous, and a stem resembling that of the poppy (in colour). It is found growing everywhere, in champaign localities more particularly. The leaves, applied with honey, heal ulcers."

In the graceful *T. aquilegifolium* Linné of Southern Europe, which is now much grown for ornamental purposes, the anthers are violet : in most other species they are





THE MEADOW-RUE—continued.

pale yellow or cream-colour ; but in *T. flavum* they are of a brighter tint. It also deserves its name of Yellow Meadow-rue by the colour of its long, creeping, and branching rhizome. This has been used as a yellow dye. It is known in France as "Rhubarbe des pauvres," and is administered in rustic practice for jaundice or intermittent fevers. The former use is probably a relic of the doctrine of signatures, a sort of crude mediæval homœopathy ; and, though the plant shares the acidity of the Family, it may be doubted whether it is really of any efficacy.

The plant is of frequent occurrence in wet places, throughout Britain, in fens, swamps, marshes, and river-banks, growing erect to a height of from two to four feet, its stem bright green and strongly furrowed. The leaves are bi-pinnate, with broadly wedge-shaped, trifid leaflets, each an inch or more in length, glabrous, and slightly paler on their under surfaces. The flowers are crowded together in small umbellate clusters on slender ascending branches, forming a sub-corymbose or pyramidal mass, the individual blossoms being erect. They are thus very conspicuous, though chiefly visited by flies.

The five small greenish sepals fall off early ; but the many spirally-arranged stamens, the filaments of which are nearly twice as long as the sepals, spread out in sunny weather, so that the pollen is well exposed to the wind. The anthers in this species are not furnished with the apical points that occur in others.

The carpels are from six to ten in number, arranged spirally. They vary somewhat in form, but are more or less ovoid, with eight longitudinal ribs, and are surmounted by a prominent sagittate stigma. Each contains a single pendulous ovule and forms a dry indehiscent achene.

LXXXII.—FURTHER ANALYTICAL DRAWINGS
OF THE BUTTERCUP FAMILY.

(*Ranunculaceæ.*)

THE Tribe *Helleboreæ* of the Family *Ranunculaceæ*, in which the fruit is a collection of many-seeded and dehiscent follicles, was analysed on Plate LXXIII. Here we deal with nine representatives of the Tribe *Anemoneæ*, in which the fruit consists of one-seeded, indehiscent achenes. One of the species included here, the Mousetail (*Myosurus minimus* Linné), has, on account of its minuteness, not been figured on a separate Plate.

All these species agree also in having polysymmetric flowers and extrorse anthers: *Clematis* alone among them has valvate sepals, those of the other types being imbricate; and *Ranunculus* alone has an erect ovule, those of the others being pendulous.

The genus *Anemone* consists of herbaceous perennials, characterised by the three-leaved involucre on the peduncle of the one-flowered scape; the numerous, imbricate, petaloid sepals; the absence of distinct petals; and the numerous carpels, on a short receptacle, tipped with persistent styles.

The first line of figures represents the Pasque-flower (*Anemone Pulsatilla* Linné), Fig. 1 being a whole flower in longitudinal section; Fig. 2, the gynæceum, showing the persistent styles which in this species elongate into feathery awns just as in *Clematis*; Fig. 3, a stamen; and Fig. 4, three ripe awned achenes on the floral receptacle.

The two figures in the second line show the under surface of the flower, and the fruit of the Wood Anemone (*Anemone nemorosa* Linné), the latter having its constituent achenes furnished with a keel or sharp edge but with no awns.

The third line of figures represents the somewhat exceptional genus *Clematis*, of which our only British species is this *C. Vitalba* Linné, variously known as Traveller's Joy, Old Man's Beard, or Virgin's Bower. The genus consists of perennial woody plants, climbing by twisting their leaf-stalks round a support, with leaves in opposite pairs and pinnately compound, valvate sepals, no petals, and long feathery persistent styles. The first figure is a flower; the second, the same in section, somewhat enlarged; the third, a stamen; the fourth, the gynæceum; and the fifth, a detached ripe carpel.

Small though it is, the Mousetail (*Myosurus minimus* Linné), represented by the fourth row of figures, has many points of structural interest. Its genus comprises some five species of little annual plants, natives of Temperate latitudes both north and south, with simple, narrow, radical leaves and numerous one-flowered scapes. The remarkable little flowers have generally five spreading green sepals, each with a slender spur at its base pressed against the flower-stalk; five erect petals, greenish-yellow, with a relatively long tubular nectariferous claw and a shorter strap-shaped



FURTHER ANALYTICAL DRAWINGS OF THE
BUTTERCUP FAMILY—continued.

blade ; five stamens, maturing before the stigmas ; and a slender tapering receptacle elongating to one to three inches and thickly set with small keeled and beaked carpels. This structure naturally suggested Dodoens's name *Myosurus*, from the Greek $\mu\upsilon\varsigma$, *mus*, mouse, and $\omicron\upsilon\rho\acute{\alpha}$, *oura*, tail, which has been translated into the French *Queue de Souris*, the German *Mauseschwanz*, and our own *Mousetail*. Parkinson says that it was called

"of some Bloodstrange, but I thinke corruptly from blood staying, for in that faculty it is predominant . . . and the Country people in some places of this land, apply it not only to those that bleed at the nose, by bruising the leaves and putting it up therein, but also to stay the much bleeding of wounds."

Fig. 1 represents the whole plant, natural size ; Fig. 2, a flower enlarged ; Fig. 3, one in longitudinal section ; Fig. 4, a petal ; Fig. 5, the gynæceum ; and Fig. 6, one achene in section showing the pendulous albuminous seed.

The four following rows of figures are devoted to species of *Ranunculus*. The first of these—the fifth row, that is, on the Plate—represents the Water Crowfoot (*Ranunculus floribundus* Babington), Fig. 1 being a flower seen from above ; Fig. 2, a stamen ; Fig. 3, a petal ; Fig. 4, the stamens collectively ; Fig. 5, an unripe fruit ; and Fig. 6, an achene.

The sixth row on the Plate represents *Ranunculus Ficaria* Linné, the Lesser Celandine, Fig. 1 being a flower seen from above ; Fig. 2, a flower in longitudinal section ; Fig. 3, one of the characteristic sepals ; Fig. 4, a petal with its honey gland ; Fig. 5, a stamen ; Fig. 6, the gynæceum or unripe fruit ; and Fig. 7, a single isolated achene.

The seventh row shows the Greater Spearwort (*Ranunculus Lingua* Linné). Fig. 1 is the flower seen from above, of natural size ; Fig. 2, the calyx ; Fig. 3, a portion of the floral receptacle in section, with stamens ; Fig. 4, an unripe fruit ; and Fig. 5, an achene.

The eighth row represents Goldilocks (*Ranunculus auricomus* Linné), Fig. 1 being a flower, characteristically defective in its petals ; Fig. 2, the essential organs ; Fig. 3, an achene ; Fig. 4, the same enlarged ; and Fig. 5, the same in longitudinal section.

The last row of figures on this Plate at once suggests the contrast between the other insect-pollinated forms and the mainly anemophilous Meadow-rue (*Thalictrum flavum* Linné). A glance at the first figure in this row, with its prominent stamens on filaments considerably longer than the perianth-leaves, tells this story. Fig. 2 is the gynæceum ; Fig. 3, a carpel ; Fig. 4, the same in longitudinal section, showing the pendulous albuminous seed ; and Fig. 5, a seed.

LXXXIII.—THE BARBERRY.

Berberis vulgaris Linné.

THE genus *Berberis* comprises about a hundred species, or nearly eight-ninths of those in the Family *Berberidaceæ*. The Family includes herbaceous perennial plants, although the Barberries are all shrubby. The leaves in all the Family are scattered; but they may either be simple, as in the true Barberries, or compound, as in the sub-genus *Mahonia*, the species of which are sometimes known as American Hollies. The flowers are in racemes and are perfect and polysymmetric, their parts being in multiples of two, three, or four, but never of five. There are two whorls of petaloid sepals, two of "honey-leaves" or nectariferous petals, and two of stamens. The anthers in most members of the Family burst inwards by two valves, which coil upward and carry the pollen with them. There is only one carpel which contains two or more ovules and may form either a baccate or a capsular fruit; and the seeds are albuminous with a straight embryo.

The Family belongs mostly to the Temperate regions of the Northern Hemisphere; but the genus *Berberis* is well represented in the mountains of sub-tropical Asia and in the Andes both Temperate and Tropical. The Family does not, however, extend into South Africa or Australasia.

The roots of the Common Barberry (*Berberis vulgaris* Linné) have been used, with lye, as a yellow dye, and the wood of the stem is of a bright yellow colour. A yellow bitter extractive known as Berberine is obtained from the root and from the bark and has purgative properties similar to those of rhubarb. Its former use in jaundice was doubtless based on the doctrine of signatures; but its bitterness may indicate some real utility in fevers. The young leaves are acid and astringent and contain free malic acid, as do also the berries. It is said that birds do not eat the latter; but this is probably only true of some species of birds. A pleasant preserve is often made from the berries, which are also sometimes pickled, a seedless variety being preferably employed for these purposes.

The shrub, which may be six, eight, or even twenty feet in height, bears long and short shoots, the primary scattered leaves on the former being metamorphosed into spines, usually tripartite but sometimes five or seven. The short shoots are axillary, bearing tufted leaves and terminal pendulous racemes of flowers, or elongating later into long shoots. The leaves are an inch or more in length, obovate and spinously toothed, and the blade is so articulated to the very short petiole as to suggest an ancestral compound leaf like that of *Mahonia*. The high polish of the leaves has suggested a possible origin of the name *Berberis* which Brunfels seems to have adapted from the Arabic. In that language "Berberys" is said to be the name of the fruit of this species; but the Phœnician "Barbar" signifies a brilliant polish, and there is a Greek word *βέρβερι*, *berberi*, meaning a pearl-oyster.



THE BARBERRY—continued.

In May and June the plant is gaily decked with the hanging racemes of bright yellow flowers, with short triangular bracts ; but their perfume is unpleasant. Each blossom is from a quarter to a third of an inch in diameter, with two or three whorls of three petaloid sepals, concave and incurved, so as to make the flower as a whole globose. The outer whorl of sepals is minute. Next come two circles of three petals each, these petals having each two large rounded orange nectaries at its base. The six stamens being also in two whorls, one lies horizontally across the centre line of each petal, its flattened filament being between the two nectaries. The ovary is surmounted by a large peltate style with a central depression and a circular inframarginal stigma. The upper—or rather, as the flowers hang inverted, the lower—exposed surfaces of the bases of the filaments are extremely sensitive to contact ; so that when a bee, wasp, fly, or beetle approaches the flower from below and touches one of these spots, the filament springs inward to the ovary, while the anther-valves, with the pollen adhering to them, turn round so as to dust the visitor with the pollen.

The oblong fruits are about half an inch long, compressed, and slightly curved. They become orange-red with a surface bloom, with the exception of the style, which turns black ; and, though juicy, are both acid and bitter. The seed has a hard testa and albumen, so that, if swallowed by a bird, it is not digested. Neglected, however, by birds, until pressed by winter hunger, the ornamental bunches of fruits hang long on the trees, so that in some parts of Switzerland, where the shrub is abundant, the feet of the mountains appear red with them.

In early summer the leaves of the Barberry commonly exhibit crowded little ochreous cup-shaped pustules, the fructification of a parasitic fungus, the Barberry Cluster-cup (*Æcidium berberidis* Persoon). Farmers long ago maintained that this fungoid disease spread to corn, producing on its green stems and leaves in June the similarly-coloured fungus known as "rust," or in some districts as "mildew." This opinion was pooh-poohed by botanists, who pointed out that this disease on corn, known as *Uredo segetum* Persoon, had a very different structure. It is now, however, certain that the farmers were right, the spores of the Barberry Cluster-cup sprouting on the young corn and giving rise within its tissues to fungal threads whence springs the "Uredo" stage. In autumn these same threads produce rows of dark-brown or black spores which can often be seen on straw, and in this form, known as *Puccinia graminis* Persoon, the fungus survives the winter and produces other spores which attack the Barberry. It has been calculated that this fungus alone causes a loss to the world of cereals to the value of fifty millions sterling per annum.

LXXXIV.—THE GREATER CELANDINE.

Chelidonium majus Linné.

THE Order *Rhœadales* in Engler's system, named from the Greek *ῥοιάς, rhoias*, a poppy, corresponds approximately with the Cohort *Parietales* in Bentham and Hooker's. This latter was named from the placentation or position of the ovules in the ovary, they being generally in this group *parietal*, *i.e.* attached to the outer wall of the ovary (Latin *paries*, a wall), the margins of the carpellary leaves not being carried in to the centre of the ovary. Consequently the ovary in this group is one-chambered, or is partly divided by partially prolonged placentas, or is completely divided into two chambers by an ingrowth from the placentas, which remain parietal.

Very few members of this group become woody or reach the dimensions of shrubs. Their flowers have their parts mostly in whorls, with distinct calyx and corolla, hypogynous stamens varying in number, and superior carpels, two to eight in number and syncarpous. The Order includes the Families *Papaveraceæ*, *Fumariaceæ*, *Crucifereæ*, and *Resedaceæ* among British plants.

The Family *Papaveraceæ*, though many of its members are very familiar plants, is but a small one, comprising about a hundred species in some twenty genera. They are herbaceous, either annual or perennial, with a thick milky juice, or *latex*, which is either white or coloured; scattered, exstipulate leaves; polysymmetric flowers; two caducous sepals; four petals in two whorls, generally crumpled in the bud; indefinite stamens; little or no style; and indefinite ovules which become small, oily, albuminous seeds. Most members of the Family are narcotic or acridly poisonous; and most of them have conspicuous, honey-secreting, insect-visited flowers, which are protandrous. The majority of them belong to the Temperate regions of the Northern Hemisphere. A main division of the Family may be based upon the fruit, which may be either a capsule dehiscing by a series of pores, or a long pod-like structure or *siliqua* dehiscing from its apex to its base by two long valves. The latter type of fruit occurs in *Chelidonium* and in *Glaucium*.

The Greater Celandine (*Chelidonium majus* Linné) is one of two species forming a genus which is confined to Europe and Asia, and, so far as this country is concerned, seems a very doubtful native, being mainly confined to waste places and hedgerows but little removed from the old cottage gardens in which it was formerly grown medicinally. It is, however, of very general occurrence, and has undoubtedly been here from very early times. Turner, for instance, in his "Libellus" (1538), says that the English call it "Celendyne aut Celidony"; and in his "Names of Herbes" (1548) that it

"is called in english Selendine, in dach Schelwurtz, in french Chelidoine or Esclere. It groweth in hedges in the spring and hath a yealowe juice."

In modern times the unique beauty of outline in the leaves has attracted the attention of the designer. They are large, and very often, as Parkinson says, "of a



THE GREATER CELANDINE—continued.

darke blewish greene colour on the upper side, like unto Colombines, and more pale blewish greene underneath." Deeply pinnatifid with four or six lateral lobes and a larger terminal one, they have all their lobes rounded and bluntly lobed, the lateral segments being prolonged downwards.

In ancient times, however, it was probably the bright orange latex with its acrid bitter taste and fetid smell, which flows copiously from any part of the brittle plant if it be broken, that most attracted notice. The bright green of the young leaves in April may have originally given the plant the name of *Chelidonium* or Swallow-wort, from the Greek *χελιδών*, *chelidon*, a swallow; but at some very early period a legendary explanation seems to have attached itself to the name. Aristotle gives the story, which is copied by Dioscorides, Pliny, and the herbalists of the Renaissance. Pliny says:—

"The brute animals have been the discoverers of certain plants: among them we will name Chelidonia first of all. It is by the aid of this plant that the swallow restores the sight of the young birds in the nest, and even, as some people will have it, when the eyes have been plucked out."

The story may have originated in a misunderstanding of the nictitating membrane or inner eyelid present in birds and reptiles; but it is only fair to the old students of Nature to mention that Aristotle admits that young birds will "recover their sight of themselves in time, without anything being applied to them"; and that both Dioscorides and Pliny give the alternative explanation of the name *Chelidonium* that the plant blossoms at the coming of the swallows and withers at the season of their departure. Parkinson tells of a further misunderstanding, arising from ignorance of Greek, that

"The Chymists in former times called the greater kinde *Cæli donum*; and thereupon did highly extoll the Quintessence drawne from it, not only to expell many diseases, but for many of their idle and fantasticke transmutations."

Possibly the German name *Goldwurz* may be connected with this notion.

The acrid character of the juice, no doubt, suggested its external use under the name of *Tetterwort* for skin diseases; but it is dangerously narcotic if taken internally. The modern physiological explanation of the fetid latex is that it may protect the plant from being browsed by animals.

The four yellow petals of the flowers—which are borne in loose umbels on slender hairy stalks—suggest a member of the Family *Cruciferae*, a suggestion which is strengthened by the long pod-like fruits, but is at once dispelled when it is seen that there are but two sepals, that there are about thirty stamens, and that there is no partition down the interior of the fruit.

The presence of a white stalk or *raphe* adherent at first down the side of the small black seed is also noteworthy.

LXXXV.—THE HORNED POPPY.

Glaucium flavum Crantz.

GLAUCUS, the son of Neptune and a sea-nymph, loved only to haunt the shores of his father's realm. His clothing was of the colour of the waters of the ocean, the grey which is neither blue nor green and is worn by so many of his friends and neighbours, with an upper robe of yellow betokening his royal birth. The desire of his heart was Scylla, the stony-hearted, who became a rock; and the love-sick demi-god wandered along the beach, close to the margin of the sea, bearing constantly a long curved fishing-rod.

To pass from mythology to fact, in the words of the Laureate:—

"A poppy grows upon the shore
Bursts her twin cup in summer late:
Her leaves are glaucous green and hoar,
Her petals yellow, delicate."

The genus *Glaucium*, first thus appropriately named, from the Greek γλαυκός, *glaukos*, blue-grey, by Tournefort, is closely allied to *Chelidonium*. Like that genus, it has a fleshily enlarged tap-root, glaucous foliage, a pale orange latex, and an elongated fruit; while the parts of its flower agree in number, arrangement, and fugacious character with those of the inland hedgerow plant. It comprises about a dozen species of maritime plants, chiefly natives of the Mediterranean region, and thus represented in three continents. They have pinnately-lobed leaves, of which the upper cauline ones are sessile and amplexicaul: their flowers are larger and more handsome than those of *Chelidonium*: a spongy partition extends from their placentas, dividing the long ovary into two chambers; and the seeds, which are imbedded in it, have a pitted surface but no adherent raphe.

Our one British species, which has also been known under the specific names *luteum*, *fulvum*, *cornutum*, and *corniculatum*, signifying either yellow, as does the *flavum* of Crantz, or horned, is a typical halophyte or sea-shore plant. Like most of the Poppy Family, it is a lover of the sun, tolerant of a very hot and dry surface-soil and of much physiological drought, but less so of frost. In shingle or loose sand, saturated with sea-water, it is anchored deeply by its long tap-root; and its thick fleshy leaves are protected from much transpiration by a thick cuticle, the comparatively small number of their sunken stomata, and by the waxy excretion which gives them their glaucous hue. Drenched frequently by spray, or even occasionally submerged at high tide, it occurs scattered over the lower sea-ward sand-dunes or shingle beach, with thickets of Sea Blite (*Sueda fruticosa* Forskål), carpets of Sea Campion and Sea Purslane (*Silene maritima* Withering and *Honkenya peploides* Ehrhart), and patches of Sea Holly (*Eryngium maritimum* Linné), Thrift, Sea Lavender, and Stone-crop.

Its stems are much branched and spread out in a more or less prostrate manner for two or three feet. They are round, glaucous, and smooth, or slightly hairy, and



THE HORNED POPPY—continued.

vary considerably in duration, being either annual, biennial, or perennial. The root-leaves are numerous, erect, four or five inches long, with a sheathing base and lyrate pinnatifid lobing, with teeth pointing in various directions, and rough with stout hairs; and they generally last through the winter. The stem-leaves are sessile and cordate at the base, so as to surround half the stem, short, broad, lobed, cut, and wavy at their margins, but with less rough surfaces. The flower-stalk is very short, smooth, and round; and when, between June and October, the fine large solitary flowers expand, the two rough hairy sepals cohere by their tips and come off as a cap, while the marvellously crumpled petals smooth themselves out. The four golden petals are in two somewhat dissimilar pairs, and are each about an inch and a half long. The numerous stamens have short slender filaments, and fall off with the petals the day after the blossom first expands.

The remarkable pod grows to be from six to twelve inches long, giving the plant its name of Horned Poppy, the German *Horn-Mohn*, and its former specific name *corniculatum*. It is rarely quite smooth, never hairy, but generally roughish with minute tubercles, terminates in two spreading sessile stigmatic lobes, and curves through half a circle. The spongy partition is sometimes incomplete; and the numerous brown seeds are in two rows in each of the two chambers, and are so pitted as to present crossing ridges with square depressions.

The late Lord Avebury, in his "Contribution to our Knowledge of Seedlings," called attention to the fact that in this species, as in many others, the two cotyledons are entirely unlike the subsequently-produced leaves. In germination the cotyledons rise above ground, but are small strap-shaped bodies. The succeeding leaves are spoon-shaped and become successively more and more pinnately notched, until the sixth or seventh leaf assumes very much the form of all the succeeding radical leaves.

Strikingly beautiful as this species is when growing in its natural surroundings, it has but few popular names. The least obvious is, perhaps, *Squatmore*, which is used in Hampshire and Dorset. Derived from *squat*, a bruise, and *more*, a root, it points to the use of this plant, like so many other succulent species, and presumably its root, to remove the discoloration of the skin by bruises.

LXXXVI.—THE CORN POPPY.

Papaver Rhæas Linné.

ALTHOUGH they have long pod-like fruits dehiscing by valves and only two stigmas, the Greater Celandine and the Horned Poppy were recognised at an early date in the history of botanical science as unquestionably related to the Poppies. The Family *Papaveraceæ* is, in fact, a well-defined natural group, especially if we consider it apart from the aberrant Sub-Family *Fumarioideæ*. The milky latex with its narcotic properties, the large flowers, generally nodding in the bud stage, the two caducous sepals, the four crumpled petals, and the many stamens serve clearly to indicate the affinity of its members. Those in which there is a more or less globular capsule, with four or more stigmas radiating from the centre of its upper surface, and dehiscing by pores round its upper edge, are still more obviously closely related, and were long all classed together in the genus *Papaver*. This is now restricted to those species, about forty in number, in which there is no trace of a style, so that the stigmatic lobes radiate on a flattish disk.

The origin of the name *Papaver*, which occurs in Pliny, and is undoubtedly the etymon alike of the French *pavot* and of our own *poppy*, is obscure; but it is probably connected with the Celtic *papa*, meaning "thick milk," either with reference to the latex in these plants or to their medicinal use—which is undoubtedly very ancient—as a mild narcotic administered in pap to induce sleep. A poppy allied to the Opium Poppy was cultivated during the Later Stone Age, its fruits and seeds being found in the Swiss lake-dwellings of that period; and some species was known as a cultivated plant to Homer, to Theophrastus, the pupil of Aristotle, and to Dioscorides. The latter author mentions both the seeds, which were used as a bread-stuff, and the opium, the Greek *ὀπὸς*, *opos*, obtained from the milky juice of the capsules. Probably, however, opium was then eaten, as it is now in Persia and India, the practice of smoking it having apparently only been introduced into China from Assam about the middle of the eighteenth century.

With outlying species in South Africa and Australia, the genus *Papaver* belongs mainly to the Temperate regions of Asia and Europe, perhaps originally to the Warmer Temperate Zone. The species are all annuals and are apt to suffer from frost, while they rejoice especially in sunny places, cultivated ground, and dry sub-soils. Throughout Europe they appear as weeds in cornfields and other arable land; and Cosson states that *P. Rhæas* Linné appears truly indigenous in Algeria, but has probably been introduced with seed corn into Europe, perhaps during the rule of the Roman Empire. This species is also said to grow on hill-sides in the Caucasus about Baku, and in similar situations in Sicily, which was, as is pointed out by De Candolle, one of the first countries in which the Græco-Latin races cultivated cereals and was for ages one of the chief granaries of Rome. Troublesome weed as it is, the plant was thus appropriately dedicated to Ceres, while its rose-like form of



THE CORN POPPY—continued.

blossom, with delicate red petals and numerous stamens, have gained for it in various countries such names as Corn Rose and Canker Rose, or the French *Rose de Tchen*, i.e. Dog Rose.

The meaning of the name *Rheas*, first employed as a specific name for the Corn Poppy by Lobel, is not quite certain. It occurs in Theophrastus as *ῥοιάς*, *rhoias*, and is probably connected with *ῥοιά*, *rhoia*, a name for the pomegranate, referring to the resemblance between poppy-capsules and that fruit. Dodoens and other botanists of the Renaissance, however, thought the name to be derived from *ῥέω*, *rheo*, I flow, referring either to the quickly-falling petals or to the abundant milky juice, and they accordingly used the term *Papaver liquidum*.

This species has an erect, branching stem and pinnatifid or bi-pinnatifid leaves with ascending lobes, a finely-toothed margin, and a terminal bristle. Both the stems and the flower-stalks are rough, with spreading, or in one variety adpressed, stiff hairs. On the two sepals, which fall as the flower opens, are similar, but more upright, hairs. The large rich scarlet petals are sometimes black at the base and are described by a seventeenth-century writer as

"crambed up within the empalement (calyx) by hundreds of little wrinkles or puckers, as if three or four Cambrick Handkerchiefs were thrust into one's pocket."

Though they smooth themselves out into a blossom three to four inches in diameter they retain a wavy margin, and are so delicate that insects visiting the honeyless flowers for the sake of the pollen usually alight on the stigma.

The ovary is smooth and becomes a sub-globose capsule, with eight to twelve stigmatic rays. As each stigmatic ray stands over one of the placentas, which project into the interior of the ovary and are covered with ovules, it is apparently formed by the union of half the stigmas of two carpels. When the capsule is ripe it dehisces by a series of minute valves under the projecting stigmatic lobes; and, as the capsule is then borne erect on the stiff withered peduncle, the seeds are well protected from the rain and are only shaken out, a few at a time, as the fruit sways in the wind. When the seeds are sprouting, variations occur with three, four, five, or six cotyledons.

The mildly narcotic character of the latex, due, no doubt, to alkaloids similar to those which have been discovered in such great variety in opium, extends to the flower, the capsule, and the seeds; but seems to have been somewhat exaggerated in popular belief, as indicated by such names as Headaches, Earaches, and Blind-eyes, while the dedication to Hypnos and Thanatos, the gods of sleep and death, in ancient Greece may have belonged rather to the Opium Poppy. Cowley, however, gives poetical expression to the thought when he says that "the poppy is scattered over the fields of corn that all the needs of man may be easily satisfied, and that bread and sleep may be found together."

LXXXVII.—THE WELSH POPPY.

Meconopsis cambrica Viguiet.

THOSE members of the Poppy Family which have a short capsular fruit dehiscing by pores are, as we have seen, so closely akin that it is not surprising that it was not until the group was carefully monographed at the beginning of the nineteenth century that our Welsh Poppy and some nine other species were separated from the genus *Papaver* under the generic name *Meconopsis*. This was the work of Viguiet, who, in 1814, published a "Histoire Naturelle des Pavots," and was endorsed by De Candolle. There are several well-marked characters as to geographical distribution and general habit which serve to distinguish these species from the true Poppies, apart from the structure of the style and stigma which constituted the original ground for their separation. They are perennials; and they inhabit mountainous regions and moist shady situations, whereas Poppies are annuals belonging to lower, drier, and sunnier places. *Meconopsis*, moreover, has a lemon-yellow latex, suggesting affinity with *Glaucium* or *Chelidonium*.

Our only European species, *Meconopsis cambrica* Vig., has a distinctly western type of distribution, being found from the Pyrenees and Western France to Ireland, the south-west of England, Wales, Yorkshire, and Westmorland; and this indicates its predilection for a moist climate. In Wales it has been found up to altitudes of two thousand feet above sea-level; but it will not only grow well in lowland gardens, but has also escaped from cultivation, and become a roadside weed in many places. The Welsh Poppy seems, therefore, to belong to the ancient indigenous flora or distributional group known as the Atlantic or Lusitanian flora, and to be of an origin geographically distinct from that of its kinsfolk those annual agrarian colonists the Poppies.

Structurally, it is quite sufficiently like the genus *Papaver* to justify its name, which is derived from the Greek *μήκων*, *mekon*, a poppy, and *ὄψις*, *opsis*, resemblance, though its perennial habit is reflected in the presence of a stout rhizome with thick rootlets and tufted branches. The aerial stem is about a foot high, branched and leafy, soft, brittle, and slightly glaucous, woolly at its base with nearly upright hairs, but nearly glabrous above. The leaves are smooth, a rather pale green above and generally glaucous on their under surfaces, stalked and pinnate; the segments being either distinct or decurrent on the midrib, ovate-lanceolate in outline, pinnatifid and acute.

From June to August, the plant puts forth its attractive blossoms, each on a very long, minutely hairy stalk. Bursting from the hairy calyx, like a butterfly from its chrysalis, the four nearly circular, lemon-yellow petals expand into a flower from two to three inches in diameter, and deliciously fragrant, although it has no honey and matures its anthers and stigmas simultaneously, so that, though visited by insects, it may apparently be self-pollinating. In the centre of the many short



THE WELSH POPPY—continued.

stamens is the elliptical-oblong ovary, smooth externally but made up of from four to six united carpels, which are indicated externally by grooves. Internally, the ovary is one-chambered, the narrow thread-like placentas passing upward into a short conical style which persists in the fruit. The four- to six-rayed stigma rises in a convex form above this, its rays being free; and the fruit bursts by valves, below the style, alternating with the stigmatic lobes. The numerous, small, dark brown or black seeds have their surfaces pitted with a finely netted pattern of deep five-sided hollows.

The Welsh Poppy seems to have been first recognised in Britain by Lobel, some of whose notes came after his death into the possession of Parkinson. The first printed record appears in this way in the "Theatrum Botanicum" of the latter, which belongs to 1640, and has a fairly good woodcut of the species. Parkinson calls the plant *Argemone Cambro-Britanica lutea*, *Yellow wild Bastard Poppy of Wales*, and thus describes it and its habitats.

"This yellow Poppy hath many winged large spreade leaves, lying upon the ground, that is, many leaves set together on each side of a middle rib, each divided leafe being somewhat deepely cut in, in some places of the edges, more than others, of a deepe, but faire greene colour: among these leaves rise up, divers branched stalkes two foote high, having some such leaves thereon, but smaller, at severall distances, and at the tops of the stalkes and branches, a faire yellow somewhat large flower, consisting of four rounde leaves, with many yellow threads in the middle, standing about a long greene head in the middle, which when the flower is fallen and the head is ripe, is then larger than the . . . long headed wilde Poppy, but in the like manner smaller at the botto ne and bigger at the toppe, with a small head thereon, containing much small blacke seed, lying within severall cells, in the same fashion that the other Poppies doe: the roote is long, and brownish on the outside, spreading into some branches, and divers small fibres thereat, which perisheth not every yeare, as the other sorts before specified doe . . ."

"Groweth in many places of Wales, in the valleyes and fields, at the foote of the hills, and by the water sides, about a mile from a small village called *Abbar*, and in the midway from *Denhig* to *Gaidir* . . ., as also neere a wooodden bridge, that giveth passage over the river *Dee*, to a small village called *Balam*, . . . and in going up the hill that leades to *Banghor*, as also neere *Anglesey* . . . was found . . . by Lobel in his life time, and therefore entituled justly according to the Country."

LXXXVIII.—THE WHITE CLIMBING FUMITORY.

Corydalis claviculata De Candolle.

ALTHOUGH sometimes treated as merely a Sub-Family of *Papaveraceæ*, *Fumariaceæ* have markedly distinctive characters. They are herbaceous and include both annual and perennial species; but their juice is watery and not the thick, milky latex of the Poppies. Their leaves are scattered, usually much divided, and in many cases serve as climbing organs. Their flowers are seldom large, are grouped in racemes, and are monosymmetric or disymmetric. The number of leaves in their perianths is the same as in the Poppies; but their positions are different, the two caducous sepals being in the median plane or front and back, whilst in Poppies they are lateral, and the two outer petals in the Fumitories being similarly lateral, whilst those of Poppies are antero-posterior. One or both of these lateral petals in Fumitories has a spur or pouch, whilst the very different inner pair cohere by their tips so as to enclose the anthers and stigma. There are apparently in all *Fumariaceæ* four stamens only; but in most cases they are remarkably united by their filaments into two groups, each consisting of one perfect lateral stamen with a two-chambered anther and two halves of the antero-posterior pair, each bearing a one-chambered or *dimidiate* anther. These stamens have often been described as six diadelphous ones, and, according to another modern interpretation, the lateral dimidiate anthers are truly parts of the central stamens in each group, whilst the inner pair of stamens, which I suppose them to represent, is suppressed. The superior ovary consists of two carpels united, but is one-chambered and may contain one or several, but not many, seeds, which, like those of the Poppies, are albuminous and have minute embryos at their bases.

The Family, or Sub-Family, comprises about a hundred and fifty species in ten genera, mostly natives of the Temperate portions of the Northern Hemisphere, especially the Mediterranean region and North America. None has been recorded from the Tropics.

The genus *Corydalis* was established by Ventenat in 1803; but the name (derived from *κορυδαλλός*, *korudallos*, a lark, from the resemblance of the blossoms to a lark's spur) is quoted by Dodoens from Galen. Pliny called it *Pes gallinaceus*, which Henry Lyte rendered literally as *Hen's foot*; whilst the modern German *Lerchensporn* is a direct rendering of the Greek name. It was named *Capnos* by some of the early botanists, and *Capnoides* by Philip Miller, from *καπνός*, *kapnos*, smoke, by analogy with the name *Fumitory*, which is from the Latin *fumus*; and it has also been known as *Neckeria*. It is mainly distinguished from *Fumaria* by its fruit, which is a capsule containing several seeds and dehiscing into two valves.

Of some ninety species, mostly natives of the Himalayan and Mediterranean regions, only one, *Corydalis claviculata* De Candolle, is wild in Britain, though two others, *C. lutea* Gaertner and *C. solida* Mœnch, both showy garden plants, are often



THE WHITE CLIMBING FUMITORY—continued.

found in a more or less naturalised state. While these two, and most of the other species, are perennials with underground tubers, *C. claviculata* is an annual with a slender branched tap-root. It grows in copses and other bushy and shady places, especially in hilly districts, in gravelly, stony, or sandy soil, preferably where humus is present, and its most marked character is the clambering of its slender delicate stem, which reaches a length of three or four feet, over other plants.

Darwin describes the process in detail in his "Movements and Habits of Climbing Plants." When the plant is quite young, the first-formed leaves are not modified in any way, but those next formed have their terminal leaflets reduced. The primary branching of the leaf is pinnate, all the leaflets being long-stalked. The lower leaflets are ternate or quinate with small ovate-oblong segments, glaucous, or paler on the under surfaces. Towards the apex of the leaf the leaflets are much reduced, being only a tenth of an inch long, or even less, and very narrow; and every gradation can be traced until we come to branchlets which show no vestige of a blade. These reduced leaflets are highly sensitive, curving under the smallest pressure; and the whole leaf stands at first almost vertical and is in continual movement, revolving in about two hours. This plant is thus exactly intermediate between a leaf-climber and a tendril-bearer. It is to these tendrils, which are not present in other species of the genus, that the plant owes its name *claviculata*, from the Latin *clavicula*, a tendril.

The flowers are pale straw-colour or nearly white, and are borne in short crowded racemes which are given off from the stem opposite to the leaves. Each flower is but a quarter of an inch long and is on a very short stalk, hardly as long as the little pointed bract. One of the outer pair of petals has a very short rounded spur or pouch at its base, which holds honey secreted by a glandular nectary at the base of the filament of the central stamen on that side of the flower. By a twisting of the flower-stalk the pouched petal is brought into a position to cover the rest of the flower. The inner petals, united at their tips, enclose the anthers and stigma; but bees alighting upon them press down these two petals and cause the essential organs to emerge. In another species of the genus self-pollination is said to be physiologically impossible, the pollen acting like a poison if placed on the stigma of its own flower. The pod is lanceolate and acute, and shows constrictions externally between the three or four seeds which it contains. These are black and lustrous, though their surface is minutely pitted.

Though by no means uncommon and a somewhat strikingly graceful little plant, this our only indigenous species of *Corydalis* seems never to have obtained any genuine popular name. *Climbing Fumitory*, a mere book-name, is used by Ray.

LXXXIX.—THE COMMON FUMITORY.

Fumaria officinalis Linné.

IT is, I fear, true that there is but little poetry or imagination in our English popular names for plants. What imagination they do evince is rather as to the curative virtues of the plants. This absence of poetic imagination, however, is not true of those South European peoples to whom we owe the earlier forms of some of these names, though it seems as if the Roman Pliny often goes out of his way to find a prosaic utilitarian explanation of Greek poetry. Thus an old Greek name *καπνιόν*, *kapnion*, from *καπνός*, *kapnos*, smoke, given from the smoke-like appearance of the plant as it rises a little way from the ground, and preserved to us in essence in the French *Fumeterre* and our older spelling *Fumiterrie*, becomes in Pliny *Fumaria* "because the juice thereof if put into the eyes produces weeping as does smoke."

It is remarkable how much more attention this genus *Fumaria* has attracted in popular nomenclature and in popular medicine than the allied *Corydalis*, mainly, perhaps, because the Fumitories are common cornfield weeds. Our commonest species well earned Linné's specific name *officinalis*, since, though it no longer appears in our pharmacopœias, it was so long considered officinal that it has been well said that a volume might be written on the medical virtues ascribed to it by physicians from Dioscorides to Cullen. With a clear, watery juice, slightly bitter and slightly acid, it was first belauded as a tonic and then fell down to the level of a cosmetic. An interesting fourteenth-century manuscript, preserved at Stockholm and ascribed to John of Milan, runs—

"Furmiter is erbe, I say,
Yt springyth in April et in May,
In feld, in town, in yard, et gate,
Where lond is fat and good in state.
Dun red is his flour,
Ye erbe smoke lik in colowur,
Ageyn feurers cotidian,
And ageyn feurers tertyeen,
And ageyn feurers quarteyn
It is medicyn souereyn."

On the other hand, the rustic John Clare in the nineteenth century can only speak of it as a plant—

"Whose red and purple-mottled flowers
Are cropped by maids in weeding hours,
To boil in water, milk, and whey
For washes on a holiday,
To make their beauty fair and sleek
And scare the tan from summer's cheek."

It has been remarked that the decided predilection of the plant for rich cultivated land which the fourteenth-century writer noticed was equally recognised by Shakespeare, who mentions "rank Fumitory" among the weeds that feed upon the fallow leas of France left desolate by war. We may well believe that this group, like the Poppies, has spread from a southern home with seed corn.



THE COMMON FUMITORY—continued.

Pliny's explanation of the name was not universally adopted. "The Grete Herball" of 1529, for instance, says :—

"It is called *Fumus terræ*, fume or smoke of the erthe bycause it is engendred of a cours fumosityte rysyng from the erthe in grete quantity lyke smoke : this grosse or cours fumosityte of the erthe wyndeth and wryeth out : and by workyng of the ayre and sonne it turneth into this herbe."

After this, our graphic provincial names, *Bloody-man's-thumb* and *Wax-dolls*, seem prosaic indeed.

The genus *Fumaria*, to which all this lore attaches, is mainly distinguished from *Corydalis* by almost all its species being annuals and by having an indehiscent one-seeded fruit. According to Mr. Pugsley, its latest monographer, it comprises some forty-two species, all of which appear to be variable or polymorphic in their characters. Of these, ten species are British. The whole genus falls into two sections, viz. *Grandifloræ* or *Latisectæ* and *Parvifloræ* or *Angustisectæ*. Of our first-recognised British forms, *F. capreolata* Linné belongs to the former, *F. officinalis* Linné to the latter. In the former section the leaf-segments are ovate, the flowers, if normal and not starved, are more than nine millimetres long, and the lower petal is not spathulate ; whereas in the latter the leaf-segments are linear, the flowers are less than nine millimetres long, and the lower petal is spathulate. Mr. Pugsley begins his detailed diagnosis of *F. officinalis* Linné by describing it as—

"A plant of more or less robust habit and often much branched ; in open fields either suberect and compact, or, generally later in the year, more or less diffuse ; in bushy places and in shade often rampant and climbing by its cirrhose petioles. Leaves 2-3-pinnatisect, usually somewhat glaucous, with leaflets cut, sometimes more or less divaricately, into flat, lanceolate or linear-oblong, acute or slightly mucronate lobes."

To this he adds that the sepals are broad and dentate ; that the lower petal is abruptly dilated towards its apex ; and that the fruit is truncate, almost reversedly kidney-shaped, and wrinkled when ripe.

Darwin gives an account of the method of climbing exhibited by this species which is typical of its writer in its minuteness of thorough observation. He is presumably thinking of the plant's stature rather than of its grade of specialisation when he writes :—"It could not have been anticipated that so lowly a plant would have been a climber." Those movements for which he suggested the name circum-nutation occur in the younger parts of the stem ; but the actual climbing is the work of the primary and secondary petioles. As in *Clematis* and other instances, those leaf-stalks that have clasped a support become thicker and more cylindrical.

It has often been noticed that after the flower of Fumitories has been pollinated the dark red at the apex becomes diffused, or white-flowered varieties become pink. This has been somewhat speculatively described as a warning to insect-visitors that such flowers have already lost their honey.

XC.—ANALYTICAL DRAWINGS OF THE BARBERRY, POPPY, AND FUMITORY FAMILIES.

(*Berberidaceæ*, *Papaveraceæ*, and *Fumariaceæ*.)

OF the three Families represented by the seven species analysed on this Plate, the first, the *Berberidaceæ*, is more nearly related to the Family that precedes it, the *Ranunculaceæ*, than it is to the other Families dealt with here. Their leaves are scattered and usually exstipulate: their sepals are petaloid: their petals and stamens are numerous and hypogynous; and the seed is albuminous. There are, however, striking differences, such as the woody, spinous habit; the parts of the flower being in multiples of two or three, but never of five; and the remarkable operculate mode in which the anthers dehisce. The first line of figures on the Plate represents our only British member of the Family, the Common Barberry (*Berberis vulgaris* Linné), Fig. 1 being a flower seen from above, or, perhaps, as the blossoms hang inverted, we should say rather from below; Fig. 2 representing a petal with a superposed stamen, seen, of course, from within; Fig. 3, an enlargement of a flower seen in longitudinal section; Fig. 4, a petal and stamen and the gynæceum; Fig. 5, the fruit; Fig. 6, a seed in section; and Fig. 7, a shoot on which the primary leaf, and, perhaps, its stipules, are represented by three spines in the axil of which is a shoot bearing a secondary leaf.

The Order *Rhœadales* comprises not only the Families *Papaveraceæ* and *Fumariaceæ*, analysed on this Plate, but also the *Crucifereæ*—the subjects of the following ten Plates—and the *Resedaceæ*, represented by Plates CI and CII and analysed on Plate CXII. These Families agree in having cyclic, heterochlamydeous, hypogynous flowers and two or more carpels united to form a superior ovary. The *Papaveraceæ*, or Poppy Family, represented by the second, third, fourth, and fifth rows of figures on this Plate, agree in being herbaceous plants with a thick, milky, acrid latex; exstipulate simple leaves; polysymmetric flowers with two sepals, four petals, and numerous stamens; and capsular fruits with many, small, albuminous seeds and parietal placentation.

The second row of figures on the Plate represents the Greater Celandine (*Chelidonium majus* Linné), Fig. 1 being a flower natural size; Fig. 2, the long pod-like fruit, resembling that of the *Crucifereæ*, but without the *septum* or partition distinctive of that Family; Fig. 3, the same opened so as to exhibit the parietal placentation; Fig. 4, the same dehiscing naturally when ripe by the separation of two valves from below upwards; and Fig. 5, an enlargement of a seed, showing the lines of deep pits across its testa and the crest on its side.

The four figures in the third line represent the Yellow Horned Poppy (*Glaucium flavum* Crantz), the first showing the flower in longitudinal section; the second, the essential organs at this early stage of development; the third, a portion of the long pod, broken open so as to show the seeds imbedded in the two spongy parietal placentas; and the fourth, a magnified view of a seed.



ANALYTICAL DRAWINGS OF THE BARBERRY, POPPY, AND
FUMITORY FAMILIES—continued.

The fourth line analyses *Papaver Rhæas* Linné, the Corn Poppy. Fig. 1 shows the essential organs, the numerous stamens, and the sub-globose ovary raised on a short stalk above the insertion of the fallen petals. Fig. 2 represents the ovary later; Fig. 3, its upper surface with ten radiating stigmatic lines, the number of these varying from eight to twelve; Fig. 4, a transverse section of the ovary enlarged, showing the partial septa, which do not meet in the middle and which have the ovules scattered over the whole of their inner surfaces (*superficial placentation*); Fig. 5, the ripe pore-capsule, showing the pores below the projecting stigmatic lobes; and Fig. 6, a seed, magnified.

The three figures in the fifth line represent the essential organs of the Welsh Poppy (*Meconopsis cambrica* Viguier), showing the ribbed ovary and club-shaped style, a cross section indicating six prominent but parietal placentas, and a seed. The seeds of *Glaucium* and *Meconopsis* are noteworthy, the former being furnished with curved ridges concentric to the hilum connected by numerous short radial ridges, thus forming curved rows of short parallel-sided pits; whilst the latter are covered with a meshwork of mostly pentagonal ridges, or—which comes to the same thing—pitted all over with alveoli which are mostly five-sided.

In the Family *Fumariaceæ*, represented by the last two lines of figures on this Plate, the juice is watery, and the flowers are in racemes and generally monosymmetric. There are two small, caducous sepals; and four petals in two dissimilar pairs. A twist in the pedicel turns the flowers through 90°, so that the outer pair of petals, originally lateral, become antero-posterior, the upper one having in *Corydalis* and *Fumaria* a spur, to hold the honey secreted by a spur-like glandular appendage of one of the stamens, and forming a sort of hood over the rest of the flower. The inner pair of petals cohere by their tips, so as to enclose the essential organs. Bees visiting the flowers for the honey depress the inner petals so that the essential organs emerge. The stamens are in two groups (*diadelphous*), each consisting of one with a two-chambered anther and two lateral ones with half-anthers.

The sixth row of figures represents *Corydalis claviculata* De Candolle. Fig. 1 is a flower, enlarged; Fig. 2 shows an outer petal; Fig. 3 shows an inner petal, deeply tinted at its apex; Fig. 4, a staminal group; Fig. 5, the gynæceum; and Fig. 6, the pod-like fruit.

The last row of figures represents *Fumaria officinalis* Linné, Fig. 1 being a flower seen laterally; Fig. 2, the inner petals; Figs. 3 and 4, the unspurred and spurred outer petals; and Fig. 5, a young fruit, with some remnants of the flower, Figs. 2-5 being enlarged.

XCI.—SCURVY-GRASS.

Cochlearia officinalis Linné.

THE *Cruciferae* are one of the more extensive Families as to number of species and one of the most widely distributed. Comprising about eighteen hundred species, in some two hundred genera, the Family consists mainly of herbaceous plants—annual, biennial, or perennial—with some shrubs, and is less well represented in the Tropics and in the South than in the Temperate regions of the North. Though exhibiting unmistakable affinities with other Families of the *Rhœadales*, especially with the *Capparidaceae*, the *Cruciferae* form a singularly natural group, *i.e.* they are all very closely similar in structure with very few marked departures from the type. Their affinities in structure are accompanied by equal relationship in composition. Pungent oils and compounds rich in sulphur, readily disengaging sulphuretted hydrogen on boiling, are characteristic not only of *Cruciferae* but to some extent also of the Caper and Mignonette Families. No member of the *Cruciferae* is poisonous: many of them are favourite and wholesome articles of food; and in former days of long sea-voyages and much salt meat they were important remedies for scurvy.

The leaves of the *Cruciferae* are generally scattered, exstipulate, and simple, though often deeply divided; and the inflorescence is an ebracteate raceme, sometimes adding to the conspicuousness of the small flowers by the corymbose lengthening of the lower peduncles which brings them more to one level. The flowers are mostly white or yellow, or less commonly pink, red, or lilac, the combination of the two series of colouring-matters producing the remarkable orange-browns of the Wallflower. The type of floral arrangement is singularly uniform, the flowers being complete, heterochlamydeous, and perfect. The calyx consists of two whorls of two sepals each, the outer pair being antero-posterior, while the inner pair are often provided with honey-pouches or spurs at their bases. The corolla is a single whorl of four petals arranged in the diagonal planes of the flower, *i.e.* opposite the spaces between the four sepals, the petals often having a long claw with the limb expanded at right angles to it in a flat cruciform manner which gives its name to the Family. The stamens are in two whorls, the outermost consisting of two, opposite to the lateral (inner) sepals. These two, having to curve their filaments to avoid two honey glands on the floral receptacle between their bases and the ovary, appear shorter than those of the inner whorl. This latter appears to consist of four longer stamens, whence the term *tetradynamous* (from the Greek *τετράς*, *tetras*, four, and *δύναμις*, *dunamis*, strength) and the name of the Linnæan Class *Tetradynamia*, which corresponds very nearly with the Natural Family *Cruciferae*. These four stamens are in two pairs placed antero-posteriorly, each pair having a stamen on either side of the median plane of the flower. There is much evidence to show that each pair is one bifurcating stamen. There are two united lateral carpels forming a superior



SCURVY-GRASS—continued.

ovary with a single short style and a bifurcate stigma. Placentation is parietal ; but a membranous ingrowth, or *septum*, from the two antero-posterior placentas extends across the ovary, making it two-chambered. This septum persists, when the fruit bursts, as a transparent membrane framed by the persistent placentas or *replum*.

The fruit is dry and usually dehiscent into two valves from below upwards ; but in a few cases transversely between the seeds ; or, in some one-seeded cases, not at all. It is generally compressed, either in a direction parallel to the septum so that the latter is narrowed (*angustisept*), or at right angles to it so that it is wide (*latisept*). If three times as long as it is broad the fruit is termed a *siliqua* ; if shorter, a *silicula*.

In the subdivision of this very "natural" Family the embryo also affords important characters. The seed is exalbuminous, and the radicle may be *incumbent*, *i.e.* bent back along the centre line of one cotyledon ; *accumbent*, or resting against the edges of the two cotyledons ; *orthoplocous*, when the cotyledons are folded in a conduplicate manner ; *spirolobous*, when the radicle is incumbent but the cotyledons are bent once upon themselves ; or *diplocolobous*, when they are bent twice or more. A recent subdivision of the Family is based upon the presence of unbranched hairs upon the leaves or branched ones with some glandular ones.

The genus *Cochlearia*, the name of which, derived from the Latin *cochlear*, a spoon, refers to the shape of the root-leaves of some species, includes some five-and-twenty perennial herbaceous plants, natives of alpine, Arctic, and Temperate regions and especially of the coast. They have small white or pink flowers with entire petals and short globose pods with inflated convex valves, a septum across their wider diameter, and two rows of seeds in each chamber. The cotyledons are accumbent. There are several British species, all of them variable, so much so, in fact, that Syme proposed the name *polymorpha* to include those now known as *C. officinalis* Linné, *C. alpina* Watson, and *C. danica* Linné.

Cochlearia officinalis Linné owes its specific name, as also its popular name of Scurvy-grass, to its use as an antiscorbutic. The fleshy leaves are characteristic of its littoral habitat, the lower radical ones being round or kidney-shaped, cordate, and long-stalked, while the upper or cauline ones are sessile, amplexicaul, and angular or lobed. The plant flowers from May to August : the style is very short, and there are from four to six large seeds in each chamber of the fruit. These seeds are covered with large mucilaginous tubercles which absorb water and swell up to many times their original size, probably serving to fix the seed on the soil.

XCII.—PENNY CRESS.

Thlaspi arvense Linné.

CLOSELY related to the *Alyssineæ*, the Tribe *Thlaspidææ* have white flowers; short pods on horizontal stalks; straight cotyledons; and an accumbent radicle. Their pods are, however, compressed laterally, that is, at right angles to the septum, which is consequently very narrow (*angustisept*); and open with two boat-shaped valves.

The genus *Thlaspi* is further distinguished by having its petals equal and its pods roundish, winged, notched at the top, and containing more than four seeds. It comprises some sixty species, inhabiting Arctic, Alpine, and Temperate regions chiefly in the Northern Hemisphere, three or four of them being British. The scientific name *Thlaspi*, strange-seeming to English, or even to Latin, ears, was adopted by Linnæus from Dioscorides, and is, no doubt, derived from the Greek *θλάω*, *thlao*, I flatten, referring to the fruits, which are far more conspicuous than the flowers. The modern English book-name *Penny Cress* has obviously the same origin, coming, perhaps, from the German *Pfennigkraut*, while the French *Tabouret*, literally "a foot-stool," refers to the same part of the plant.

William Turner in his "Names of Herbes" (1548) says of it:—

"Thlaspi or thlaspium is called in duche Baurensenfc. It groweth wonders plentuously about Bon in the corne fieldes, and among the corne. It groweth also plentuously besyde Syon. It may be named in englishe dysh Mustard, or triacle Mustard, or Boures Mustard, because the seede is lyke mustarde seede in colour and in tast, and the vessel that conteyneth the seede is lyke a disshe."

Lyte translates the German name as *Bower's Mustard*; while Gerard corrupts this into *Bowyer's Mustard*, while translating the original as *Churl's Mustard*. The name *Mithridate Mustard* has been wrongly transferred to this plant from the somewhat similar *Lepidium campestre* Brown. This name and the connected *Treacle-mustard* recall a long romance in the history of medicine. *Mithradates Eupator VI*, king of Pontus from 120 to 64 B.C., whose name is also preserved in that of both the very different plants we know as Agrimony, was the hero of a remarkable story. Succeeding his father when a mere boy he was for seven years pursued by assassins. With an intellect in advance of that of most of those about him, he acquired the reputation of a magician, and was believed to have so saturated his body with poisons that no poison could have effect upon him. Thus when, defeated by Pompey, he wanted to poison himself, he could not, and ordered one of his soldiers to stab him. In primitive civilisations the venom of serpents, or other wild animals known, or supposed, to be poisonous, is a main ingredient in the noxious mixtures used to anoint the dagger of the assassin or as fatal potions to be administered to the enemy. Thus a remedy against venom and poison became a *θηριακή*, *theriake*, from *θηρίον*, *therion*, a wild beast, and such theriacs, *triacles*, or *treacles* came to be known also as *Mithridates*.



PENNY CRESS—continued.

Though some of the other British forms belonging to the genus *Thlaspi* are biennial or perennial, they are quite local in their occurrence. Of those commonly united as *T. alpestre* Linné, summer-flowering plants six to ten inches high, with sagittate cauline leaves; flowers an eighth of an inch across and sometimes tinged with pink; and obcordate pods a quarter of an inch long and containing from eight to sixteen red-brown seeds, *T. sylvestre* Jordan, with rounded lobes at the apex of the pod, occurs in Teesdale; at Thornhaugh, Northumberland; and at altitudes of 2,500 feet in Glen Isla and Glen Shee in Forfarshire; *T. occitanum* Jordan, with toothed leaves, a triangular pod, and longer style, occurs on limestone at Settle in Yorkshire and Llanrwst in North Wales; and *T. virens* Jordan, with only a slight broad and shallow notch to the pod, and an even more projecting style, inhabits the limestone rocks of Matlock, Derbyshire.

T. perfoliatum Linné is a small, spring-flowering annual, about six inches high, confined to a small limestone area on the borders of Gloucestershire and Wiltshire, with converging pointed auricles to its cauline leaves which thus clasp the stem, but are amplexicaul rather than perfoliate; white flowers only a twelfth of an inch across; and small pods with very short styles and containing from eight to twelve pale seeds.

T. arvense Linné, the species represented on our Plate, is far more common, occurring frequently as a cornfield or roadside weed in the lowlands. It is an annual, but grows a foot or more in height, branching but little, and bearing oblong, sagittate cauline leaves with toothed margins. From May to July it produces its white flowers, which are a quarter of an inch across. Nectar is secreted by four small green glands situated on either side of the base of the two shorter stamens; and, since, according to Kerner, the flower is slightly protogynous, insect-pollination doubtless occurs; but, as the anthers of the four long stamens seem to mature and open inwards at the same time as, and on a level with, the stigma, self-pollination can also occur.

As is usually the case in the genus, the peduncle elongates after flowering, so that the pods, which reach three-quarters of an inch in diameter, are borne in a long raceme. They each contain from ten to sixteen dark-coloured, oblong seeds, marked with concentric ridges and rows of pits.

XCIH.—GARLIC MUSTARD.

Alliaria officinalis Andrzejowski.

FROM what we have already said as to the uniformity of character among the *Cruciferae* it will be readily understood that the discrimination of the genera in that Family is no easy matter. Thus it comes about that the very common and long-recognised hedgerow plant with which we have now to deal, has at different times been referred to several genera, such as *Hesperis*, *Erysimum*, and *Sisymbrium*, as well as to a genus of its own, *Alliaria*. It was called *Alliaria*, from its resemblance in smell to the true Garlics of the genus *Allium*, by Fuchs, Dodoens, Matthioli, Lobel, and other pre-Linnæan botanists. Ray and Morison named it *Hesperis allium redolens*: Linné called it *Erysimum Alliaria*; and Scopoli, *Sisymbrium Alliaria*; and it is unquestionably closely related to these genera. Together, they form a Tribe *Sisymbrieæ*, characterised by having the seeds in a single row, and flattened, and the radicle incumbent. In this Tribe, *Alliaria*, *Sisymbrium*, and *Erysimum* have a flat disk-shaped stigma with a thickened margin, while *Hesperis*—represented in our flora by the fragrant lilac-flowered Dame's Violet (*Hesperis matronalis* Linné), which is not truly indigenous—has two erect stigmatic lobes. *Erysimum* has bifurcate or trifurcate hairs lying flat against its surface, a four-angled seed-pod, the two valves of which are prominently keeled with one longitudinal vein, and a slender thread-like *funicle* or stalk to its seeds. *Sisymbrium* has unbranched hairs spreading outwards from its surface, or reflexed, seed-pods which may be four-edged or terete, but with three longitudinal veins to each valve, and a slender funicle. *Alliaria* is almost glabrous, its few scattered hairs spreading and unbranched like those of *Sisymbrium*: its pod is terete with three longitudinal veins to each valve, though the middle one is much more prominent than the others; but the seeds are oblong and slightly furrowed or *striate*, and are borne on flattened, winged funicles. Being for these reasons recognised as the type of a distinct genus, and such double names as *Alliaria Alliaria* being now considered inadmissible, our Garlic Mustard comes to bear the name *Alliaria officinalis* given to it in 1819, in the third volume of the "Flora Taurico-caucasica" of F. A. Marschall von Bieberstein (1768-1826), by A. L. Andrzejowski (1784-1868), the author of the Ukraine Flora.

Common in almost every hedgerow in England, this plant occurs over the greater part of the Palæarctic Region, attracting attention by the pleasing bright green of its young spring foliage and the succeeding corymbose clusters of white flowers, and sowing itself freely in shady places, in ground unoccupied in the earlier part of the year. It is annual or biennial, and grows erect with a slightly branched stem to a height of from one to three feet; but the stem is often *decumbent* or prostrate at its base, and when young and slender is somewhat flexuous in its growth. The leaves are all stalked, thin, and prominently veined, the radical ones reniform, cordate, and crenate, and often three inches across, while the upper ones are acutely



GARLIC MUSTARD—continued.

deltoid, cuneate at the base, and coarsely dentate. All of them are generally slightly hairy on their under surfaces. The flowers appear in May and are individually about a quarter of an inch across, but are massed into corymbs often of considerable diameter. A succession of blossom is often maintained until late in the summer. Honey is secreted by the glands at the base of the short stamens; but as the flowers are homogamous and appear early in the season, when there are few insects about, they are probably largely self-pollinated.

The pods are borne on short, stout, spreading stalks, but themselves rise erect, with a slight curve, to a length of two and a half inches.

All the popular names of the plant refer to its powerful odour of garlic when bruised. This odour, which is not noticeable until the plant is bruised, is identical in every way with that of the Monocotyledonous genus *Allium*, though it is related chemically to the pungent sulphur-compounds in other *Cruciferae*. *Garlic Mustard* is apparently quite a modern name; and, in fact, *mustard* is not a very old word in our language. *Leek-cress* is an appropriate Early English name; and, no doubt, *Poor Man's Treacle* is also old. The first reference to the species as a British plant is in William Turner's "Libellus de re herbaria" (1538), on the first page of which appears:—

"*Alliaria* est herba passim in sepibus proveniens circinato folo [query, folio] allium odore mire referens. Hec est (ni conjectura fallat) *sauce alone*, aut ut alii uocant *Jack of the hedge*."

This we may translate:—

"*Alliaria* is a herb occurring everywhere in hedges wonderfully recalling garlic by its smell when the leaf is rolled up. This (unless the identification is erroneous) is *Sauce alone*, or, as others call it, *Jack of the hedge*."

Gerard says of it:—

"Divers eate the stamped leaves heerof with salt fish, for a sauce, as they do those of Ramsons."

It is stated that this rank taste is even more marked in the seeds than in the rest of the plant. The milk of cows feeding on this plant acquires its unpleasant flavour; as also, it is said, does the flesh of chickens if they eat it.

From an agricultural point of view this plant is probably a very harmful weed, since its young foliage affords food to the Flea Beetle or Turnip Fly (*Haltica*, or *Phyllotreta nemorum*) before the turnips are ready for them. This is equally true of Charlock and Shepherd's-purse; but, if these three weeds were kept under, it would almost certainly much reduce this destructive insect.

XCIV.—HEDGE MUSTARD.

Sisymbrium officinale Scopoli.

IT has been truly said of this plant, as also of the Mealy Guelder-Rose (*Viburnum Lantana* Linné), that it seems to have a special affinity for dust. The Guelder-Rose, it is true, is covered with stellate hairs which not only capture the dust but themselves impart a dusty look to the shrub: the Hedge Mustard, on the other hand, has only simple unbranched hairs, but these are numerous, fine, and mostly reflexed, sloping, that is, down the stem. The plant is, moreover, a lower-growing species, frequenting the very edges of the highway. In spite, however, of this sordid aspect, the plant is not without some beauty, more especially in the outline of its root-leaves, whilst in former times it seems to have been in considerable popular repute as a remedial agent, as, indeed, were several of its congeners, now alike consigned to oblivion, so far as any medical value is concerned.

The name *Sisymbrium* is from the Greek *σισύμβριον*, *sisumbrium*, which is employed by Theophrastus and Dioscorides apparently for more than one plant in no way connected with the genus now so called. The Water-Mint (*Mentha aquatica* Linné) and the Cat-Mint (*Nepeta Cataria* Linné) are supposed to have been so named; but nothing is known as to the etymology of the name itself. Linnæus used it as a generic name, including under it the London Rocket (*Sisymbrium Irio*), so called because it sprang up in quantity in London after the Great Fire of 1666, and the Flixweed (*S. Sophia*), which was known as "Wisdom of Surgeons" from its repute in healing wounds, its English name referring to its use in dysentery. He, however, referred our present species to the genus *Erysimum*, so that the name *Sisymbrium officinale* dates from the second edition of the "Flora Carniolica" of J. A. Scopoli (1732-88), published in 1772.

As at present constituted, the genus comprises some fifty or more species, natives of the North Temperate Zone, with three or four British representatives. They are annual or biennial herbaceous plants, covered, as we have said, with unbranched hairs. They have a rosette of radical leaves differing in form from those on the stem, which are scattered and frequently auricled at the base; and a raceme of flowers, generally small and yellow. The sepals are nearly equal, ascending, slightly coloured, and deciduous; and the petals are undivided and have claws nearly as long as the sepals. The style is very short, and the stigma discoid and persistent. The pods are borne erect in long clusters and are slender, terete, or angled, with convex valves with three longitudinal veins to each of them. The seeds are numerous, small, smooth, and so arranged alternately on either side of the septum as to form a single row. Though compressed, they have no distinct margin, and the funicle is slender. The radicle is incumbent, *i.e.* it rests against the flat back of one of the cotyledons.

Our common Hedge Mustard (*S. officinale* Scopoli) is a tap-rooted annual of a dull or yellowish shade of green, generally rough, hairy, or downy all over. Its stem



HEDGE MUSTARD—continued.

grows from one to two feet in height and is often remarkably erect, terete, and bearing many stiffly horizontal branches. It bears leaves, except on its uppermost part, and is generally rough with fine, reflexed, bristly hairs. The leaves are lyrate and runcinately pinnatifid, being deeply divided into from five to seven lobes, of which the terminal one is larger and hastate, whilst the lateral ones are oblong, and unequally toothed, and point towards the base of the leaf. The minute, pale yellow flowers are not more than a tenth of an inch across; and it is presumably the little corymbose clusters often at the apex of a long slender stem which has gained for the plant the name of *Lucifer Matches*, which is stated in Messrs. Britten and Holland's excellent "Dictionary of English Plant-Names" to be in use in Worcestershire.

The late Lord Avebury wrote of these flowers:—

"There is a honey-gland on each side of the two short stamens. When the flower opens, the pistil and the longer stamens project slightly. The shorter stamens are enclosed in the flower, but the anthers are open. All six stamens then grow a little so that the anthers of the shorter ones reach the stigma, while those of the longer ones project slightly beyond it. The flower is therefore adapted for cross-fertilisation, but may also be fertilised by its own pollen. It is visited by bees, flies, and butterflies."

As is often the case in this Family, the corymbose cluster of flowers—an adaptation for conspicuousness and probably, therefore, for insect-pollination—rapidly elongates, as the lower flowers are fertilised, into a long racemose cluster of fruits—an adaptation apparently for more effective seed-dispersal. The pods in this species are rather more than half an inch long, on very short thick stalks: they are erect and are pressed close to the main stalk; and they each taper from the base into the style. Though usually covered with fine down, there is a variety in which the pods are glabrous. There are about twelve seeds in each pod. Gerard, whose "Herball" (1597) contains the first record we have of this species, calls it *Banck Cresses*, and truly remarks that it grows "in stony places among rubbish by pathwaies."

The plant acquired the name *officinale* from the reputed efficacy of its juice, or of an infusion either of the whole plant or of its seeds, in cases of asthma, hoarseness, or ulcerated sore-throat; and for the same reason it is still known in France as *Herbe au Chantre*, the singer's herb.

Some of the earlier botanists, struck it would seem by the resemblance of its stiff branching to that of the Vervain, called it *Verbena*; but whilst Tragus calls it *Verbena famina*, Fuchs calls it *Verbena mas*.

The name *Hedge Mustard* seems to have been first used, in 1713, by James Petiver (*fl.* 1658-1718), Sir Hans Sloane's apothecary and the friend of John Ray, in his illustrated catalogue of Ray's herbarium.

XCV.—THE CHARLOCK.

Sinapis arvensis Linné.

NO artist is as daring as Nature in the collocation of colours. Next to a field scarlet with Poppies may be one uniformly yellow with Charlock. A modern West-Country dialect rhyme runs :—

“ The kerlock plant is a site to see,
As it shines in the yields like gowld ;
But all y'ant gowld that glitters vree,
I was once by my weather towld ” ;

and every farmer knows that this troublesome weed is golden only in appearance.

It is a wild Mustard, and the genus *Sinapis* of Linné, under which we still prefer to place the Mustards, differs but by a single character from the Cabbages, *i.e.* the genus *Brassica*. While the Cabbages have erect sepals, like those of a Wallflower, the Mustards have them in an ascending or half-spreading position. Small, however, as this distinction seems, it is, we think, quite sufficient—seeing that it is very constant—in a Family, such as the *Cruciferae*, in which the distinctive characters of Tribes and genera are so very slight. If the Mustards be reduced to a sub-genus or Section of *Brassica*, the Charlock would be the *Brassica Sinapistrum* of Boissier, but would bear the earlier name of *B. Sinapis* Visiani.

As we have already pointed out, the extremely “natural” character of the Family *Cruciferae* has compelled us to have recourse to apparently slight and by no means conspicuous characters for the discrimination of the Tribes and genera into which the Family is divided. Though Prantl, one of the latest authorities, bases his primary division of the Family upon the hairs on the leaf being simple or branched, whilst De Candolle employed the folding of the cotyledons in the seed with reference to the radicle as the primary character, a very convenient, and apparently not unnatural, system is based primarily upon the length and partitions of the fruits. According to this, there are five primary subdivisions of the Family which we may term Sub-Families. These are the *Siliquosae*, with long pods or siliquas, dehiscing throughout their length, with partitions across the broader diameter of their transverse section ; *Latisepiae*, with short pods or silicles (*siliculae*), dehiscing throughout their length and with the septum across the broader diameter ; *Angustisepiae*, with silicles with septa across their narrower diameter ; *Nucamentaceae*, with indehiscent, one-seeded pods ; and *Lomentaceae*, with pods which divide transversely into one-seeded portions. These Sub-Families are subdivided, by the number of rows of their seeds and the characters of the cotyledons and radicle already alluded to, into Tribes, of which there are ten or eleven among British *Cruciferae*.

In every system of classification, however, the Cabbages, Mustards, and Wall Mustards (*Diplotaxis*) must come near together. They constitute the Tribe *Brassicæ*, in the Sub-Family *Siliquosae*, characterised collectively by having yellow



THE CHARLOCK—continued.

flowers, long pods with partitions across their wider diameters, either not compressed or compressed parallel to the septum, with their seeds in one or two rows, and with the cotyledons folded conduplicately or lengthwise so as to clasp the *incumbent* radicle. The genus *Diplotaxis* is distinguished by its compressed pods and two-ranked seeds ; whilst *Brassica* and *Sinapis* are, as we have said, distinguished only by the direction of their sepals.

It is not surprising that several allied yellow-flowered Crucifers are often confused under the name of Charlock, including its more useful congeners the Black and White Mustards (*Sinapis nigra* Linné and *S. alba* Linné). The seedlings of Charlock can be distinguished from those of the Turnip (*Brassica Rapa* Linné) by the first foliage-leaves, the cotyledonary leaves being nearly identical. The Turnip has a long-stalked round leaf ; the Charlock an almost stalkless obovate one of a darker green. From the other Mustards the best distinctions are the pods. Charlock has a slightly angular, straight-sided pod ending in a conical beak which sometimes contains one seed ; whilst White Mustard has a shorter pod constricted into several bead-like portions and ending in a curved sword-like beak which is longer than the rest of the pod and is also sometimes one-seeded ; and Black Mustard has a four-sided pod, closely pressed against the stem and ending in a short subulate seedless beak.

The dark brown seeds of the Charlock are unfortunately hardly distinguishable from those of the Turnip and retain their power of germination for several years if deeply buried, thus coming up at irregular times. Though an annual, the plant is thus a serious pest on light soils, especially calcareous loams. The most effective remedy against it is spraying with copper-sulphate. Charlock has a rough stem, one to two feet high, and branched ; stalked lyrate-lobed lower leaves and sessile, lanceolate, irregularly serrate upper ones. Though not as large as those of the Cabbage, its flowers are larger than those of the allied Mustards, being often three-quarters of an inch across. The pods spread outwards from the stem and are from one to two inches long.

The seeds contain some fixed or fatty oil, so that they occur as an impurity or adulterant in Rape or Colza oil-cake ; but their ground flour does not form on being moistened the pungent volatile oil of mustard, which in Black and White Mustard is the result of a complex fermentation set up by the action of a ferment or enzyme known as myrosin upon certain glucosides. Household mustard is prepared from an admixture of Black and White Mustard seed, to which Wheat-flour and Turmeric are often added ; but the Mustard of the Pharmacopœia is *S. nigra* Linné.

XCVI.—THE NAVEW.

Brassica campestris Linné.

IT may, perhaps, be the case that plants growing by the sea-side, under conditions somewhat unfavourable to nutrition, especially on account of the salinity of their supply of water, develop special tendencies to arrested growth and the storing of nutriment. They may thus cease to complete their life-cycle in a single season ; lessen their transpiration by coating their leaves with that covering of wax-particles which gives them a glaucous hue ; and store up water, with some sugar and other organic reserve material in various parts of their structures which become correspondingly enlarged. This seems to be the explanation of the comparatively large proportion of our cultivated vegetables which are of maritime origin.

If two nearly related wild forms were both brought under the stimulus of cultivation at the same time and place various cross-breeding might occur and result in the formation of stable "races," or forms true to seed, the "recessives" of the Mendelian experimentalists. After centuries of the artificial selection of the cultivator the parentage of such races may well be difficult to unravel.

Cultivated plants may always stray beyond the boundaries of garden or field, and may, whether by reversion or by starvation, degenerate into forms somewhat unlike those known in cultivation.

This is, perhaps, the history of the genus *Brassica*. Several of its undoubtedly wild forms are natives of the sea-shore and have glaucous foliage. In several of the cultivated groups there are annual races and others that are biennial, forming only an abbreviated stem and a rosette of radical leaves during their first season, and flowering and fruiting at the expense of stored-up nutriment during the second.

De Candolle is of opinion that the cultivation of the species of *Brassica* is of pre-Aryan Europæan origin, there being no certain evidence of it in ancient Chinese or Sanskrit literature ; and he suggests that the wild stock may have belonged to north-western Europe. Such names as *Brassica* and *Cabbage* may be of great antiquity, since although the former is Classical Latin and occurs in Pliny, it looks rather like a Celtic loan-word, so that the Celtic *bresic* may be earlier, and *kab* or *kap* occur in several Celtic and Slavonic forms.

Of the two great groups of cultivated varieties, *Brassica oleracea* Linné, almost certainly wild on our southern cliffs, has glaucous glabrous leaves, the upper ones dilated at the base, and elongated racemes of large cream-coloured or pale yellow flowers. Among its chief modifications under cultivation are the variety *bullata*, the Savoy, with hollow dome-like elevations of the cellular tissue between the meshes of the leaf-vein ; var. *gemmifera*, the Brussels Sprout, with lateral buds on the stem ; var. *botrytis*, the Cauliflower, with much-branched, fleshy, aborted inflorescences ; and var. *caulorapa*, the Kohl-rabi, in which the base of the leaf-bearing stem is enlarged into a globular green food-store.



THE NAVEW—continued.

The other great group is *Brassica campestris* Linné, or *B. polymorpha* Syme, which has the lower leaves hispid and lyrate-pinnate; the upper ones auricled and embracing the stem; and a more corymbose raceme of flowers which may be pale orange, bright yellow, or buff, those colours being characteristic of the varieties known as Rape, Turnip, and Swede respectively. The most fundamental division between the cultivated and wild or apparently wild races of this group would seem to be the colour of the first foliage-leaves. These are generally rough or hispid, but in the Turnip group, the sub-species *B. Rapa* Linné, they are grass-green; whilst in the Swede group, *B. Napus* Linné, they are glaucous. In both these groups there are forms with enlarged roots, *B. Rapa*, var. *rapifera* Koch, the Turnip, and *B. Napus*, var. *napo-brassica* De Candolle, the Swede; and forms with more slender roots known as Rape. De Candolle makes the interesting remark that:—

“When the root or the lower part of the stem is fleshy, the seed is not abundant, nor worth the trouble of extracting the oil; when those organs are slender, the production of the seed, on the contrary, becomes more important, and decides the economic use of the plant. In other words, the store of nutritious matter is placed sometimes in the lower, sometimes in the upper part of the plant.”

In both the green or turnip-like Rapes and the glaucous or swede-like ones, there are varieties named *annua*, known in cultivation as Summer Rapes, sown in April or May and harvested in September; and varieties named *oleifera* or Winter Rapes, sown in August and September and harvested in the following June and July.

Napus is Classical Latin for a Turnip; so that, whether we got the vegetable from the Romans or not, we probably got the name, which in Old English became *Nep*, from them; whilst in French it became *Naveau* and *Navette*, borrowed by some of our sixteenth-century writers under the form *Navew*. *Turnip* has been said to be from *Terræ napus*. The apparently wild form, which Hewett Watson treated as a variety *sylvestris*, is frequent on river-banks; and by the banks of the Thames, where that river borders the county of Bucks, is known as *Bargeman's Cabbage*.

XCVII.—THE CORALWORT.

Dentaria bulbifera Linné.

SOME of our woods in the south-west of England have a special beauty of their own in the possession of the rare, or rather local, Coralwort (*Dentaria bulbifera* Linné). In a wild state it is probably, with us, confined to Buckinghamshire, Hertfordshire, Middlesex, Surrey, Kent, and Sussex; whilst though it is recorded from most countries in Europe and from Western Asia, it does not extend into Northern Scandinavia.

It was first recorded as a British plant by Parkinson in his "Theatrum" (1640). He writes of it:—

"*Dentaria*. Toothed Violets, or Coralworts. There be divers sorts of these toothed Violets, differing one from another cyther in roote or leafe or both. . . . 1. *Dentaria bulbifera*. Bulbe bearing toothed Violets.

"This toothed Violet shooteth forth one or two winged leaves, upon long brownish footestalkes, which in their rising up out of the ground, are as it were doubled or foulded downwards, and then open themselves into scaven leaves most usually, and sometimes but five, each whereof is somewhat long, dented about the edges, and pointed, of a sad greene colour, and set on both sides of the middle ribbe one against another: the stalke that beareth flowers riseth up in the same manner with the leaves, and is bare or naked of leaves unto the middle thereof, where it shooteth forth a leafe, and so one or two more up higher, each consisting but of five leaves, and sometimes but of three, having also the uppermost single, at each whereof commeth forth a small round Bulbe, cloven, or as it were divided into some parts or cloves, of a sad purplish greene colour, which being ripe and put into the ground, will grow to be a roote, and beare leaves like as the Bulbes of a red bulbed Lillie; about which at the very toppe stand foure or five flowers in long huskes upon short footestalkes, opening into foure leaves, of a purplish colour, very like unto the flowers of Stocke Gilloflowers, or Dames Violets; after which come small long hornes or coas pointed at the ends, wherein lye such like seede, as are in the coas of Dames Violets, which will as soone as it is ripe, breake the podde and fall out: the roote is very white, smooth and shining, made of divers small round knobbes set together not growing downwards, but lying along, and encreasing under the upper crust of the ground, having very few fibres thereat: the taste both of leafe and roote is somewhat bitter, hot and sharpe like Raddish . . . at Mayfield in Sussex, in a wood called Highreede, and in another wood there also called Foxholes."

In 1734 John Blackstone found it abundantly in the Old Park Wood, near Harefield, Middlesex, where it still grows in profusion, forming dense patches amongst Wild Hyacinths and Dog's Mercury, in the humus of Beech trees, on a chalk sub-soil. It also extends along the Chilterns into Hertfordshire and Buckinghamshire; whilst Parkinson's Sussex record, which Blackstone doubted, has also been abundantly confirmed in the neighbourhood of Tunbridge Wells.

Lord Avebury writes of the plant as growing

"in damp woods, and like other inhabitants of such localities" having "large, flat, delicate leaves. As, moreover," he adds, "the leaves inhabit places where, and appear at a season when, the leaf supply is abundant, the plants run their risk, and need no special protection from browsing quadrupeds. In dry, arid regions where the food for goats, sheep, etc., runs short, they would not last a day."

His lordship then enumerated as in the same category Honesty, Herb Paris, Dog's Mercury, Lords-and-ladies, and Butter-bur; but we should ourselves describe the habitats of the first four of these and of the Coralwort as shady rather than damp woods, since they are generally on a light, porous sub-soil. The leaves of *Dentaria*, though delicate, are moreover not very large.

The genus *Dentaria*, which is named from the tooth-like processes on the rhizome, comprises some twenty species, natives of North Temperate regions. It is distinguished from *Cardamine* mainly by one character, viz. the possession of a



THE CORALWORT—continued.

broad, winged funicle or stalk to the seeds. Both genera belong to the Tribe *Arabideæ*, the members of which may have yellow, lilac, or white flowers, and an accumbent radicle, *i.e.* resting against the edges of the cotyledons. It is seldom, however, that the seeds of *Dentaria bulbifera* are seen. The blossoms have no perfume, though honey is secreted by four nectaries at the base of the stamens. Insect visits are, however, rare ; and Sir James Edward Smith long ago noted the curious apparent case of compensation, that pods or seeds are hardly ever perfected, while the bulbils and branching rhizomes form ample modes of reproduction. Considering the situations in which this attractive species occurs and the appearance of its rhizomes (which have suggested such book-names as Toothwort and Coral-root, in addition to those already cited), it may be found either that this plant is to some extent saprophytically dependent upon humus, or that it has a mycorhiza or symbiotic root-fungus.

Parkinson's remarks on the taste of the rhizome are borne out by the fact that the rhizome of another species of the genus, *Dentaria diphylla* Michaux, a native of eastern North America, is used as a condiment under the name of Pepperwort.

XCVIII.—LADY'S-SMOCK.

Cardamine pratensis Linné.

AFTER the depression of flowerless winter, our eyes rejoice in the brightness of any patch of colour in the landscape, even the palest. It is thus the season of spring,

"When lady-smocks, all silver-white,
Do paint the meadows with delight,"

rather than any great beauty of form or colour in the flower itself, that has made this so popular a plant. That it has long been popular is shown by the great number of vernacular names that it bears. Characteristic of wet undrained meadow land, once much more common than it is to-day, it is sometimes even known simply as *Meadow*; whilst our ancestors, constantly testing the adaptability of wild plants for food, recognised its botanical affinities by the name *Medetarde*, an early form for *Meadow Cress*. Its blossoms, "somewhat dasht over with blush," as Parkinson puts it, "and many times but at the edges onely," have earned the names of *Pink*, *Spink*, or *Bog-spinks*; but as seen in the mass they are white enough to be called *Milkmaids*, *Lady's Milk sile* (soil), and *Lady's-smock*. The season of flowering—from the middle of March to the end of May—naturally associated it, especially if we allow for the change of Style in our almanacs, with Lady Day, or Lady-tide, as the days before and after the feast were called, and with the coming of the cuckoo. Whether we adopt the older spelling *Ladye-smock*, or the more modern *Lady's-smock*, the first half of the name is clearly in the possessive case; and in former days linen lying on the grass to bleach was a far more familiar sight than it is to-day; but in spite of the absence of any evidence of the use of the name as Our Lady's Smock, we think the season of flowering strongly favours this original. It may even explain such an apparently inappropriate name as *Canterbury Bells*, which Gerard says was in use in Norfolk in his time; since Chaucer has shown us that

"Whan that Aprille with his schowres swoote
The drought of Marche hath perced to the roote,
Thanne longen folk to gon on pilgrimages,
And specially, from every schires ende
Of Engelond, to Cantarbury they wende";

in other words, there was a spring season when pilgrimages to Canterbury were the fashion. As for such names as *Cuckoo-bread* or the Somerset *Gookoo-buttons*, and the Welsh *Cuckoo's Shoes and Stockings*, these are obviously the outcome of the playful fancy of children; and we are told that in the last the whiter flowers are the stockings and the pink ones the shoes. The Latin name *Cardamine* is taken from the Greek of Dioscorides καρδαμίνη, *kardamine*, which was applied to some kind of cress, and has been derived from καρδιά, *kardia*, the heart, and δαμάω, *damao*, I tame, in reference to some supposed medicinal virtues. The flowers of Lady's-smock, whether fresh or dried, have been reported to be a cure for epilepsy; but,



LADY'S-SMOCK—continued.

though they have the pungency of the Family in a very slight degree and may be eaten as an ornamental and harmless salad, they have no real medicinal value.

As we have seen, the genus, in which the closely-allied *Dentaria* is often sunk, belongs to the Tribe *Arabideæ*, its most distinctive characters being the small, simple, capitate stigma; the long, narrow, compressed pod, with no veins in its elastic valves, and the slender thread-like funicle. The fifty species, natives of Temperate and cold regions both north and south, include both annual and perennial forms: they are usually glabrous and have pinnate leaves, the name *Bitter Cress* (belonging strictly to *C. amara* Linné, one of our four or five British species) being often extended to the whole genus.

While De Candolle justified the separation of *Dentaria* from *Cardamine* by the thick funicle of the former and the slender funicle of the latter, Robert Brown suggested the union of the two, on the ground partly that the thickened rhizome of the Lady's-smock is not very dissimilar to that of the Coralwort. A general tendency of the plant to vegetative methods of reproduction shows itself moreover in the occasional production of lateral stolons or suckers.

Varieties have been described, in one of which the leaflets of the pinnate radical leaves, normally roundish, are more decidedly angular, the *Cardamine dentata* of Schultz, a more robust plant; and in another the leaflets are more numerous, smaller, and narrower, while the flowers are also smaller, with white, narrower petals, this being the *Cardamine Hayneana* of Reichenbach, which may be a hybrid with *C. hirsuta* Linné, which it resembles in these characters.

In autumn the Lady's-smock very often becomes viviparous, producing buds upon the radical leaves which grow into new plants, a process familiar to us in our ferneries, in the case of *Asplenium bulbiferum* Forster, and other species, and occurring also occasionally in *Chelidonium majus* Linné, *Drosera longifolia* Linné, and other Flowering Plants, and commonly made use of in the multiplication of Begonias and Gloxinias. An even more remarkable abnormality is not very uncommon, in which buds, often forming new flowers, develop in the axils of the petals.

The flowers of the Lady's-smock are larger than those of most other species in the genus, and secrete honey from four nectaries at the bases of the stamens. They are visited by various insects and are stated to be *self-sterile*, refusing, that is, to set seed when the stigma is pollinated with the pollen of the same blossom.

The valves of the pod open, when ripe, from below upwards so as to jerk the seed to some distance, though they are not so explosively elastic as those of *Cardamine impatiens* Linné.

A double variety of the Lady's-smock is a showy garden plant, which is multiplied by division of the rhizome or by cuttings.

XCIX.—THE WALLFLOWER.

Cheiranthus Cheiri Linné.

THE bright green foliage and clear yellow blossoms of the Wallflower adorning the rugged tops of the grey ruined walls of some Norman keep, or the remnant rubble of an abbey erstwhile far more extensive, carries the mind back through a long vista of mediæval medicine and ancient commerce. In a truly wild state, where they may inhabit rocks rather than ruins, the small genus *Cheiranthus* is probably native to the warmer, sunnier, drier regions of the Mediterranean. The forked or stellate hairs close pressed to the surfaces of stem and leaf are a suitable protection there against excessive transpiration : there the large bright blossoms have sun to spread themselves under, to increase their secretion of honey, and to bring out their fragrance ; and, even at the early season at which they expand, there are plenty of long-tongued insects to reach their sweet stores. Here their sturdy, slightly woody, perennial stems enable them to survive as aliens in a less favoured clime.

To us there does not appear to be much connection between a Wallflower and a Violet ; but Stocks and Wallflowers seem to have been known to the early Greek botanists as λευκόιον, *leukoion*, from λευκός, *leukos*, white, and ἴον, *ion*, a violet, a name literally translated later into Latin as *Viola alba*, one kind of which, our Wallflower, was known even down to the time of Ray as *Leucojum luteum*, literally "the yellow white violet" ; whilst Tabernæmontanus a century before had called it *Viola petræa lutea*, and even to-day it is known in Guernsey as *Violette de châte*, the Castle Stock.

It was probably to the great world's mart at Alexandria that Arab navigators first brought from India the dried flower-buds of *Eugenia caryophyllata* Thunberg, the nail-like form of which gave them the name of *cloves*, the French *clou* ; and when, at a later date, the tree that bore them became known to botanists, the resemblance of its foliage to that of the Walnut, then known as καρύα, *karua*, gained it the name of *Caryophyllus aromaticus*. The costly Indian spice was soon recognised as a valuable carminative and cordial, good for all diseases of the heart—a literal heart's-ease ; and the European physicians were glad to be able to suggest a cheaper substitute in the blossoms of *Dianthus Caryophyllus* Linné, our Clove Carnation, a native of the Mediterranean area, which have the same scent. The originally Greek name *Caryophyllon* became for Albert the Great *gariofilus*, and later the French *giroflée* and our English *gilliflower* ; and a spirit essence of the flowers of the Carnation became the popular cordial Gilliflower water, or, as their name *Sops-in-wine* tells us, they were also otherwise administered. The occurrence of this Carnation alike on the walls of Falaise, the birthplace of William the Conqueror, and on those of the castles of Dover and Rochester, so intimately associated with him and his companions in arms, suggests that the plant may have been introduced into England by the Norman builders of those strongholds. But, whilst these summer flowers were the Gilliflowers *par*



THE WALLFLOWER—continued.

excellence, so that the false etymology *July flowers* was invented, the earlier blossoms of Wallflowers and Stocks, though with a very different fragrance, came to be known as *Winter Gilliflowers*, or the former was called *Yellow* or *Wall Gilliflower*.

Arab physicians knew some very sweet-scented red flower, possibly the cultivated race of Wallflowers now known as *Bloody Warriors*, by the name *Kheyry*. William Turner in his "Names of Herbes" (1548) writes:—

"Viola alba is called in greeke Leucoion. There are diuerse sortes of Leucoion. One is called in englishe Cheiry, Hertes case or wal Gelefloure, it groweth vpon the walles, and in the sprynge of the yere, it hath yealow floures. The Arabians call it Cheiri."

Linnæus seems to have added the Greek termination *anthus* to the Arabic name and then to have invented the meaning (derived from the Greek *χείρ*, *cheir*, the hand) that the fragrant flowers were suitable to carry in the hand as a bouquet.

In the uncultivated state of the plant, the erect sepals are tinged with red, but the petals are a pure yellow. The lower flowers on the ebracteate inflorescence have slightly longer stalks than the others, so that the blossoms gain in conspicuousness by being massed together; but after flowering the main axis elongates, so that the fruits are separated one above another. The honey, secreted by two nectaries on the receptacle on the inner side of the base of the two shorter stamens, collects in the two pouched sepals, and the long upright claws of the petals form a tube, almost closed by the anthers, so that short-tongued insects can only reach the pollen. Abundance of fruit is perfected, the pods reaching two or two and a half inches in length. They are four-angled, each of the two valves having a midrib projecting from the base half-way up the pod: there is a short, thick, angular, slightly bristly style and a bi-lobed stigma. The seeds are much compressed and are surrounded by a thin membranous wing, which apparently aids in their dispersal by wind.

The many beautiful varieties of the Wallflower in cultivation are best propagated from the better ripened seed imported from the Continent. It should be sown from March to the end of May, all seedlings being transplanted in May or June.

C.—ANALYTICAL DRAWINGS OF THE WALLFLOWER FAMILY.

(*Cruciferae*.)

WHEN the study of Botany was merely ancillary to that of medicine, the test of taste was more universally applied, and a knowledge of properties thus ascertained assisted the then limited knowledge of structure in guiding the student to the true affinities of plants. Though the *Cruciferae* have, almost without exception, six stamens, the difference in length between them which formed the basis of Linné's Class *Tetradynamia* is not always obvious. The cruciform corolla, however, and the remarkable fruits, in which, in most cases, two valves separate from below upwards, leaving a transparent septum with the seeds attached to its framework, naturally attracted attention at an early period; and, coupled with the pungent taste and antiscorbutic value of the plants, led to the recognition of a natural relationship between them.

As our knowledge has increased, it has been realised that this is a very natural Family, especially in the number and arrangement of the parts of the flower. In all our British representatives of the group there are four sepals in two pairs, the outer antero-posterior, the inner lateral; four petals in one whorl placed diagonally; two shorter lateral stamens and two pairs of longer ones, each pair placed on either side of the median plane; and finally two lateral carpels united into a dry fruit with parietal placentation but divided longitudinally by the partition mentioned above.

Among the minor characters upon which we are accordingly thrown back for the subdivision of the Family into Tribes and genera, the most obvious are the relative length and breadth of the fruit, and the direction of the septum across it, other valuable differentia, dependent on the structure of the embryo, being less conspicuous.

Of the nine types analysed on this Plate, the first line of figures represents the Scurvy-grass (*Cochlearia officinalis* Linné), Fig. 1 being a flower, and Fig. 2 a petal, natural size; Fig. 3, a flower magnified, and Fig. 4, the same in longitudinal section; Fig. 5 is the stamens and gynæceum, also enlarged; Fig. 6, a young fruit, natural size; Fig. 7, the same enlarged; Fig. 8, a fruit dehiscing naturally; and Fig. 9, a transverse section across the same, both being enlarged.

The second line of figures represents the Penny Cress (*Thlaspi arvense* Linné), Fig. 1 being a flower, natural size; Fig. 2, a petal; Fig. 3, a sepal; Fig. 4, the essential organs; Fig. 5, the young gynæceum; Fig. 6, a flower, after fertilisation, all enlarged; Fig. 7, an unripe fruit, natural size; and Fig. 8, the same torn open so as to show the seeds.

The third line of figures represents the Garlic Mustard (*Alliaria officinalis* Andrzejewski), Fig. 1 being a flower, and Fig. 2, a petal, natural size; Fig. 3, the



ANALYTICAL DRAWINGS OF THE WALLFLOWER
FAMILY—continued.

calyx; Fig. 4, a sepal; Fig. 5, the essential organs; and Fig. 6, a stamen, enlarged; Fig. 7, a pod, natural size; and Fig. 8, a portion of the septum enlarged, showing the seeds attached to the replum.

The fourth line of figures represents the Hedge Mustard (*Sisymbrium officinale* Scopoli), Fig. 1 being a flower, natural size; Fig. 2, the same enlarged; Fig. 3, a petal; Fig. 4, the calyx, and Fig. 5, the essential organs, enlarged; Fig. 6, an unripe pod, and Fig. 7, a ripe one dehiscent, both nearly double the natural size.

The fifth line represents the Charlock (*Sinapis arvensis* Linné), Fig. 1 being a flower; Fig. 2, a petal; Fig. 3, the gynæceum; and Fig. 4, the calyx and stamens, and Fig. 5, the septum of a ripe fruit, all natural size.

The sixth line represents the closely-related Navew (*Brassica campestris* Linné), Fig. 1 being a flower, as seen from above; Fig. 2, a petal; Fig. 3, a longitudinal section of a flower; Fig. 4, the essential organs; and Fig. 5, a young pod, all natural size.

The seventh line represents the Coralwort (*Dentaria bulbifera* Linné), Fig. 1 being a flower, seen from above; Fig. 2, the calyx and stamens; Fig. 3, a young siliqua; Fig. 4, a fully-formed one; Fig. 5, the replum and septum of the same; and Fig. 6, a bulbil, also all of natural size.

The eighth line of figures represents the nearly-related Lady's-smock (*Cardamine pratensis* Linné), Fig. 1 being a flower, seen from above; Fig. 2, the calyx and stamens; and Fig. 3, the essential organs, natural size; Figs. 4 and 5, two aspects of a stamen, enlarged; Fig. 6, a siliqua, natural size; Figs. 7 and 8, portions of the same, slightly and considerably enlarged to show the alternate arrangement of the seeds on the two sides of the replum; and Fig. 9, a siliqua dehiscent.

The last line of figures represents the Wallflower (*Cheiranthus Cheiri* Linné), Fig. 1 being a flower, seen from above; Fig. 2, a longitudinal section through a flower; Fig. 3, the stamens; Fig. 4, the gynæceum; and Fig. 5, a dehiscent siliqua, all of natural size.

CI.—THE WILD MIGNONETTE.

Reseda lutea Linné.

UNQUESTIONABLY related to the *Cruciferae*, and still more closely to the Caper Family (*Capparidaceae*), the small Family *Resedaceae*, which is chiefly represented by the Mignonettes, consists mostly of herbaceous plants, adapted to dry sunny conditions, with a watery juice and no marked medicinal properties. At the same time, they take their name from the genus *Reseda*, which in turn derives its name from the Latin *resedo*, I calm, from some entirely imaginary sedative properties. This generic name, adopted by Linnæus, is used by Pliny.

The Family belongs largely to the Mediterranean region, but extends not only into Northern Europe but also into South Africa and California. In Britain it is represented only by two species of the genus *Reseda*, a third species, *R. alba* Linné, though occurring sometimes in waste sandy places near the sea, being probably only an outcast from gardens or an introduction with corn from the south, and others being only casuals. On the mainland of Europe there are nearly twenty species.

Their roots share the acidity of the allied Families *Cruciferae* and *Capparidaceae*, and those of the Wild Mignonette (*Reseda lutea* Linné), which have the smell of radishes, were formerly considered to have sudorific, aperient, and diuretic characters. The bitterness which is so generally associated with yellow colouring-matters is strongly marked in the leaves of *R. Luteola* Linné; but the fragrance of *R. odorata* Linné, which is the main popular association with the name Mignonette, is not possessed by most of the other species.

Scattered leaves with minute, gland-like stipules and terminal bracteate racemes or spikes of greenish inconspicuous flowers are general in the Family, as also is a certain absence of symmetry in the flower, the number of the parts being inconstant and the floral axis giving rise to a large posterior hypogynous disk. The sepals and petals both vary from four to eight in number, and the former are imbricate in the bud and persist into the fruiting stage. The two posterior petals are often larger than the rest, and this, coupled with the posterior position of the bilaterally symmetrical disk, renders the flower monosymmetric or zygomorphic, it being possible to divide it symmetrically only through its median or antero-posterior plane. While the petals are inserted below the disk, the stamens, which generally number between ten and twenty-four, spring from its upper surface, and, with reference to the gynæceum, may perhaps be described rather as perigynous than as hypogynous. There are three or six carpels, generally united into a one-chambered ovary, with three parietal many-seeded placentas, which curiously gapes open at the top between the three stigmatiferous lobes, even before pollination. The fruit is usually a parchment-like bladderly capsule, and the kidney-shaped seeds are exalbuminous and have curved embryos.



THE WILD MIGNONETTE—continued.

The genus *Reseda* has a green, gamosepalous calyx, deeply and irregularly divided into a varying number of lobes. Its petals are more exceptional in character. They are extremely unequal. They all have short, broad, orbicular, gibbous claws, which are sometimes green: the anterior one or two have at the apex of this a slender pale-coloured lamina: the lateral ones have this limb usually two- or three-cleft to the top of the claw; while the broader two posterior petals have a many-cleft limb and a remarkable projecting ridge or *ligule* at the junction of claw and limb. Nectar is secreted in a cup-shaped cavity of the disk, which is arched over by the ligules of the posterior petals, being thus enclosed in a closed box, the lid of which, as Hermann Müller pointed out, must be raised before the honey can be extracted. A special genus of short-tongued bees (*Prosopis*) has a flat trowel-shaped proboscis, primarily evolved, perhaps, as an instrument for plastering the cells of its honeycomb, which is, however, admirably adapted, as are the proboscides of no other insects, to get the honey out of these blossoms.

The small seeds are nearly circular, black, smooth, and shining, and are thus readily dispersed by the mere swaying of the open capsules in the wind.

The Wild Mignonette (*R. lutea* Linné) is a biennial with a branched and ribbed stem about a foot high and very variously lobed leaves, they being generally divided into three or more pinnately-arranged, linear, obtuse lobes. There are six linear sepals: the six petals are yellow, the posterior ones three-lobed, the lateral two-lobed, and the anterior ones entire: there is no perfume but a good supply of nectar which attracts many small insects; and, though the flowers are homogamous, self-pollination is, according to Darwin, generally inoperative. The stamens vary in number from sixteen to twenty and curve inwards towards the gynæceum; and the capsule reaches half an inch or three-quarters of an inch in height.

Gerard calls the plant *Crambling Rocket*, probably in reference to an Old Latin name for it, *Eruca peregrina*, which would seem to imply that it spread readily by seed from place to place. Parkinson, however, took Gerard's name to mean "climbing," and proposes as a substitute *Base Rocket*, since, as he says,

"Being referred to the rockets they are base and wilde herbes, but clammer not."

The species is doubtfully wild in Scotland or Ireland; and in England is practically confined to calcareous soils, rejoicing in sunny slopes of bare chalk.

CII.—THE WELD.

Reseda Luteola Linné.

IT certainly seems unfortunate that Linnæus should have adopted two names so similar in sound and in significance for our two British species of *Reseda* as *lutea* and *Luteola*. Neither name can, however, be said to be inappropriate. By all our ordinary criteria the two plants are unquestionably placed in one genus, for which Pliny's name *Reseda* is a suitable substantival term. Linnæus, therefore, simply adopted *Reseda lutea* from John Bauhin's "Historia Plantarum" (1650), in which *lutea* is merely an adjective meaning "yellow," although he might have made use of the *Reseda vulgaris* of Caspar Bauhin's "Pinax" (1671), or the *Reseda Plinii* of Gerard. He might even have spelt the specific name *lutea* with a capital initial, since John Bauhin uses this name, taken from Pliny, generically. There seems, in fact, to have been the same doubt about the spelling of the name of this common dye in Classical times as there has been later with reference to its English name. Virgil treats it as a neuter *lutum*, though in his Fourth Eclogue it appears in the ablative case:—

"Ipse sed in pratis aries jam suave rubenti
Murice, jam croceo mutabit vellera luto":

"But the ram in the meadows will now of his own accord change his fleece to a sweetly blushing red or to the yellow of weld,"

where Messrs. Lonsdale and Lee unfortunately misrender the word by "saffron."

Lutum was probably the earlier form of the name, *luteus* being an adjectival derivative implying "that which pertains to *lutum*," and hence "yellow," whilst *lutea* may have been originally a feminine agreeing with the noun *herba*, not always expressed.

In contradistinction to what they considered a larger related species, Lobel (1570), Johnson in his edition of Gerard's "Herbal," Caspar Bauhin, Parkinson, and Ray, all call our Weld *Luteola*, a diminutive from *lutea*; and Linnæus in adopting this earlier generic name specifically does spell it with a capital.

The plant, if boiled whole, when in bud, affords a beautiful yellow dye for wool, linen, silk, or cotton, or a green when used after woad or indigo. With aluminium or tin mordants these colours are bright and fast to light. The colouring-matter, *luteolin*, is said to be most abundant in the seeds. It has been prepared artificially, but the process is expensive. Once widely cultivated throughout Europe for this use, the plant is now used only to a limited extent, especially for yellow woollen cloth and braid for military uniforms. The existence of the Latin names above mentioned, and of another and entirely distinct series of Teutonic source, suggests the independent and possibly primitive origin of the use of the plant as dye. The names *Woold*, *Wold*, and *Weld* are, perhaps, connected with the word *yellow*, and even with *gold* itself, the German *Geld* and *gelb*; whilst their similarity—probably no mere coincidence—to *woad*, the Early English *wad*, has led to endless



THE WELD—continued.

confusion with the cruciferous *Isatis tinctoria* Linné. The modern German name for the Mignonettes is *Wau*.

Reseda Luteola is often known as *Dyer's Yellow-weed*, or simply as *Yellow-weed* or *Yellows*. *Dyer's Rocket* and *Dyer's Weed* are also used and have naturally resulted, among those more interested in dyes than in plants, in confusion with *Genista tinctoria* Linné.

The plant itself is readily recognisable. It grows much taller and more erect than *R. lutea*, often reaching a height of three feet: it is glabrous, the long undivided linear leaves having a shining polish; while the flowers are in very long and slender spike-like racemes. There are only four sepals and not more than five petals, one posterior one being three- to four-cleft, two lateral ones three-cleft, and the two anterior ones entire. The capsules are shorter and broader than those of the Wild Mignonette.

The physiological observations recorded by Linnæus are comparatively few; so that it is interesting to recall that he notes that in this species the flowering shoots perform a revolving movement—*circumnutation*, as it was afterwards termed by Darwin—following the sun. Though Linnæus naturally connected this movement with that of the sun, the fact that other plants circumnutate in the opposite direction (*i.e.* counter-clockwise instead of clockwise) is, perhaps, sufficient evidence that it is altogether independent of solar influence.

In duration the plant is an annual; but late seedlings often survive a mild winter, thus becoming biennial. This adaptability reminds us of the readiness with which the deliciously fragrant Mignonette of our gardens (*Reseda odorata* Linné), a native apparently of the warmer half of the Mediterranean area from Afghanistan to Egypt and North Africa, can be converted from its usual annual into a biennial or perennial condition—the Tree Mignonette or variety *frutescens* of gardeners. Usually the physiologically exhausting process of flowering and fruiting ends the life of the plant; but, if the flower-buds are removed, a reserve of nutriment is stored up and the plant becomes woody and survives the winter. If flowering be prevented again, the tips of the shoots being pinched out, and fruiting prevented in succeeding years, a bushy shrub can be maintained for four or five years.

Weld, like the other species, prefers a light soil and a sunny situation, and is found on walls as well as on chalk or other calcareous soils.

CIII.—THE SUNDEWS.

Drosera rotundifolia Linné, *D. longifolia* Linné, and *D. anglica* Hudson.

IT is with considerable hesitation that we follow Engler in uniting in the one Order *Sarraceniales* the three Families *Droseraceæ*, *Sarraceniaceæ*, and *Nepenthaceæ*. The structural characters they have in common are but few. They are herbs with scattered leaves; polysymmetric, more or less whorled floral organs; five or fewer united carpels; and numerous small albuminous seeds. Obviously, the insectivorous adaptations of their foliage have had great weight in determining their collocation; but such physiological considerations are a most unsafe clue to affinity. Linnæus's botanical instinct, we feel convinced, led him correctly in placing the Side-saddle plants of North America near the Poppies and Water-lilies; while it is doubtful whether the insertion of the petals and stamens in the Sundews should be considered as hypogynous or as perigynous, and many characters suggest their near affinity to the *Saxifragaceæ* or to their near kin the Australian Pitcher-plants or *Cephalotaceæ*.

The Family *Droseraceæ* comprises rather more than a hundred species in six genera. Geographically, these are curiously wide in their distribution; and, as all of them are insectivorous and most of them are inhabitants of poor boggy ground, it would seem as if their special means of obtaining organic food have enabled them to spread to situations for which there is comparatively little competition. In all of them the root-system is but very slightly developed, whilst all the leaves are modified for insectivorous purposes, being furnished with glands excreting a digestive fluid and absorbing the peptones formed by its action. In the Australian genus *Byblis*, in which there are two species, the leaves and flower-stalks bear two kinds of simple glands with a viscid excretion, some stalked, some sessile. The pinnately-lobed leaves of the two species of the shrubby South African genus *Roridula* bear somewhat more complex glandular hairs of varying length. The only species of the genus *Drosophyllum*, *D. lusitanicum* Link, is a native of Morocco, Southern Spain, and Portugal, and its long narrow leaves bear two kinds of glands, stalked ones with an acid excretion, and sessile ones which do not excrete until stimulated by nitrogenous matter, when they pour out a fluid containing a digestive ferment. Both kinds of glands absorb liquid organic matter. In none of these three genera is any movement exhibited by the glandular hairs.

The genus *Drosera* includes some ninety species, more than forty of which are Australian, while others occur in Madagascar, India, South Africa, and America from Canada to Tierra del Fuego, and the three British species, all of which are here figured, have wide distributional areas chiefly in the Northern Hemisphere. The blades of the leaves, which vary in form in the various species, are surrounded and covered with "emergences" or lobes into which simple veins extend, while they terminate in viscid glands. For these structures, differing as they do from mere hairs by containing vessels, Darwin proposed the name *tentacle*. The sticky



THE SUNDEWS—continued.

secretion is neutral until it has captured some nitrogenous body, when it becomes acid and contains at least one digestive ferment or enzyme. As the secretion is then capable of digesting both nitrogenous matters, as does the pepsin of the animal stomach, and starchy substances, as does the ptyalin of saliva, it would seem that either two special ferments are present or that there is one with the double function like that of the pancreas in the higher animals. The tentacles are extremely sensitive to contact with the most minute particles of organic matter, bending at their bases (sometimes through 180°) so as to carry the captured fly or other body to the centre of the leaf. Nor is the change in the character of the secretion and this movement confined to the tentacle that captures the prey. The protoplasm of the cells of this tentacle contracts and breaks up into rounded masses, and this change spreads rapidly from cell to cell throughout the leaf, all the glands in turn becoming acid and all the tentacles bending inwards. It has been experimentally demonstrated that the plants benefit, both in vegetative growth and in the production of flower, fruit, and seed, by this method of nutrition; and possibly the reddish colouring which largely replaces their chlorophyll may be an indication of their comparative independence of atmospheric carbon-dioxide.

As the two remaining genera in the Family—the Venus's Fly-trap (*Dionæa muscipula* Ellis) of the south-eastern United States, and the rootless aquatic *Aldrovanda* of Australia, India, and Southern Europe, though more elaborately organised—have fewer species and a less wide distribution, Darwin truly says that "*Drosera* has been incomparably the most successful in the battle of life."

In our British species the flowers are cleistogamous, just showing the white petals but not opening, so that they are necessarily self-pollinating.

The popular name *Sundew* is probably from the Teutonic *sindau*, meaning ever-dewy, though it has long been misinterpreted so as to become the German *Sonnenthau* and the *Ros solis* of mediæval pharmacy, which was further corrupted into *Rosa solis*.

Burton in his "Anatomy of Melancholy" quotes Bernardus Penottus, a mediæval physician of Salerno, as saying that "for all ills and phantasies of the head no herb upon earth is comparable to this *herba solis*."

CIV.—THE REFLEXED-LEAVED STONE-CROP.

Sedum reflexum Linné.

ONE of the most important and most interesting starting-points in the evolution of Dicotyledons is presented by the great Order *Rosales*. Its varied but often ill-defined Families comprise alike plants with flowers of a very primitive type and others very highly specialised in structure and function. In most cases their floral organs are cyclic or whorled ; and, though sometimes apetalous, they are generally heterochlamydeous ; so that they represent a higher grade of evolution than the *Ranales*, with which, however, they have much in common. A flower such as that of the Bramble or of Herb Bennet, with five sepals, five petals, and indefinite stamens and carpels, the latter not united and each of them one-seeded, seems at first sight to differ but little from that of a Buttercup. As in *Ranunculaceæ*, the higher types are monosymmetric, though polysymmetry prevails in most Families of the Order. As too in the lower group, the carpels vary in number from one to an indefinite number, and may be either free or united. The main distinction would, in fact, appear to be in the "insertion" of the petals and stamens. Whilst in *Ranales* this is generally—though not always—hypogynous, the primitive condition which we saw so well illustrated in the Mousetail (*Myosurus*) in Plate LXXXII, in *Rosales* it is generally—though not always—perigynous. The floral receptacle, that is, instead of tapering from the base of the flower upward, is arrested in its elongation and grows out, at some distance behind its apex, laterally into a disk, or first laterally and then upward into a cup or so-called "calyx-tube." In some cases this not only surrounds but adheres to and imbeds the carpels, so that the ovary becomes "half-inferior" or "inferior," and the petals and stamens, appearing to spring from the top of it, may become epigynous.

Of thirteen Families included in the Order, four, and those the four largest, are represented in our British Flora ; and their importance may be gauged from the fact that here we devote no less than forty-three Plates—the remainder of this volume—to them. These four Families are the *Crassulaceæ*, *Saxifragaceæ*, *Rosaceæ*, and *Leguminosæ*.

The *Crassulaceæ* form a considerable and very natural Family of herbs and shrubs, numbering nearly five hundred species in fifteen genera, of which *Sedum* comprises 140 species, *Crassula* 100, and *Cotyledon* 90. The group is cosmopolitan, but it is represented in especial abundance and variety of forms in South Africa. Most of them grow in the very driest situations, naked rocks, old walls, or hot sandy plains, where not a blade of grass can live ; and most of them are perennials specially adapted for these conditions by their xerophytic structure. Their stems, and still more generally their leaves, are succulent, being thick and containing a considerable reserve store of water—often mainly derived from dew—which is retained by their thick and often glaucous cuticle with a few sunken stomata. The leaves are also



THE REFLEXED-LEAVED STONE-CROP—continued.

generally packed closely one above another. Such a power of resistance to drought and such a retention of the vegetative faculty do these structures bestow upon them that specimens of this Family required for the herbarium have to be plunged for a short time into boiling water to kill them before they are put in the press, or they will continue to grow, actually sprouting whilst between the pressing-boards. It is probably in correlation with this storage of moisture that vegetative multiplication frequently occurs in the group, either in the form of offsets, so that a cushion-like colony is produced, or even by adventitious buds on the edges of the leaves, as in the Tropical genus *Bryophyllum*. As in other xerophytes, a considerable accumulation of malic or other acid occurs in their juices, and, whatever may be the origin of this, it probably serves as a protection against browsing, to which such green juicy plants, growing often on the margins of desert areas, would otherwise be liable.

The inflorescences in the Family are generally somewhat complex unilateral cymes, and it is to this character rather than to the direction of its leaves that *Sedum reflexum* Linné owes its specific name. One of its former names was *scorpioides*, referring to the same structure. The flowers are usually strikingly polysymmetric and star-like, having an equal number of equal parts in the calyx, corolla, and gynæceum, and double that number in the andrœcium. The number in each of the alternating floral whorls varies from three to thirty. The sepals persist and may be united, as also may the petals and the carpels. The fruit is usually a ring of many-seeded follicles. Flies are attracted by the secretion of nectar by a scale at the base of each carpel, while self-pollination is generally prevented by the stamens maturing in advance of the stigmas.

The large genus *Sedum* consists of herbs, mostly belonging to the Temperate Zone, with from four to six parts in each floral whorl and no union between the petals. Its name, which occurs in Pliny, is derived from the Latin *sedeo*, I sit, and refers to the prostrate mode of growth usual in the group. Their numerous small seeds are widely scattered and they can mostly accommodate themselves to very unfavourable situations, so that garden species, such as *S. reflexum*, often become established over considerable areas with a wild-seeming aspect.

This species has apparently no truly popular English name; but Petiver, in his "Herbarium Britannicum" calls it *Crooked Yellow Sengreen*.

CV.—THE ORPINE.

Sedum Telephium Linné.

THE large genus *Sedum* can be conveniently subdivided by the colour of the petals, which may be yellow, white, or red. The apparent etymology of the name *Orpine* suggests a doubt as to whether it was not originally applied to one of the yellow-flowered species and not to *Sedum Telephium* Linné. A favourite mediæval yellow pigment was a sulphide of arsenic known phonetically as orpiment (*auri pigmentum*), and this name seems in France to have been transferred to the plant as Orpin. It is amusing to find the many corruptions which have arisen among our country-folk from the attempt to rationalise what they do not understand. The meaningless *Orpies* or *Arpent* becomes *Orphan John*, *Harping Johnny*, or *Alpine*. *Live-long*, on the other hand, is a thoroughly comprehensible name, referring to that great vitality which, as we have seen, is in varying degrees characteristic of the whole Family, and connected, as is also the name *Midsummer Men*, with the use of the plant in divination, half playful, half superstitious. The poet Spenser speaks of it as "Orpine, growing still"; and Gerard says, "This plant is very full of life," and proceeds to paraphrase Dodoens on the subject. In Lyte's translation of Dodoens's "Herball" (1578) it is stated that—

"The people of the country delight much to set it in pots and shelles on Midsomer even, or upon timber slattes or trenchers dawbed with clay, and so to set or hang it up in their houses, whereas it remayneth greene a long season and groweth, if it be sometimes over-sprinkled with water."

John Stow in his "Survey of London," which was published almost simultaneously with Gerard's "Herbal," writes:—

"On the vigil of St. John Baptist, every man's door being shadowed with green birch, long fennel, St. John's wort, orpin, white lilies, and such like, garnished upon with garlands of beautiful flowers, had also lamps of glass, with oil burning in them all the night."

John Parkinson, another Londoner, writing nearly half a century later, but quoting the sixteenth-century writer Tragus, says in his "Theatrum Botanicum" (1640):—

"The leaves are much used to make Garlands about Midsommer with the corne Marigold-flowers put upon strings to hang them up in their houses, upon bushes and May-poles, &c. Tragus sheweth a superstitious course in his country, that some use after Midsommer day is past, to hang it up over their chamber doores, or upon the walles, which will be fresh and greene at Christmas, and like the Aloe spring and shoote forth new leaves, with this persuasion, that they that hanged it up, shall feele no disease so long as that abideth greene."

Even to this day a similar playful superstition is sometimes practised at Rio de Janeiro with the bud-bearing leaves of the allied *Bryophyllum* which are given to a departing friend to hang up in his cabin and bring him good luck as long as they continue to sprout.

The bonfires in honour of Baal, the sun-god, no longer blaze on our hill-tops at the Summer Solstice; but we should not be surprised to learn that the use of Orpine for love-divination still lingers in some remote country parts.



THE ORPINE—continued.

In one of the interesting little moral tales for the young of a century ago, "Tawney Rachel, or the Fortune-Teller," attributed to Hannah More, it is said of one of the heroines—

"She would never go to bed on Midsummer Eve without sticking up in her room the well-known plant called Midsummer Men, as the bending of the leaves to the right, or to the left, would never fail to tell her whether her lover was true or false."

That this was then no modern superstition was curiously shown, just about the date when this story was published, by the digging up, near Cawood in Yorkshire, of a small gold ring of fifteenth-century workmanship, which is described in "Archæologia" as bearing the device of two orpine plants joined by a true-love knot, the stalks bending towards each other.

As to the scientific names of the plant, it is called *Sedum Telephium* because identified with the *Τελέφιον*, *Telephion*, of Dioscorides, which was said to be the plant employed by Achilles to heal the grievous wounds which he himself had inflicted upon Telephus, the son of Hercules, who was king of Mysia.

Matthioli called it *Fabaria*, and John Bauhin, *Faba crassa*, i.e. thick bean, from the resemblance of its thick leaves in form to the leaflets of the Broad Bean; but *Fabaria* was used by Koch as the specific name of a closely-related form, the *S. purpureum* of Tausch.

There is a short, thick rhizome and numerous long, tuber-like, descending, adventitious roots, or, as Parkinson puts it, "divers, thicke, round, white, glandulous or tuberous clogges." The erect, fleshy, but brittle aerial stems rise from six to twenty-four inches in height and are often tinged with the red colouring-matter of the inflorescence, so that Koch distinguished Linné's type as *S. purpurascens*. The close-set ascending leaves are sessile, ovate, flat, or slightly concave on their upper surfaces and slightly serrate; and the rose-coloured flowers are grouped in a corymbose terminal cyme and have their floral organs in whorls of five, their stamens maturing so well in advance of the stigmas that self-pollination is improbable. The carpels are furrowed at the back. *S. purpureum* Tausch is mainly distinguished by having slightly stalked leaves and no furrows on the carpels.

Though often an escape from gardens, this tallest of our British species of *Sedum* may sometimes be truly wild, growing, as Parkinson says, "in the shadowic sides of fields and woods," and flowering in July.

CVI.—THE HOUSE-LEEK.

Sempervivum tectorum Linné.

THERE are few more characteristic details in a picture of the English country cottage than the outhouse—be it kitchen, cow-house, or piggery—with its tiled roof bearing a rounded cushion of House-leek. This is, however, practically the only habitat of the plant in this country, and thus, familiar as it is, it has probably little or no claim to be truly indigenous. Possessing a ready means of vegetative multiplication, it may grow for years without flowering, the stores of water in its rosettes of fleshy leaves preventing its feeling the effects of drought which forces many other plants into blossom. That, when it does flower, however, it is a strikingly handsome plant, our Plate is sufficient evidence.

The House-leek (*Sempervivum tectorum* Linné) is a member of a genus of some fifty species, natives of the mountains in the central region of the Old World, mostly tufted perennial herbaceous plants, but in some cases elongating into undershrubs. They produce dense rosettes of simple, fleshy, radical leaves, from the axils of which short branches generally originate with other terminal rosettes. These offsets, which send out tufts of fibrous roots and may in turn produce other offsets like themselves, thus form that cushion-like association which is so characteristic of the vegetation of rock-ledges and screes, the *chomophytes* (from the Greek *χῶμα*, *choma*, earth thrown up) of the ecologists.

On the dry sunny ledges of the Alps, above the zone of trees and where the number of competing species and individuals is comparatively small, various species of *Sempervivum* fix themselves with shallow roots in crevices of shaly rock. From such situations the whole colony may be dislodged by the weathering of the rock and carried down to lower levels; or offsets, whilst still small and rootless, may be swept by wind or rain from ledge to ledge. Such is the natural habitat of a plant which, when in proximity to man, grows almost exclusively on the roofs and walls that he has built, so that Linnæus gave it the appropriate specific name *tectorum*, *i.e.* "belonging to roofs or buildings."

It may have been the prevalence of electric storms among the bare alpine peaks, on which the House-leeks grow, that first suggested that these plants were proof against lightning, so that they became, it is said, sacred to Thor the thunder-god; and the Christian emperor Charlemagne issued an edict ordering that it should be planted on every roof. It has, however, been cynically remarked that nowadays at least it is more common on the roofs of stables and other farm buildings than on those of dwelling-houses, as if the farmer were more solicitous for the safety of his cattle than for that of his family. The Early English name *Homewort* may, however, redeem our ancestors from this reproach.

"This plant is alwaies greene, neither is it hurte by the colde in winter," says Gerard; and this evergreen character was alike the origin of most of the names the



THE HOUSE-LEEK—continued.

plant has borne, and probably also—it being thus always at hand—of a more extended exploitation of what little curative powers it possesses than most plants received.

The Greek *ἀειζωον*, *aeizoon*, of Theophrastus became by literal translation the *Sempervivum* of Pliny, the *Vitalis* of Apuleius, the Old English *Singreen* and its many corruptions, such as *Sengreen*, *Silgreen*, and *Sungreen*—just as *Sindaw* became *Sundew*—and Turner's emended *Aygreen*.

The abundant mucilaginous juice of its leaves, cool and acidulated with malic acid, was found to yield a soothing lotion, or, if boiled in milk, a pleasant drink for the feverish, or, with honey or cream, a healing unguent. It is, says Parkinson,

"good for all inward heats as well as outward . . . a Possit made with the juice of Houselecke is singular good in all hot agues, for it cooleth and temperateth the blood and spirits, and quencth the thirst . . . it cooleth and restrayneth also all other, hot inflammations, Saint Anthonies fire, and all other hot eruptions in the flesh, scaldings also and burnings, the shingles, fretting ulcers, cankers, tetters, ringwormes and the like, and easeth much the paine of the gouthe, proceeding of a hot cause : the juice also taketh away warts and cornes in the hands or feete being often bathed therewith, and the skinne of the leaves being layd on them afterwards : it easeth also the headach, and distempered heate of the braine in frensyes or through want of sleepe, being applied to the temples and forehead : the leaves bruised and layd upon the crowne or scame of the head stayeth bleeding at the nose very quickly. The distilled water of the herbe is profitable for all the purposes aforesaid : the leaves being gently rubbed on any place stung with Nettles or Bees, or bitten with any venemous creature doth presently take away the paine."

Apuleius also makes use of the name *Jovis barba*, which has become the French *Joubarbe* ; but its original significance is not clear. The crowded rosettes in a cushion of House-leek may, perhaps, have recalled the conventional treatment of the close curls in the beard of the Jupiter of Classical sculpture, or a poetical imagination may have seen fit to bestow this name upon the handsome flowering shoots of the plant.

These shoots rise erect to a foot or more in height, bearing a few scattered leaves and terminating in a corymbose cyme with unilateral, or, as they are termed, "scorpioid" branches. The dull red-purple flowers are nearly an inch across and have their parts in whorls of twelve or more. Their petals are—like the foliage-leaves—fringed with hairs, and the stamens of the inner whorl are sometimes aborted, or may even bear ovules within their anthers in lieu of pollen. Though slightly protandrous, the flowers may pollinate themselves. Honey is secreted by minute laciniated scales at the base of the carpels.

CVII.—THE WALL PENNYWORT.

Cotyledon Umbilicus-Veneris Linné.

IT is by no means safe to infer the conditions under which a plant grows from its general habit or structure. It not infrequently happens that an extensive group of plants, perhaps a whole Family, may inherit certain striking external characteristics which were originally adaptive, while individual members of the group have acquired a secondary adaptation to an altogether different set of conditions.

Thus the glabrous, and often glaucous, fleshy leaves of the *Crassulaceæ* suggest xerophilous conditions; and, for the majority of the members of the Family, this suggestion is an accurate indication of the dry environment in which they live. It is not so, however, for the Wall Pennywort (*Cotyledon Umbilicus-Veneris* Linné), which, though sometimes to be found on dry stone walls in the dry air of our eastern counties, is far more abundant and more luxuriant on wet rocks and banks in the moister air of the south-west. So too the storing up of nutriment by perennial plants in enlarged rounded underground structures, whether bulbs or corms, is more frequent among plants inhabiting very dry situations; but in this Wall Pennywort we find a round, solid underground stem sending out a few fibrous adventitious roots thickly covered with root-hairs and producing successive internodes upwards very much as in *Crocus*.

The genus *Cotyledon* is now a considerable one, numbering some ninety species, since it has been found impossible to keep separate from it the plants formerly known as *Echeveria*, many of which are familiar in gardens and green-houses. The main botanical characters of the genus, in addition to those common to the whole Family, are the presence of five parts in each floral whorl, the union of the five petals into a tubular or bell-shaped corolla, and the epipetalous insertion of the stamens. The character, however, to which the group owes its generic name and most of its popular appellations is one that is not even universal within the limits of a single species, viz. the orbicular peltate leaves. Herbert Spencer, writing, as few botanists have ever written, of the pure science of morphology, cites, in his "Principles of Biology," the leaves of *Cotyledon Umbilicus-Veneris* as an example of different kinds of symmetry occurring in the leaves of the same plant, along with differences in their relations to conditions, and illustrates his remarks by a graphic little sketch.

"The root-leaves," he says, "that grow up on vertical petioles before the flower-stalk makes its appearance, are symmetrically peltate; while the leaves which subsequently grow out of the flower-stalk are at the bottom transitionally bilateral, and higher up completely bilateral."

Dioscorides called the plant *κοτυληδών*, *cotyledon*, from *κοτύλη*, *koile*, as some early Latin writers called it *Acetabulum*, the words *κοτύλη* and *acetabulum* both meaning alike a round dish or bowl, the hollow dish-like socket of the hip-joint or other similar hollows in other parts of the body. Matthioli called it *Umbilicus Veneris* from the same character; whilst the great Flemish botanist Charles de



THE WALL PENNYWORT—continued.

l'Écluse or Clusius (1526-1609) was the first to join the two names together in the form adopted by Linnæus, *Coryledon Umbilicus-Veneris*. The fleshy texture and acidulated cool juice of the leaves told some of the earliest botanists—in an age before the recognition of the main importance of floral structures in classification—of the close affinity of the plant with the House-leek and the Stone-crops, so that in popular medicine its leaves were often employed for the same purposes as those of the other *Crassulaceæ*, and we get such names as the Worcestershire *Corn-leaves* and the Devonshire *Cut-finger*. It was, however, the doctrine of signatures, no doubt, that suggested that the plant might be good for diseases of the hip-joint, or, as the upper leaves are kidney-shaped, for those of the kidneys, and thus gave us such names as *Hipwort*, *Kidneywort*, and *Navelwort*, while the outspoken frankness of our ancestors did not think it shame to transfer the attributes of Venus to the Blessed Virgin.

It is naturally in the West of England, where the plant is conspicuously abundant, that it has received the greatest number of the playful nicknames bestowed by children, and Devonshire makes use of *Bachelor's Buttons*, *Cups-and-saucers*, *Pancakes*, *Penny Pies*, *Penny Cakes*, *Penny Plates*, *Penny Hat*, and others. One would not have been surprised had the name last mentioned been of Classical origin, for the peltate root-leaves, with the central dimple marking the attachment of the petiole, closely reproduce the hat usually worn by the Greek statues of Hermes. The Latin descriptive names *Scutellum*, a little shield, and *Scutum cæli*, shield of heaven, though they gave us the Old French name *Escueilles*, have been without effect upon our English popular nomenclature.

In the south-east of England the flower-stalk is generally simple and not more than six inches high; but in the west it is often more than a foot and bifurcating or branched. Although the arrangement may really be cymose, the flowers appear as if in a raceme, hanging by short pedicels. The gamosepalous calyx is small and the tubular corolla, which is about two-fifths of an inch long, is of a greenish-white and destitute of perfume. The ten epipetalous stamens are in two whorls, those opposite to the petals being a little higher up and having the stigmas opposite and near to them but a trifle above them as the flower hangs. Honey is secreted by large reddish-yellow scales at the base of the carpels which give a pink tinge to the lower part of the translucent corolla-tube. The flowers are visited by few small insects, such as *Aphis* and *Thrips*; but self-pollination often takes place, and seed is set abundantly.

CVIII.—THE MEADOW SAXIFRAGE.

Saxifraga granulata Linné.

LESS sharply defined and less uniform in its adaptations than the *Crassulaceæ*, the large Family *Saxifragaceæ* presents many points of structural interest and furnishes many favourites of our gardens. It comprises over six hundred species in some seventy genera and these are grouped under seven well-marked Tribes, most of which have been treated by some botanists as distinct Families. Though the geographical distribution of the Family as a whole must be said to be cosmopolitan, it is mostly represented in Temperate or Arctic-alpine Zones, the latter being specially the region of the genus *Saxifraga* from which the Family takes its name.

Few members of the Family attain the dimensions of shrubs, and those that do so belong to Tribes, such as the *Ribesioideæ*, *Escallonioideæ*, and *Hydrangeoideæ*, other than that which includes the true Saxifrages. Among these shrubs, the Californian *Ribes sanguineum* Pursh, the Chilian *Escallonia rubra* Persoon, the Mock Orange (*Philadelphus coronarius* Linné) of Southern Europe, the Hydrangeas, which have their headquarters in Northern China, and the Deutzias, belonging mainly to the same region, are familiar as hardy plants in our gardens. Of the herbaceous forms in the Family, most are perennial, and many of the Arctic-alpine species grow in the characteristically xerophytic form of cushions in the "open," *i.e.* uncrowded, conditions of such situations. The leaves are generally scattered and the flowers perfect and polysymmetric, with their perianths in two differing whorls of five leaves each, ten stamens, and from two to five carpels usually united in their basal parts. The insertion of the petals and stamens is generally perigynous; but the adhesion of the receptacular tube to the partially united carpels commonly renders calyx and ovary reciprocally half-superior and half-inferior. The anthers generally mature before the stigmas: the fruit may be dry or succulent; and the seeds are albuminous.

Although there is no hard and fast line of separation, this diagnosis shows that *Saxifragaceæ* differ from *Rosaceæ* in the latter Family having generally more than ten stamens; one, five, or more carpels, and exalbuminous seeds. The close approximation between the two Families is strikingly shown by the resemblance of the Japanese *Astilbe japonica* Asa Gray to the genus *Spiræa*, it being commonly sold under the name of *Spiræa japonica*, and still more by the alleged origin of the French garden plant *Astilbe Lemoinei* by the hybridism of *Astilbe Thunbergii* Miquel, a Japanese undershrub, and *Spiræa astilboides* T. Moore, var. *floribunda*. If this be the true parentage of this plant, it is, perhaps, a unique instance of hybridism between plants referred to two Families.

The Tribe *Saxifragoideæ* are all herbs with scattered leaves, and have mostly five leaves in each perianth-whorl, and two carpels united below but with two divergent styles above. Among the British genera of the Family, *Saxifraga*,



THE MEADOW SAXIFRAGE—continued.

Chrysosplenium, and *Parnassia* are placed in this Tribe. By far the most extensive genus in the Family is that from which it takes its name, comprising as it does some two hundred species, mostly northern Arctic, alpine, or Temperate forms. Most of them are xerophytic and many grow on bare rock surfaces, inserting tufts of short, slender rootlets into the crevices of the stone, and thus, perhaps, to some slight extent aiding the penetration of rain, melted snow, and the action of frost, and justifying their names of *Stone-break* and *Saxifrage*, the latter being derived from the Latin *saxum*, stone, and *frango*, I break. The quaint mediæval theory of signatures seized upon this habit as an indication that these plants would be efficacious in cases of calculus.

Even among our few British species, variously estimated at from twelve to twenty in number, there are various adaptations to dry conditions. Thus the purple-flowered *Saxifraga oppositifolia* Linné, which is found from Snowdon, Ingleborough, and Ben Lomond to Franz Josef Land and Tibet, has water-glands at the tips of its leaves which form an incrustation of chalk; and London Pride (*S. umbrosa* Linné), common in our gardens but wild in the west of Ireland, has thick leathery leaves; while the Meadow Saxifrage (*S. granulata* Linné), though it may be found in moist meadows, is more at home on gravelly banks, and stores up nutriment in the little brown, downy, pea-like bulbils from which it takes its specific name. One of the effects of drought upon it is, perhaps, the rich tinting of its palmately-lobed kidney-shaped leaves with red and brown.

Its stem is viscid with scattered glandular hairs, probably, as in London Pride, a protection for the honey-store of the blossoms from the depredations of small crawling insects, those "unbidden guests," as Kerner calls them, which would be unlikely to effect cross-pollination. As such glands can, however, absorb liquid nitrogenous matter, it is possible that this species, and, still more, the little *Saxifraga tridactylites* Linné of our dry upland fields, may derive some nourishment from the captured insects.

The beautiful chalice-like flowers expand to an inch in diameter, their obovate petals, dead-white above, becoming greenish-yellow below as guides to the honey secreted by the base of the ovary; and as they are protandrous they are probably generally cross-pollinated by insect-visitors.

A double-flowered garden variety has received a number of pretty popular names, such as *First of May* and *Fair Maid of France*. It was also, perhaps, the *Pretty Maids* that grew "all in a row" in the garden of "Mary, quite contrary."

CIX.—THE GOLDEN SAXIFRAGE.

Chrysosplenium oppositifolium Linné.

WHEN botanists of to-day can be induced to refer to the early literature of their science, they are frequently surprised to find evidences of minute and accurate observations made by the herbalists of the sixteenth and seventeenth centuries who are too often contumeliously ignored. The mistake is made of thinking that, because they were credulous as to the supposed medicinal efficacy of many plants which we think destitute of any useful properties, they were incapable of many careful observations as to the external structures and habits of plants. They were, it is true, ignorant of the sexuality of plants and of the physiological significance of stamens and stigmas; but the careful scrutiny of form and the test of taste, resulting from the necessity of discriminating the officinal species, led them in many cases to the recognition of affinities which we might have expected to have escaped them.

The name *Sedum palustre luteum* of Morison, for instance, and, still more, the earlier *Saxifraga aurea* of Dodoens, of which our popular name, *Golden Saxifrage*, is merely a literal translation, implies a really remarkable recognition of affinity, which was not forgotten even after the adoption of the name *Chrysosplenium*, proposed by Tabernæmontanus. In the absence of petals one might almost suppose that it was the two divergent styles that suggested the affinity with the Saxifrages. While, however, Parkinson seems to think that this affinity ought to have been based on the possession of lithotritic properties, he seems himself to base it upon the form of the leaf. Placing it, as we are placing it here, close to *Saxifraga granulata* Linné, under the name "*Saxifraga aurea*, Golden Saxifrage," and figuring and describing only one species, viz. this one with opposite leaves, he writes:—

"Golden Saxifrage is a small low herbe having many round leaves lying on the ground bluntly indented about the edges somewhat like the former common Saxifrage, but not hairy, somewhat thicker also and of a darker greene colour, among which rise up divers slender and weake stalkes, little above a hand bredth high, with such like leaves on them as grow below up to the toppes, where among the leaves come forth very small gold yellow flowers not easily observed, and falling away so quickly, that they are so seldome scene with them, and after they are past, there appeare in their places small round heads, wherein is contained small round reddish seede: the roote is composed of a number of small strings or fibres: the whole plant is almost insipide or without taste, but nothing hot that it may be judged to be effectuall to dissolve or expell the stone.

"It alwayes groweth in moist places by Well sides, or other standing and sometimes running waters, and sometimes also in moorish grounds, as about Tidnham in the Forrest of Deane, at Ashford and Iden in Kent, at Chepstow in Essex, and in divers other places.

"It flowereth in May and sometimes in April, but abideth greene all the rest of the yeare, and perisheth not like the last.

"It is called *Saxifraga aurea* of most Writers, from the forme of the leaves and colour of the flowers, scarce any well knowing whereunto better to referre it. . . ."

The genus *Chrysosplenium*, named from the Greek χρυσός, *chrusos*, gold, and σπληνίον, *splenion*, spleenwort, comprises some forty species of small, succulent, herbaceous plants, belonging to the North Temperate Zone, of which two are British, *C. alternifolium* Linné and the more abundant *C. oppositifolium* Linné. These two both occur under very similar conditions and may often be found together. They, and most of the other species of the genus, are perennial; and they are among



THE GOLDEN SAXIFRAGE—continued.

the varied plants to which the name *Sengreen* has been applied. They have stalked, simple, kidney-shaped, cordate, radical leaves, whilst the upper cauline ones are spread out in the same plane as the little blossoms and are often of a golden yellow, thus making the inflorescence more conspicuous. The flowers are arranged in a corymbose cyme, the terminal blossom, which opens first, being pentamerous, though sometimes not formed, whilst the others are tetramerous. The yellow calyx-tube is adherent to the ovary: petals are absent; and honey is secreted by an epigynous disk on the edge of which the stamens are inserted. The two carpels are united below into a one-chambered, many-ovuled ovary; and the two recurved styles end in stigmas which mature at the same time as the anthers, or nearly so. Small insects visit the flowers for their honey; but pollination is also apparently often effected by small snails, especially those of the genus *Succinea*.

Of our two British species, *C. alternifolium* is more erect, with a triangular stem, branching only at the top; scattered leaves; and orange flowers; while *C. oppositifolium* is procumbent, has a quadrangular stem branching from its base, and opposite leaves, and is paler both in foliage and in blossoms.

In hilly districts the Golden Saxifrages may form a bright green line across a mountain-side, marking the course of some little hidden torrent, and their matted growth has led to their being classed as *exo-chomophytes*, or matted-screes-plants. In lowland situations we have known them to form a true peat, associated with Alder, Willows, and Marsh Marigold.

In German their name is translated as *Goldmilz*, and in France they have the pretty name *Dorine*; but in the Vosges they are eaten as salad and are then known as *Cresson de roche*.

CX.—THE GRASS OF PARNASSUS.

Parnassia palustris Linné.

IT has always been a puzzle to us to account for the fact that Wordsworth passing most of his life in the Lake District, where the lovely Grass of Parnassus is abundant, and undoubtedly taking an active interest in the plants of his neighbourhood, should never have sung the praises of this choice beauty among Nature's treasures. Every time we have seen it we have been impressed by its charm. On the pale green of a Sphagnum bog near Windermere, where the oozy black mud was gay with the gold of the Lesser Spearwort (*Ranunculus Flammula* Linné), we first saw its ivory petals and glossy green beside a few plants of pale pink Heath (*Erica Tetralix* Linné) and the flaming fruit-spikes of Bog Asphodel. We have seen its pallid stars dotting miles of marshland in Northern Russia and Prussia; and we have found it with *Epipactis longifolia* Allioni, the Lesser Skull-cap (*Scutellaria minor* Hudson), and Sundew, in a small bog beside a ruined Priory, in Norfolk. We recall no more beautiful surroundings for it, however, than those of the Naunton Seven Springs among the Cotteswolds. Following up the clear babbling stream of the Windrush from the picturesque village of Bourton-on-the-Water, where many white ducks and geese waddle over the common, and many little stone foot-bridges cross the stream, each leading to a separate cottage, a green marshy meadow is reached, circled round on three sides by a low hill of dry rubbly oolite. On its slopes in spring are the silky violet cups of the Pasque-flower (*Anemone Pulsatilla* Linné), the white Meadow Saxifrage, and the rare little Perfoliate Penny Cress (*Thlaspi perfoliatum* Linné); but in autumn the Grass of Parnassus in the marsh has no rival. Seven copious springs gush out of the hill-side into overflowing bubbling pools to feed the Windrush, bordered with Forget-me-nots, hard by; and in soft green islands between these pools, reddened here and there with rosettes of Sundew, rise the stiff green stalks of *Parnassia*. Surely the snow-crowned Parnassus itself and the Castalian spring, the favourite haunt of Apollo and the Muses, was not a fairer scene!

The whole plant is glabrous and both leaves and flower-stalks are a glossy green. The ovate, heart-shaped outline of the former and their thick texture naturally suggested the comparison with *Anemone Hepatica* Linné, which made Cordus name it *Hepatica alba*, a name which Gerard rendered literally as *White Liverwort*. The short, thick, premorse rhizome bears tufts of unbranched roots and the withered remains of former leaves: the radical leaves have petioles two or three inches long; but in addition to them there is only a single sessile cauline leaf on each flower-stalk, less than half way up it. The peduncle is angular and is twisted by circumnutation, though standing singularly erect and sometimes reaching nearly a foot in height. With the exception of the gynæceum, the symmetry of the solitary terminal flowers is pentamerous: the five ovate green sepals, which are spreading in



THE GRASS OF PARNASSUS—continued.

the flower stage, persist round the fruit-capsule ; and it is only the small number of the stamens and the union of the carpels which should have prevented the suggestion of affinity in the name *White Buttercups* which has been applied to the plant.

The flowers are remarkably variable in diameter, ranging from less than three-quarters of an inch to over an inch and a half. Creamy white exteriorly, the five beautiful rounded and hollowed petals are a purer white pencilled with pellucid greenish veins on their inner surfaces, these veins acting apparently as honey-guides. The whole of the exquisite blossom seems, in fact, elaborately contrived to favour cross-pollination by insect agency. We have seen a considerable number of insects, Thrips, ants, and small flies crawling about the corolla ; but in no single instance did we see an insect impeded by the secretion, or a dead fly within the flower. There seems no evidence in favour of the carnivorous function ascribed to the remarkable staminodal glands merely from their superficial resemblance to the leaf of a Sundew.

The flower is markedly protandrous, the large anthers of the five stamens being fully formed when the corolla first expands, when they are pressed with their backs against the immature apex of the ovary. Maturing in succession, the subulate filament of each stamen lengthens, straightens itself, and moves forward through an arc of over 120° : the anther discharges its pollen outwards and falls off, while the filament now lying horizontally between two petals is even more persistent than they. This movement of each stamen occupies a separate day, and not till the sixth day do the four sessile stigmas become receptive ; so that cross-pollination would appear to be essential. One of the most striking details in the flower is the whorl of five nectaries alternating with the stamens. These are good-sized obovate scales secreting honey from two glands on the inner surface of each of them, but fringed with a comb of from eight to seventeen filaments, terminating in glistening, but dry, yellow knobs so deceptively resembling drops of honey that flies have been observed vainly licking them. The external form of these nectaries has suggested a kinship between *Parnassia* and the St. John's-worts (*Hypericum*), in which the stamens branch in a somewhat similar manner ; but Jussieu was undoubtedly right in seeing most affinity to the Saxifrages. The honey is more copiously secreted from the basal glands of the nectaries on bright sunny days and then the flower has a honey-like perfume, which disappears as the sun declines.

The ovary is made up of the unusual number of four carpels, united into a single chamber, with parietal placentas bearing numerous very minute seeds, ripening to a capsule which splits down the four midribs of the carpels.

CXI.—THE GOOSEBERRY.

Ribes Grossularia Linné.

IT is now generally agreed that the genus *Ribes* is so closely akin to the Saxifrages that at the most it can only be erected into a Tribe or Sub-Family *Ribesioideæ* in the Family *Saxifragaceæ*. It comprises nearly sixty species of shrubs, native to the colder Temperate regions of the Northern Hemisphere and to the Andes. They bear simple, scattered or tufted, stalked leaves, palmately veined, but variously folded in the bud and mostly exstipulate; racemes of polysymmetric flowers with a distinctly inferior ovary; resulting in a one-chambered berry, which is surmounted, when ripe, by the withered calyx. Much of the pulp in these fruits is, in fact, the testa or outer coat of the seeds. Their stems are, in some cases, covered, when young, with glandular hairs or may, as is the case with the Gooseberry, bear spines. The flowers, though sometimes unisexual, are mostly of small size, complete, regular, and generally pentamerous, with a bract and two minute bracteoles below each. The receptacular-, or so-called calyx-, tube, unlike that of most *Saxifragaceæ*, is so united or continuous with the two carpels of the ovary as to present a somewhat marked difference from the half-adherent, or "half-superior," condition in the Saxifrages; but it expands above into a saucer-shaped or deeper cup-shaped hollow, from glands at the base of which honey is secreted. The limb of the calyx is often coloured, and, as we have said, persists in a withered or *marcescent* condition in the fruit stage. The expansion of the "calyx-tube" carries out the petals and stamens (each usually five in number) in a perigynous manner. In spite of their honey, the flowers, with their usually small scale-like petals, are not very conspicuous; and, though insect visits occur, stamens and stigmas generally ripen sufficiently contemporaneously for self-pollination to take place.

The name *Ribes*, which was employed by Fuchs, is said to have been of Arabic origin, to have referred originally to a species of Rhubarb, and to have been transferred to the Gooseberry and its congeners, which belong, as we have seen, to more northern climates, merely on account of the similar taste of the fruit of the latter and presumably the leaf-stalks of the former. Similarly the name *Grossularia*, used generically by Dodoens, is derived from the Latin *grossus*, an unripe fig. The French derivative of this, *Groseille*, is obviously connected with *Grizzle* and *Gozill*, which are recorded from Dumfries and from Kent respectively, and apparently with *Groser*, which is used in Turner's "Names of Herbes." He writes, under *Vua crispa* :—

"*Vua crispa* is also called *Grossularia*, in english a Groser bushe, a Gooseberry bush. It groweth only that I haue sene in England, in gardines, but I haue sene it in Germany abroad in the fieldes amonge other bushes."

Thus a name spelt in accordance with a fancied etymology, the berries having less to do with geese than they have, judging from the French *Groseille à maquereau*,



THE GOOSEBERRY—continued.

with mackerel, has replaced in general use the far older *Feabes*. This last occurs in an Early English tenth-century manuscript ; and, besides being still in wide-spread colloquial use, under various slightly differing forms, is used by Gerard. He writes :—

“The fruit is used in divers sawces for meates, and used in broths in stead of Verjuyce, which maketh the brothe not only pleasant to taste, but is greatly profitable to such as are troubled with a hot, burning ague. The ripe berries are sweet, but yeeld little nourishment, and are seldome eaten or used as sawce . . . the young and tender leaves are eaten in sallads.”

The spinous stems and flowers, either solitary or two or three together, characterise a sub-genus *Grossularia*, as distinguished from *Ribesia*, with unarmed stems and many-flowered racemes. The name *Currant* for these last, whether red-, white-, or black-, fruited, is simply a transfer of the name of the small black grapes—widely differing in structure—which have long been exported from Corinth.

The rigid buff spines in the Gooseberry are generally in groups of three below the leaf-buds, and may represent a leaf with its stipules. The leaves, which are of a vivid light green when young, are orbicular, three- to five-lobed, and irregularly crenate, with sheathing bases to their petioles ; and it is interesting to trace in the leaf-bud the series of transitions from a mere sheath serving as an outer bud-scale to forms with more or less rudimentary blades and ultimately to fully-formed leaves with sheath, stalk, and blade towards the interior of the bud. The flowers hang downwards and expand in April and May, their short downy stalks bearing minute bracteoles. Greenish at first, the lobes of the calyx bend backward and become tinged with brown or red, and the throat of the calyx-tube, the bases of the stamens, and the young ovary may all bear stiff hairs which arch over and protect the honey from the shorter-tongued insects. In the form most commonly found wild on the Continent, to which Linnæus gave the name *Ribes Uva-crispa*, the ovary is glabrous.

In England the Gooseberry is most commonly merely an escape from cultivation, its sticky seeds being often carried from cottage gardens to neighbouring hedgerows or copses by birds, much as are those of the Mistletoe. In the North, however, as also in Scandinavia, it seems truly indigenous.

Over three hundred varieties of Gooseberry are known in cultivation, with fruits varying in form, from round to oblong, oval, and obovoid ; in colour, from green to yellow, whitish, or red ; and in surface, from smoothness to downiness or hairiness. It is the hardiest of all our cultivated fruits and, in fact, succeeds better in our northern counties than in the warmer south, and better in our moist air than in the drier atmosphere of the eastern United States.

CXII.—ANALYTICAL DRAWINGS OF
THE MIGNONETTE, SUNDEW, STONE-CROP, AND
SAXIFRAGE FAMILIES.

(*Resedaceæ*, *Droseraceæ*, *Crassulaceæ*, and *Saxifragaceæ*.)

WE have in this Plate dissections illustrating eight genera belonging to four Families.

The first line represents the Mignonette (*Reseda lutea* Linné), a type of a Family more nearly related to the Families analysed on Plates XC and C than to those with which it appears here. In none of the species of the genus are the flowers individually large, although they are massed, coloured, and in some cases perfumed so as to become conspicuous or attractive. The curiously large and antero-posteriorly unsymmetrical disk represented by Fig. 3 in this line affects the symmetry of the whole flower. Fig. 1 is a flower, natural size; Fig. 2 shows the six petals separated so as the better to exhibit the large multifid posterior ones, the undivided anterior pair, which are crowded under the disk, and the intermediate lateral pair. Fig. 4 represents the curious bladder-like fruit with surface projections corresponding to the seeds within, and open at the summit, as it was in the earlier floral stage.

The second line of figures represents the Round-leaved Sundew (*Drosera rotundifolia* Linné). The first figure shows a young leaf, as seen in profile, with its marginal tentacles depressed, so that, as Darwin pointed out, in the process of capturing insects their sticky glandular apices bend through more than 180°. Fig. 2 shows a similar leaf with the tentacles bending inwards. Those of the farther side have been omitted for the sake of clearness. Fig. 3 shows the essential organs of the cleistogene flower; Fig. 4, a flower in longitudinal section; Fig. 5, a sprouting seed unfolding its first true leaf; and Fig. 6, the seed before sprouting.

The third, fourth, and fifth lines of figures represent genera of the Family *Crassulaceæ*, viz. *Sedum*, *Sempervivum*, and *Cotyledon*. In the third line, Fig. 1 is a flower of *Sedum reflexum* Linné, natural size; Fig. 2 is the calyx and stamens, the latter twice the number of the segments of the former, so shown as to exhibit the striking symmetry of the blossom. Fig. 3 is the calyx and gynæceum; Fig. 4, a single carpel detached from the ring; and Fig. 5, a similar carpel enlarged and cut longitudinally so as to display the numerous ascending parietal ovules in the follicle.

The fourth line deals with the House-leek (*Sempervivum tectorum* Linné). Fig. 1 represents a single flower enlarged, although not very much so. Fig. 2 is a petal with its superposed stamen; Fig. 3, a flower not yet completely expanded; and Fig. 4, an interesting example of the frequent abortion of some of the stamens in this plant. This stamen bears imperfectly developed ovules in lieu of pollen, physiologically a most remarkable transformation and of great interest



ANALYTICAL DRAWINGS OF THE MIGNONETTE, SUNDEW,
STONE-CROP, AND SAXIFRAGE FAMILIES—continued.

from the point of view of comparative anatomy. Fig. 5 shows the gynæceum, natural size; Fig. 6, a single carpel in longitudinal section; and Fig. 7, the same structure in transverse section.

The fifth line of figures represents the Wall Pennywort (*Cotyledon Umbilicus-Veneris* Linné). Fig. 1 is a flower, natural size, showing the small calyx and the tubular corolla tinged with colour at its base in the neighbourhood of the honey glands. Fig. 2 is the corolla, so opened as to exhibit the two whorls of epipetalous stamens; Fig. 3 shows the gynæceum; Fig. 4, the same part enlarged; Fig. 5, a carpel, also enlarged; and Fig. 6, a transverse section across it.

The last three lines of figures represent *Saxifragaceæ*; but such very diverse types as *Saxifraga*, *Parnassia*, and *Ribes*. Line six deals with *Saxifraga granulata* Linné, the first figure showing a blossom of natural size, as seen from above. Fig. 2 is the calyx; Fig. 3, the calyx and stamens, as seen from above; Fig. 4, a side view of the ovary and stamens; Fig. 5, the stigmas in their earlier incurved position; Fig. 6, a young fruit with them in the later recurved position; Fig. 7, one of the spoon-shaped stigmas enlarged; and Fig. 8, a ripe fruit.

The penultimate line represents the beautiful and interesting Grass of Parnassus (*Parnassia palustris* Linné). Fig. 1 is a flower, as seen from above; Fig. 2 is a stamen; Fig. 3, a nectary with a curved obovate nectariferous base and a fringe of dry honey-like sham nectar glands. Fig. 4 shows the same structure enlarged; Fig. 5, the ovary; Fig. 6, a transverse section of it; and Fig. 7, the same section enlarged, so as to make clear the four carpels with their prominent parietal many-seeded placentas projecting into the single ovarian cavity.

The last line of figures deals with the Gooseberry (*Ribes Grossularia* Linné). Fig. 1 is a flower opened, so as to disclose the ovary, and enlarged. Fig. 2 shows the calyx, with the little scale-like petals between its lobes and the perigynous stamens. Fig. 3 is the gynæceum; Fig. 4, a young fruit in longitudinal section; and Fig. 5, the same in transverse section, enlarged, showing the two parietal placentas and the seeds which are borne on rather long stalks or funicles and have a thick pulpy transparent testa which constitutes much of the pulp of the interior of the fruit. The inner coats of these seeds are dark-coloured, hard, and thick, like the testa in other seeds.

CXIII.—THE MEADOW-SWEET.

Spiræa Ulmaria Linné.

A PART altogether from their many beauties, the members of the Rose Family present so striking a variety of structure that we have found it necessary to represent them by an exceptional number of types. In the Stone-crop Family (*Crassulaceæ*) we had a uniformly succulent xerophilous group with symmetrical flowers, flat or slightly hollowed receptacle, and carpels not less than three in number, slightly if at all united at the base, forming many-seeded follicles. In the *Saxifragaceæ* there is a greater variety in habit and in flower and fruit. The flowers are symmetrical, cyclic, and pentamerous; and the receptacle may be flat but is generally hollowed; but the carpels are generally two in number, united at least at their bases, and so sunk in the adherent hollowed receptacular tube as to be either half-inferior or wholly so. The stamens may thus be perigynous or, as in *Ribes*, epigynous; and the fruit may be dry or succulent, a capsule, or a berry. In the much more extensive Rose Family, however, we have a far greater variety of habit: the floral receptacle may be prolonged upwards, flattened, or hollowed: the carpels occur in every variety of number, cohesion, and adhesion, from one to an indefinite number, apocarpous or practically syncarpous, superior or inferior; and the fruits are more varied than in any other Family, from the one achene of *Alchemilla*, the ring of follicles in *Spiræa*, and the many achenes of *Geum* or *Potentilla*, to the drupe of *Prunus*, the many drupels of *Rubus*, the pome of *Pyrus*, and the highly specialised fruits of the Strawberry and the Rose. This varied habit and structure, of which the latter implies varied adaptations for pollination and for seed-dispersal, suggest a high antiquity for the Family, as does also the fact that it is cosmopolitan in its geographical distribution.

So close is the affinity between the *Saxifragaceæ* and *Rosaceæ* that some genera seem to be referred to the one Family or the other almost arbitrarily. It is thus difficult to separate the Saxifragaceous genus *Astilbe* from the Rosaceous *Spiræa*; but while the former has generally not more than ten stamens and two or three carpels, *Spiræa* has twenty or more stamens and at least five carpels. When, as in Japan, the two genera are represented in the same country, as by such species as *Astilbe japonica* Asa Gray and *Spiræa astilboides* T. Moore, their affinity is very striking.

Our British *Rosaceæ* fall into four Sub-Families. The first of these, the *Spiræoideæ*, may be stipulate or exstipulate: their floral receptacle tapers upward in the staminal region; and the carpels, sometimes reduced to one or two, or multiplied to twelve, but usually five, form a level whorl of follicles. The calyx persists in the fruit stage and has no epicalyx, and the ovules in the carpels are pendulous.

The genus *Spiræa* comprises some fifty species of herbaceous or shrubby plants, natives of the Temperate and colder regions of the Northern Hemisphere.



THE MEADOW-SWEET—continued.

Their leaves vary ; but have generally stipules united laterally (*adnate*) to their petioles. The flowers are white, cream-colour, or various shades of red, and are generally individually quite small, but are massed in varied terminal or axillary cymose clusters. The inferior, persistent calyx is generally five-cleft : the petals equal the calyx-lobes in number : the stamens range from twenty to sixty in number ; and the carpels are usually free, or nearly so, and two- to six-seeded.

The name *Spiræa*, the Greek *σπειραία*, *speiraia*, dates from Theophrastus ; but its significance is uncertain. It may refer to the flexible branches, to the sprays of blossom twisted into garlands, or, more probably, to the follicles, which in the Meadow-sweet are each spirally twisted. Of our two indigenous British species, the Meadow-sweet bears the specific name *Ulmaria*, which is employed by Dodoens, from the decided resemblance of its leaflets to the leaves of Elm (*Ulmus*). With a short rhizome, it sends up its erect, branched, and angular aerial stems to a height of two to four feet. The root-leaves are large and *interruptedly pinnate*, having, that is, a few large serrate leaflets and small intermediate ones in pairs. The terminal segment is large and acutely palmately three- to five-lobed, and the whole leaf is usually white and downy on its under surface.

The creamy-white blossoms are borne aloft in very characteristic complex cymes with long side branches ; and, though they yield no honey, attract many insects by their fragrance and abundant pollen. The carpels are from five to nine in number, smooth and twisted, and each contain two brown flattened seeds. The late Lord Avebury suggested that the twisted carpels might deceive birds by their resemblance to small caterpillars and thus be carried to some distance.

As throughout the summer its foamy masses of fragrant blossom trace the winding line of the brook as it traverses the fields, or advance into the water of the reed-swamp with such companions as the Great Willow-herb (*Epilobium hirsutum* Linné), the Yellow Loosestrife (*Lysimachia vulgaris* Linné), and the Water-plantain, it seems well to deserve the old name *Regina prati*, which remains in Scotland and in the United States as *Queen of the Meadow* and under similar forms in most countries of modern Europe. As William Coles puts it in his "Adam in Eden" (1657) :—

"In what meadow so ever it grows, it is more perspicuous than any of the rest."

The appropriate name *Meadow-sweet* is used by Gerard, and is taken, like *Bridewort*, to refer to the use of the plant for strewing the floor, though Dr. Prior considered it but a corruption of *Meadwort*, a name still employed in Scandinavia, which means that the scented blossoms were added as a flavouring to mead.

CXIV.—THE DROPWORT.

Spiræa Filipendula Linné.

THE likenesses and unlikenesses of the Meadow-sweet and the Dropwort afford a good example of two species alike obviously belonging to one genus and yet distinctly separated from one another.

The Dropwort (*Spiræa Filipendula* Linné) is, in general, as characteristic of dry upland pastures as the Meadow-sweet is of moist lowland situations. Being also apparently more particular as to soil than its congener, the Dropwort is less frequent. We should have been inclined to describe it as belonging exclusively to chalk and limestone pastures, had it not been for the earliest record of the species as a British plant and its present occurrence in Middlesex. At first reading, William Turner's mention of the plant in 1548 might well be taken to refer to one of the Umbelliferous Water-Dropworts for which we now employ the Latin name *Ænanthe*.

"Ænanthe," he writes, "is called boeth of the Herbaries and of al our country men Filipendula, in duch Rotensteynbrech . . . Filipendula groweth in great plentie beside Syon & Shene in the middowes."

It is, however, quite certain that the plant here referred to is *Spiræa Filipendula*. Lobel figured it under the name *Ænanthe Filipendula*; and, although Parkinson's figures and description are somewhat confused, they also help in the identification. He speaks of a *Filipendula* that

"shooteth forth divers long winged leaves, that is, many small leaves, some bigger and some lesser, set on each side of a middle ribbe, and each of them dented about the edges, somewhat resembling Burnet and wild Tansy, or rather Agrimony, or betweene them all . . . the roote consisteth of many small blacke tuberous peeces, fastened together by many small long blackish strings, which runne from one unto another."

Though, however, he calls this the Syon plant, he adds that it has "many white sweete smelling flowers," whilst the flowers of *Spiræa Filipendula* are scentless; and he speaks of another species as having flowers "of a white enclining to a purple," which phrase might well be applied to the opening buds of the Dropwort. He adds, however,

"This is taken by many learned writers, and herbarists in these dayes, to be the 'Ossá@n, Ænanthe of Dioscorides . . . It is called of all moderne writers *Filipendula*, quod numerosi illi in radice bulbilli, quasi ex filo pendere videntur* . . . the Italians and Spaniards call it *Filipendula*, . . . the Germanes *Rotten Steynbrech*, that is, red breakestone, from whence came the Latine name among them *Saxifraga rubra*, red Saxifrage; as also wild Garb, that is *Millefolium sylvestre*."

Not many years ago the plant was still abundant in the low-lying meadows near the Thames in the neighbourhood of Richmond, which are neither dry nor calcareous; and Messrs. Trimen and Dyer in their "Flora of Middlesex" speak of the distribution of the species within that county as limited to the immediate neighbourhood of the Thames. Probably the rhizomes and tubercles, which retain their vitality under very adverse circumstances, have been carried down by the river from its upper reaches where it often flows at the foot of steep chalk slopes

* "On account of the numerous bulbils on the root which appear as if hanging by a thread."



THE DROPWORT—continued.

on which this plant would be in its more natural home, so that it has come about that Turner's first recorded locality is an altogether exceptional one.

It is probably an example of how Old Latin names, often of monastic introduction, have been adopted merely phonetically into colloquial speech that the name *Fillyfindillan* is recorded by Messrs. Britten and Holland as in use in County Clare.

The plant has a short brownish rhizome; and the tubercles are generally darker, sometimes black and fusiform; but we have often found them united into palmate bifurcating or trifurcating masses. They are also sometimes united several together end to end in a necklace-like or *moniliform* manner. Internally they are white and farinaceous; and they are said by Linnæus to "afford no despicable substitute for bread"; but the whole plant is decidedly astringent and had formerly very many medicinal virtues ascribed to it.

The leaves are almost entirely radical, spreading in a rosette adpressed to the earth, or ascending. They are dark green and glabrous, and are very prettily divided in an interruptedly pinnate manner into a great number of small sessile leaflets deeply cut and serrated. There are a pair of narrow, uncut stipules to the root-leaves; but those of the few cauline leaves are toothed.

The aerial stem is smooth, round, and erect, rising a foot or eighteen inches, and often deeply tinged with crimson, the same deep red extending to the outside of the opening flower-buds. The branching of the many-flowered inflorescence is similar to that of the Meadow-sweet and is technically known as an *anthela*, the first-formed branches ending in flowers and then producing lateral shoots which overtop them.

The flower does not secrete honey; and it is somewhat remarkable that the fragrant principle *coumarin* so abundant in the Meadow-sweet, and so simple in chemical constitution that it has originated independently in many other plants of different Families, from the Tonka bean (*Coumarouna odorata* Aublet) to various Orchids and the Sweet-scented Vernal Grass (*Anthoxanthum odoratum* Linné), does not occur in this species.

The carpels are more numerous than in the Meadow-sweet, varying from six to twelve in number. They are straight and have a downy surface and terminate in short recurved styles and large blunt stigmas.

There is a pretty double variety in gardens which is useful for bouquets both in its foliage and in its lasting blossoms. In Northamptonshire it is known as *Lady's Ruffles*. It is very hardy and is readily increased by division.

CXV.—THE CRAB-APPLE.

Pyrus Malus Linné.

THE second Sub-Family of the *Rosaceæ* is the *Pomoideæ*, comprising the genus *Pyrus* and such closely related series as the Quinces (*Cydonia*), Medlars (*Mespilus*), and Hawthorns (*Cratægus*). They are all woody plants, with stipulate leaves; but their most characteristic part is the gynæceum. From two to five carpels—or very rarely a solitary carpel—are progressively enclosed and united by the enlarging receptacular tube into the practically syncarpous and inferior fleshy fruit known as a *pome*, surmounted by the withered but persistent calyx, the carpels themselves constituting the hard central “core.”

Though the Apple is now cultivated at the Cape, in Australia, and in New Zealand, the genus *Pyrus* in a wild state is confined to the Temperate and colder parts of the Northern Hemisphere; and, among fruit trees, the Apple is, perhaps, more characteristic of the North Temperate Zone than is any other. It cannot be grown within the Tropics or north of the Arctic Circle; but rejoices in the dry climate and sunny summers of Canada, the United States, and Australasia even more than in its native Old World home. The only truly indigenous British tree with a coloured corolla, the Crab-apple in May is a peculiar glory of our latitudes. The late Dr. Alfred Russel Wallace, writing of Tropical scenery, said:—“I have never seen anything more glorious than an old crab-tree in full blossom.” The fruit, at the same time, as the fruit *par excellence* of the Teutonic area, has appropriated the name Apple which was once a common Germanic term for fruit of any kind, from Bramble-apples and Thorn-apples to Love-apples and Pine-apples.

The genus *Pyrus* is characterised by its urceolate receptacular tube, its two to five carpels distinct from one another, though entirely imbedded in the receptacle, with a cartilaginous texture, and containing one, or more usually two, seeds each. Its species fall into two series or sub-genera, at least so far as the British representatives of the genus are concerned, which differ mainly in bearing large or small fruits, the latter series, which includes the Rowan and the White Beam, being sometimes separated as the genus *Sorbus*. The two well-known species of *Pyrus*, in the restricted sense as the name of the sub-genus with large fruits, viz. the Pear (*P. communis* Linné) and the Apple (*P. Malus* Linné), differ mainly in the partial union of the styles in the latter, and more especially in the forms of their fruits, the Pear having the core near its apex, and the apex of the fruit-stalk so enlarged as to make the fruit *turbinate*, shaped, that is, like a peg-top, while the Apple is more globular and is *umbilicate*, or hollowed, at the insertion of the stalk.

Whilst in our orchards the Apple-trees are very generally blown into various sloping directions of growth, their low stems commonly branch into three main boughs which spring from the trunk at angles of from 90° to 120°, thus giving a spreading habit to the tree. The subsequent branches and twigs diverge at angles



THE CRAB-APPLE—continued.

slightly more than a right angle, thus giving to the tree its characteristic and readily recognised irregularly-spreading outline—one of its chief charms.

The leaves of the Apple are never very ornamental. They unfold with a brownish tinge in April, a little in advance of the blossom, and are oblong with an abrupt or *acuminate* point and slightly serrate margin, and in autumn they dry to a dark brown colour.

When the delicate deeply-blushing petals widen their curves in May, like rosy sails billowing in the breeze, the stigmas are already ready to receive the insect-borne pollen; and, whilst bees and other insects come for the abundant honey, the anthers burst, row after row, from the outside towards the centre of each blossom, during the course of several days. Then, after pollination, there ensues the remarkable series of changes by which the receptacular tube enlarges into the fruit, which in the wild Crab-apple ripens at first to yellow to be afterwards

"Sun-reddened with a tempting cheek."

Of the two forms found apparently wild, *Pyrus Malus*, var. *mitis* Wallroth, which has its young branches, calyx-tube, and under side of the leaves downy and carries its fruit erect, is the probable original stock of our cultivated Apples, and in Britain is, perhaps, always an escape from cultivation. The other, more truly wild, is *Pyrus Malus*, var. *acerba* De Candolle, which has a drooping fruit and the above-mentioned parts smooth.

The Apple may have been spread over northern Europe in prehistoric times by migratory herds of deer, and certainly the Crab-trees in our old forest lands owe their preservation to the fondness of deer for this fruit. Carbonised remains indicate the use of the Apple as food, by the prehistoric Swiss lake-dwellers, before the Druid cut with golden knife the golden boughs of the Mistletoe from the trees in the *Ynys yr Avallon*, the Isle of Apples. Pliny, while fabling of pygmies who eat nothing, but live on the smell of Apples, enumerates twenty-two cultivated varieties; and the number referred to in our literature increases from the "Pearmane" and "Costard" of Chaucer, the seedling "Pippin" (brought from France by Leonard Maschal in 1525), the Codling, Pomewater, Bitter-Sweeting, and others mentioned by Shakespeare, to fifty-seven enumerated by Parkinson, seventy-eight by Ray, two hundred by Hartlib, and probably at least two thousand sorts at present raised.

Crab-tree cudgels are proverbial for their hardness, and verjuice is still made in France from the unripe fruits of the wild species. But from the dim antiquity when, as the Edda tells us, Iduna gave the gods Apples to eat in order to renew their youth, the cultivated varieties have eclipsed the importance of the Crab.

CXVI.—THE WHITE BEAM.

Pyrus Aria Ehrhart.

WE do not expect to see snowdrifts in May. Blackthorn winter is then over and the Beech-trees may be already green when we see on the brow of some chalk hill or the ledges of some limestone escarpment what looks at first sight like some lingering snow-wreath. It is the white under surfaces of the leaves of the White Beam (*Pyrus Aria* Ehrhart) which the wind has turned towards us. The white flowers, which may also be out at this season, combine to entitle this shrub, with its long flexible branches, to its Hampshire names *Hoar Withy* and *White Rice* (*Rice* meaning a shrub), to Evelyn's name for it, *Whiteleaf*, or to the general name of *White Beam*. As the species is abundant thereabouts, it may well have given its name to the modern village of Whyteleafe in the chalk downs of Surrey; whilst as "Beam" is merely the Old English form of the German *baum*, a tree, to add "Tree" to "White Beam" is obviously a mere pleonasm.

A native of the mountains of Greece, and of most of the countries of Europe, except the extreme north, and also of Northern Africa and Western Asia, its name *Aria*, which it has borne since the days of Theophrastus, may possibly refer to Khorassan, the country which was known in ancient times by that name. The French name *Alouchier* has been connected with *alluchon*, a cog, the tough wood of the White Beam being used for making cogs among other articles of turnery; but the form *Alisier* and the German *Arlasbaum* have also been derived from some supposed mediæval forms, such as *aliarius* and *arloxerius*. The shrub is so distinctively at home in exposed elevated situations that Bauhin's name *Sorbus alpina* is decidedly appropriate, while the Dutch *Bergsorbenboom* is only a translation from this Latin form. Of the many local names which this species bears in the British Isles, *Cumberland Hawthorn* would seem to be merely one of Gerard's deliberate coinages; whilst *Sea Ouler*, quoted by Parkinson as in use in the same part of England, is merely Sea Alder, the leaves being not unlike in form to those of the Alder, while the shrub itself is specially luxuriant on the exposed seaward front of the limestone hills of Cumberland and Lancashire. We may recall that when Tom the chimney-sweep in Kingsley's "Water Babies" climbed down the limestone ledges of Lewthwaite Crag,

"He came to a bank of beautiful shrubs: whitebeam with its great silver-backed leaves, and mountain ash, and oak."

On these hills of north-western England the White Beam grows at altitudes of 1,500 feet, and its structure exhibits several marked adaptations against cold and damp. The older bark is smooth and red-brown; but the young shoots have a white mealy surface with conspicuous *lenticels* or cork-warts of a paler hue. The dwarf-shoots or spurs, given off at angles of about 45°, are also downy and bear leaves clustered in tufts, preceded by downy buds with leathery scales exuding a



THE WHITE BEAM—continued.

sticky secretion. The delicate tissues of these buds may frequently be found in winter congealed to ice and yet in no way permanently injured. The leathery scales, gummy excretion, and thick felt of hair on the exposed under surfaces of the ribs of the leaves, all seem to be mainly effective by keeping off moisture from the outside and probably by also moderating the suddenness of any changes of temperature. It is noticeable that as the leaf-buds unfold they always assume a vertical position, like a row of white pillars, whatever may be the position of the shoot that bears them. The downiness of shoots and leaves extends to the stalks of the broad flat clusters of white flowers, and even to the lower part of the two to four styles which each flower contains.

The flowers are followed by the many sub-globose fruits, each about half an inch in diameter. By October these have ripened to a bright scarlet, but are dotted over with the numerous little brown lenticel-like points which have given them the name of *Chess-apples*. The orange-coloured flesh of these little apples is mealy and at first acid and astringent. Like that of the Medlar, however, it undergoes a change known as bletting, especially, perhaps, after a slight touch of frost, by which it is rendered palatable. In times of famine these fruits have been dried and ground as a material for bread, and it is probably to the recollection of such a use that the tree owes the German name of *Mehlbeerbaum* (meal-berry-tree). They have also been fermented into a beer and distilled, as are those of the Rowan, for spirit. Squirrels, hedgehogs, and birds eat them with avidity.

Although on the exposed slopes of the North and South Downs, or the Chiltern Hills, or when waving from the limestone crags of the gorge of the Wye, or even from the ruined arches of Tintern, the White Beam is but four or five feet high, or little more than a bush, in more sheltered spots it becomes a tree with a single smooth bole reaching three or four feet in girth and thirty or forty feet in total height, with slender ascending branches which give it a graceful pyramidal outline. Although in a wild state this species is distinctly calciphile, whatever the fact of the plant growing on calcareous soils may actually indicate physiologically, under cultivation it seems to do perfectly well in any good well-drained garden soil, so, perhaps, in this, as apparently in other cases, the real preference is for a light well-drained soil which is not acid in reaction.

CXVII.—THE HAWTHORN.

Cratægus Oxyacantha Linné.

IT must be admitted that there are but few characters by which we can separate the genus *Cratægus* from *Mespilus*, or from the sub-genus *Sorbus* of the genus of *Pyrus*. It may have a single carpel, or two, or more, up to five: the core is made up of distinct portions which are bony, in which it resembles *Mespilus* rather than *Sorbus*, though its fruits are small and generally clustered, as in the latter, rather than large and sub-solitary, as in Apples, Pears, and Medlars. Unlike the Medlars, however, it has the up-grown and in-grown fleshy receptacular tube so far developed as to conceal, though not completely to cover, the bony segments of the core.

Cratægus until recently comprised some fifty species of shrubs and small trees, belonging to the North Temperate Zone. Recently, however, a great number of new species have been described by American botanists. The genus as a whole may be said to be generally spinous, the spines representing modified branches: the leaves are simple, with deciduous stipules: the flowers are white or pink, in terminal corymbose cymes, pentamerous, secreting honey, and protogynous; and there are two ovules in each carpel, one or both of which may remain as a seed in the bony divisions of the pome. Another general character is the toughness of the wood, the result of slow growth and complex structure, from which the name *Cratægus* (from the Greek *κρατός*, *kratos*, strength), which dates from Theophrastus, is derived.

Our species derives its name *Oxyacantha*, which has been applied since the days of Dioscorides to such very different shrubs as the Barberry and the Sweetbriar, from *ὄξύς*, *oxus*, sharp; *ἀκανθα*, *akantha*, a thorn. It reaches twenty or even thirty feet in height, growing either with a single stem as a small round-headed tree, or branching freely near the ground; and, in either case, its branching is copious and it is very spinous. To this habit and its tolerance of the shears it owes its employment as our chief hedge-making bush from the earliest days of private property in land, whence it derives its names of *Hawthorn* and *Quickset*. The word "haw" is the same as "hedge"; but in the north of Britain the fruits of this thorn are still called "haigs," so that it is somewhat doubtful whether the word "hedge" is derived from the name of the tree that bears the "haws," or whether, as is more probable, the fruit took its name from being borne on a hedgerow tree. Although it can be grown from seed, it is readily propagated by cuttings; but perhaps gets the name *Quickset*, or "planted alive," whether grown from seed, for cuttings, or from transplanted seedlings, merely as distinguished from a fence of dead timber. The lighter colour of its bark, a brown shading to red, as though blood coursed in its veins, gives it such names as the Classical *Alba spina*, the Old English *Albespyne*, the French *Aubépine*, and our modern *Whitethorn*, as distinguished from the *Blackthorn* or *Sloe*.



THE HAWTHORN—continued.

The stalked leaves, wedge-shaped at the base, vary considerably in outline and margin, and even more in their autumn colouring when the tree puts on what the poet Sackville aptly called "his motley liverye."

When, in the month of May, from which the tree takes another of its many popular names, the young green leaves are hidden beneath the masses of blossom, resembling white roses in miniature, it will be acknowledged to have well earned William Howitt's description of it as "Glory of England's landscape." The delicate pink anthers become brown as they burst and discharge their pollen; and the air is laden with fragrance that tells of honey. Even in winter, when the tangle of darkened boughs appear as a black blot on the landscape, the deep red mealy fruits, mellowed by frost, furnish acceptable food for birds.

Besides the many species and varieties grown in our parks and gardens, there are several wild varieties of the Hawthorn. The commonest of these is *Cratægus Oxyacantha*, var. *monogyna* Jacquin, with downy flower-stalks and calyx, and only a single carpel, as is shown by its withered style in the centre of the remains of the calyx which surmount the fruit. Another variety, var. *oxyacanthoides* Thuillier, flowering a fortnight earlier, has rather leathery and glossy leaves, smooth flower-stalks and calyx, rather fewer but larger flowers, and two or three styles. Still less common forms have yellow or white fruits.

The Glastonbury Thorn, reputed to have sprung from the staff of St. Joseph of Arimathæa, planted on Wearyall Hill at Glastonbury, which blossoms and fruits at the usual season and also, as Tennyson says, "blossoms at Christmas, mindful of our Lord," is known to botanists as the variety *præcox*. A similar habit occurs in some other plants.

By the ancient Greeks the Hawthorn was regarded as the emblem of hope: it was carried in their wedding processions and used to deck the altar of Hymen. Its symbolism has, however, undergone a complete change, probably from the mediæval legend that it furnished the Crown of Thorns.

In Germany it still bears the name *Christdorn*: in France there is a tradition that it utters groans and cries on Good Friday; whilst in England there is an old superstition that it is unlucky to uproot a tree of this species, and the still lingering belief that it is ill-omened to bring boughs of it into the house.

Though seldom obtainable in any considerable quantity or of sufficient size, the wood of the Hawthorn was found, in the days of wood-engraving, to be the best substitute for Box. One would, however, it is to be hoped, think twice before sacrificing an old thorn—a beauty spot not readily to be replaced—to such base uses.

CXVIII.—THE WILD RASPBERRY.

Rubus idæus Linné.

THE third Sub-Family of the *Rosaceæ* is the *Rosoideæ*, in which the gynæceum consists of any number of distinct carpels, which are indehiscent and contain when ripe only one seed. They are generally, but not always, dry achenes. The British members of the group fall into three Tribes, the *Potentilleæ*, *Sanguisorbeæ*, and *Roseæ*, according to Dr. W. O. Focke's classification in Engler and Prantl's "Natürliche Pflanzenfamilien." In the *Potentilleæ* there are generally a considerable number both of stamens and of carpels, the latter being collected together in a head or *eterio*, as it is called (from the Greek *ἑταῖρος*, *hetairos*, a companion), and arranged spirally round the apex of the floral axis, which does not itself, as a rule, enter into the structure of the fruit. The Tribe is subdivided into three Sub-Tribes, the *Rubineæ*, including the large genus *Rubus*; the *Potentillinæ*, including *Fragaria*, *Potentilla*, and some other closely-related genera; and the *Dryadineæ*, including *Geum* and *Dryas*. The *Rubineæ* are characterised by the absence of the epicalyx; by the carpels becoming *drupels* or miniature drupes, each with its *epicarp* or skin, *mesocarp* or pulp, and *endocarp* or stone, like a tiny plum or cherry; and by having two pendulous ovules, only one of which becomes a seed.

The genus *Rubus* is widely distributed, especially in the Northern Hemisphere, its species being often capable of holding their own against, or dominating, other vegetation. Opinions differ very widely as to the limits of species within this genus; but every botanist admits that some of them are extremely variable. Thus the British species are counted as four in Hooker's "Student's Flora," as forty-eight in Babington's "Manual," and as a hundred and three in the Rev. W. Moyle Rogers's "Handbook of British Rubi." As, however, all these authorities agree in treating the Wild Raspberry (*Rubus idæus* Linné), the Stone Bramble (*R. saxatilis* Linné), and the Cloudberry (*R. Chamæmorus* Linné) each as a single species, the great discrepancy in their estimated totals depends almost entirely upon their views as to the Brambles, which Linné lumped together under the name of *Rubus fruticosus*. So difficult is the problem as to these, which some evolutionary botanists have termed "species in the making," that it is recognised as a distinct subject of critical study under the name of *Batology* (from the Greek *βάτος*, *batos*, a bramble).

All the species of the genus *Rubus*, of which there may be two hundred in all, agree in being perennial, at least so far as their rhizomes are concerned, though the aerial shoots are seldom more than biennial. These shoots are generally woody, though little so in the Stone Bramble and Cloudberry, in which they are annual. The leaves are scattered, petiolate, stipulate, and mostly compound, being composed of from three to seven leaflets. The stipules are generally adnate to the petiole, and the leaflets palmately arranged; but the Raspberries are distinguished partly by having the latter pinnate. The flowers are generally produced in a racemose



THE WILD RASPBERRY—continued.

arrangement during the second year on the stems formed during the first year : their calyx is deeply divided into five lobes, has, as we have said, no epicalyx, and persists in the fruit stage : the petals are normally five, white or pink, perigynous and deciduous ; and the stamens numerous, perigynous, and in one or more whorls. The floral receptacle is flat in the Stone Bramble and Cloudberry, conical in the rest. In the Raspberries, which constitute Focke's sub-genus *Idæobatus*, the ripe fruit separates as a whole from a dry, conical receptacle, whilst in the other shrubby brambles, the sub-genus *Eubatus*, the drupels remain attached to the receptacle, which is spongy.

As the Classical Latin *Rubus* is suggested to be connected with a Celtic root *rub*, meaning "red," it may have referred in the first instance rather to the Raspberries than to the Blackberries.

The Raspberry is widely distributed in Northern and Western Asia, in North Africa, and throughout Europe, even beyond the Arctic Circle ; and in our islands it is so generally distributed as to be unquestionably indigenous. Abundant on Mount Ida in Asia Minor, it was called *Báros 'Idaía*, *Batos Idaia*, by Dioscorides, which was latinised as *Rubus idæus* by Matthioli and so retained by Linnæus. The pretty French name *Framboise* is said to be a corruption of a Dutch name *Brambezie* ; and the Old English *Hindberry*, still used in the North and represented also by the Danish *Hindbaer*, may merely suggest that the fruit was a favourite with deer. The plant is first recorded as British by Gerard, in 1597, under the name *Raspis Bush*, he saying :—

"I have found it among the bushes of a cawsey neere unto a village called Wisterson where I went to schoole two miles from the Nantwich in Cheshire."

With a short, creeping rhizome, the plant sends up numerous suckers or "canes" to a height of four to six feet. These biennial stems are round, erect, but nodding at the top, glaucous or mealy, with few, straight, bristle-like prickles, pointing slightly downwards. The leaves consist of five, three, or seven pinnately-arranged leaflets, with a white-felted under surface and an irregularly serrate margin. The flowers droop, a few together, with curved prickles on their stalks, and last two days. The stamens and stigmas mature simultaneously ; but honey is secreted by a fleshy ring-shaped nectary on the receptacle and many insects come for it. The greenish, white-felted sepals spread outwards as the petals fall and then bend backward, whilst the narrow white petals standing erect so squeeze the stamens together as to shut off short-tongued insects from the nectary. The drupels are covered with a white down when young : they are numerous, form a globular group, turn red or amber-coloured as they ripen, and then drop off as a whole. Swallowed by birds, or other animals, their little pitted stones or "endocarps" resist digestion, and the plant is undoubtedly largely dispersed in this manner. It does not seem very particular as to soil, occurring in dry and damp situations, on sand, loam, and limestone.

CXIX.—THE BLACKBERRY AND THE DEWBERRY.

Rubus thyrsoides Wimmer and *R. cæsius* Linné.

IT is, as we have said in writing of the Raspberry, more especially among the "fruticose Brambles," the *Rubi fruticosi* of Babington, or the sub-genus *Eubatus* as Dr. Focke terms them (from the Greek εὖ, *eu-*, truly; βάτος, *batos*, a bramble), that the extreme variability of the genus is exhibited. The multitude of forms comprised in this sub-genus are shrubby, *i.e.* have woody stems, have compound leaves of a palmate type with adnate stipules, and have their ripe drupels individually adherent to the conical receptacle. The Rev. W. Moyle Rogers is compelled to arrange our British forms into no less than fourteen groups, corresponding roughly to the species of Babington and the sub-species of Mr. J. G. Baker's arrangement in Sir Joseph Hooker's "Student's Flora." He is, however, able to arrange these groups into four larger groups dependent mainly upon characters derived from the mode of growth of their stems and the prickles and other armature of the surface. The two forms here selected for representation, both common in our hedgerows, *R. thyrsoides* Wimmer, a pink-flowered Blackberry, and *R. cæsius* Linné, the Dewberry, belong respectively to the first and last of these larger groups.

In the first main group, the stems are tall and very often, even if they do arch over, do not, as many Brambles do, root at their tips: their general surface is glabrous or slightly hairy, and the prickles are equal in length or nearly so, and are mostly restricted to the angles of the stem. Of the five minor groups belonging to this main group, the Blackberry here represented belongs to the fifth, called, from their usually pink flowers, *Discolores*. In this group the stem does arch and may become prostrate, but seldom roots: it is generally covered with adpressed stellate hairs; and the leaves are covered with a whitish felt on their under surfaces, which disappears, leaving them green in autumn. The widely distributed *R. thyrsoides* Wimmer (named from the Greek θύρσος, *thursos*, the wand twined with ivy and vine-leaves and surmounted by a pine-cone which was carried by the devotees of Bacchus) has little of the pubescence general among the *Discolores*. Its stem arches high up and is self-supporting: its prickles are stout at the base, and, if not straight, only slightly hooked: the leaves have five leaflets, almost smooth on their upper surfaces and pale beneath, with irregularly cut margins; and the flowers are in a long showy *panicle* or cluster, with a few recurved prickles and reflexed felted sepals; whilst the drupels are comparatively few in number, rather large, smooth, and sub-acid. Dr. Focke treats this as a *species collectiva*, and, of the species into which he subdivides it, Mr. Rogers places our common form in or near *R. thyrsanthus* Focke, with a broad central leaflet and short close branches to the panicle.

The long, quick-growing, prickly stems of the Blackberries are often known in the country as *Lawyers*, because when you once get entangled in their clutches you have some difficulty in escaping them. They are used for fastening down thatch



THE BLACKBERRY AND THE DEWBERRY—continued.

or for fixing the newly-laid turf on graves. Those species that root at their tips form the ingenious "rolling fence" of the squatter, who, cutting away the older growth on his side of the boundary, annually extends his enclosure. The whole plant is astringent, the green shoots yielding a black dye, or making with honey a useful gargle. The fruit has been used to colour wines, and is now largely collected in this country for use in tarts or as jam, though a popular prejudice against the plant as the supposed material of the Crown of Thorns makes the peasantry of Northern France refuse to touch it.

Waterton tells an amusing legend of the Bramble.

"The cormorant," he says, "was once a wool merchant. He entered into partnership with the bramble and the bat, and they freighted a large ship with wool: she was wrecked, and the firm became bankrupt. Since that disaster, the bat skulks about till midnight to avoid his creditors, the cormorant is for ever diving into the deep to discover its foundered vessel, while the bramble seizes hold of every passing sheep to make up his loss by stealing the wool."

Mr. Rogers's fourteenth group, the *Cæsii*, termed *Corylifolii*, i.e. hazel-leaved, by Dr. Focke, are low-growing, arching, or trailing plants, with roundish or slightly angular stems with many rooting branches, a mealy surface, and scattered, straight, slender, needle-like prickles. Their leaflets are broad and almost sessile, their flowers have large roundish petals, and the drupels are generally few and large. The Dewberry (*Rubus cæsius* Linné) is a variable, but easily recognised, species, found chiefly on calcareous and clayey soils and in damp places, often in dense shade. Its round, low-arching, or prostrate stem is very glaucous: its leaves are almost always ternate with thin, irregularly-lobed and toothed leaflets: its flowers are few in a cluster but large and white, with felted, long-pointed sepals; and the few drupels are glaucous and acid.

It is the *Ronce bleuâtre* of the French and has been identified as the *Thevethorn* of Wyclif's Bible, where, in Jotham's fable in the Book of Judges, the Vulgate *Rhamnus* is translated *Bramble* in the Authorised Version. Matthiolus quotes some monastic commentators who, following probably a traditional interpretation, describe the plant in question as "a certain bramble which, prostrate on the ground, and growing in uncultivated places, bears berries of a blue rather than of a black colour." The word *Theve* is supposed to signify lowliness.

CXX.—THE WILD STRAWBERRY.

Fragaria vesca Linné.

THE Sub-Tribe *Potentillineæ*, which includes the genera *Fragaria* and *Potentilla*, shares, of course, the characters distinctive of the whole Tribe *Potentilleæ* and of the Sub-Family *Rosoideæ*. Its members have, that is, an indefinite number of one-seeded carpels collected together in an etærio. They are distinguished from the Sub-Tribe *Rubineæ* by the possession of an epicalyx, and by the carpels becoming, not drupels, but dry achenes ; and from the Sub-Tribe *Dryadineæ* by the styles not elongating after the flower stage.

The genus *Fragaria* is distinguished from the otherwise nearly allied genus *Potentilla*, as well as from all others, by the remarkable large fleshy outgrowth from the floral receptacle which forms after fertilisation below the carpels. It comprises about eight species, natives of the North Temperate Zone ; but extending into the Andes, the Sandwich Islands, and Réunion, three significant extensions southward. They are all perennial herbaceous plants, bearing radical leaves and flowering scapes on a subterranean rhizome ; while they reproduce themselves freely in a vegetative manner by the formation of numerous slender runners, with long internodes, rooting and shooting at the nodes and thus producing numerous young plants at some distance from the parent, which in time become independent. Strawberries are thus enabled to hold their own even amongst grass, and sometimes to dominate the ground vegetation of woodland. The runner or *stolon* springs from the axil of a radical leaf and is continued by an axillary shoot at the second node, thus forming a sympodially cymose branch-system, whilst it bears a single scale-leaf at the first and other intermediate nodes. The leaves, which in our one British species, *Fragaria vesca* Linné, are ternate, may also be pinnate or simple. They have stipules adnate to their petioles. The inferior calyx is a cup of five united sepals which persist in the fruit stage ; and the five-leaved *epicalyx* immediately below it, and closely resembling it, probably represents five pairs of stipules, a pair to each sepal, one of each pair being united to one of those belonging to the next sepal. The function of this epicalyx may be to act as an additional protection for the honey against crawling or boring "unbidden guests." The five petals, white in our species, are in other cases yellow, and are obovate with a short claw. The numerous stamens wither but remain on for some time. When both stamens and carpels are present in one blossom the stigmas mature first ; but great variety occurs as to the sex of the flowers, especially, perhaps, under cultivation. While some plants have all their blossoms perfect, others are entirely staminate, or entirely carpellate, or more commonly in Britain staminate or carpellate flowers occur in the same cluster with perfect ones. The species is thus *polygamous* or *sub-diacious* here ; but is stated to be more generally *diacious* in North America. The numerous achenes are readily seen to be arranged in a spiral and to have their styles springing



THE WILD STRAWBERRY—continued.

laterally nearly from their bases, though the "man in the street" mistakes the achenes for seeds. Each achene contains an ascending seed.

The receptacle is, as has been said, the most distinctive feature in the plant. As Lindley put it :—

"When you gather the Raspberry you throw away the receptacle under the name of core, never suspecting that it is the very part you had just before been feasting upon in the Strawberry. In the one case the receptacle robs the carpels of all their juice in order to become gorged and bloated at their expense ; in the other case the carpels act in the same selfish manner upon the receptacle."

Whether from the weight of the fruit, or from an independent curvature, the fruit-bearing pedicel bends downward ; and, perhaps, the ripening of the fruit is thus hastened by the heat radiated from the surface of the ground. Few, if any, fruits of equal succulence grow so close to the ground ; and this feature has, no doubt, originated the German name *Erdbeere*, Dutch *Aardberien*, "earth berries." Probably, too, after the plant came under cultivation it got its English name *Strawberry* from the same character, that name being derived from the old preterite of the verb "to strew," and not from the laying of straw beneath the fruits or from their being sold threaded on a straw.

The Latin *Fragaria*, which occurs in Pliny, is said to be connected with a Sanskrit root *ghra*, meaning fragrant ; and it is the source of the modern Romance names—*Fragola* in Italian, *Fraise* in French, and *Fresa* in Spanish. Fragrance is certainly a most striking feature of the plant, and not of its fruits only, though, perhaps, this is more characteristic of the wild than of the cultivated form. Spenser, in one of his Sonnets, says that the

"Fragrant flowres doe give most odorous smell" ;

and Bacon endows

"Strawberry leaves dying, with a most excellent cordial smell."

When plants were believed to absorb the properties of those growing near them, the Strawberry, which, as Shakespeare says, "grows underneath the nettle," was looked upon as an exception to the rule. St. Francis de Sales writes :—

"We cannot but admire the fresh innocence and purity of the strawberry, because although it creeps along the ground, and is continually crushed by serpents, lizards, and other venomous reptiles, yet it does not imbibe the slightest impression of poison, or the smallest malignant quality."

It is clear from references in various writers that in the sixteenth and seventeenth centuries it was still customary to transplant the roots of our wild wood Strawberry to gardens, although, in the fifteenth, the Strawberries in the garden of Ely Place are said to have attracted the attention of Richard of Gloucester ; and Dr. William Butler, the friend of Izaak Walton, in the time of James I, passed the well-known verdict that

"Doubtless God could have made a better berry, but doubtless God never did."

CXXI.—THE SILVER-WEED.

Potentilla Anserina Linné.

THINKING only of our British species, we are apt to associate white flowers with the Strawberries and yellow ones with the allied genus *Potentilla*. There are, however, yellow-flowered species of *Fragaria*; whilst a common early-flowering representative of the *Potentillas* is white. This is the little Barren Strawberry (*Potentilla sterilis* Garcke, or more familiarly *P. Fragariastrum* Ehrhart) which is sometimes mistaken for the Strawberry. It is a small plant, grey with silky hairs, with trefoil leaves and small flowers on short weak stalks, opening on our hedge-banks in April; whilst the Strawberry is a sturdier, greener plant, bearing its larger blossoms a month later on erect stalks from one to six inches high.

If the colour of the petals is by no means distinctive of all species of *Potentilla*, neither is the form of their leaves, though they were formerly lumped under the name *Pentaphylloides* and its pretty translation *Cinquefoil*. The genus consists mainly of perennial herbaceous plants, though a few species are shrubby. There are, perhaps, two hundred species in all, and almost all of them are natives of the North Temperate region. They have compound leaves with stipules adnate to the leaf-stalk: their conspicuous flowers have an epicalyx and have the parts of the perianth in fives or fours: they secrete honey by a ring-shaped nectary inside the whorl of numerous stamens; but they are homogamous, so that self-pollination may occur. There are numerous small dry carpels on a dry flattish receptacle, each with a lateral or basal style and containing a single ovule.

The name *Potentilla*, from the Latin *potens*, powerful, meaning "powerful little plant," was applied by Brunfels, Matthiolus, Fuchs, and other botanists of the Renaissance, originally apparently to the species which we call *Silver-weed*, from the great medicinal virtues which they attributed to this species and its allies. As a matter of fact, beyond a slight astringency they possess no known curative properties. Lonicer says:—

"By what name the ancients called that which we nowadays call *Potentilla* does not appear. It is *Genserich* of the Germans, meaning the same as *Anserina*, because geese rejoice in it for food."

This is the most probable origin of these names and of our own *Goose-grass*, while *Goose-tansy* contains also a reference to the form of the leaf. Turner, in 1548, writes:—

"*Portentilla* or as some write *Potentilla*, is named also *Tanacetum sylvestre*. It is named in english *wylde Tansey*, in duche *Genserich* & in french *Taunasi Saluage*."

Ray says truly enough that the plant loves watery places where water has stood during the winter; while Sir James Edward Smith speaks of it as frequent in osier holts and spongy meadows. It often seems to rejoice in the dust of the roadside gutter; but Linnæus considered it indicative of clay. These are places where geese



THE SILVER-WEED—continued.

are often seen, whether they eat the plant or not, though Dr. Prior's suggestion that *Goose-tansy* is but a contemptuous way of saying False Tansy, like Fool's Parsley, is to some extent borne out by the Scottish name of *Dog's Tansy*.

There is abundant curious evidence that the slender branching rhizomes of this plant were formerly used as human food in each of the three kingdoms. Ray says that near Settle, in Yorkshire, the boys are wont to dig them up in the winter and eat them; that they call them *Moors*; and that they are as agreeable as parsnips. Lightfoot records that in the Hebrides these underground stems have sometimes been the sole food of the islanders for months together, they being eaten roast or boiled, or used as a bread-stuff; and in the north of Ireland they have been roasted and eaten, under the name of *Marsh-corns*, in quite recent years.

The copious pink runners, closely resembling those of the Strawberry, enable the plant to spread independently of seed-production; whilst they produce a charming colour-grouping with the green and silver foliage and the sun-reflecting blossoms. The interruptedly pinnate leaves of many much-serrated leaflets, silvery with long, soft, silky hairs on the under surface, or on both surfaces, cannot fail to attract notice. Dodoens called the plant *Argentina*, and *Silver-weed* is used in Lyte's translation of his herbal; whilst Aubrey in his "Natural History of Surrey" records that in his time the people of Lingfield decked their church and their houses with garlands of this plant under the name of *Midsummer Silver*. In Guernsey it is called *Fouâle à macré*, i.e. Mackerel Fern, merely, no doubt, from the appearance of the under side of the leaf; and probably the Border names *Fair Grass* and *Fair Days* have the same origin, although the latter has been explained as referring to the blossoms only remaining open in sunny weather. Lord Avebury states that they "partly close at night and in wet weather."

The flowers are solitary and generally open during the first few days of June, often reaching three-quarters of an inch in diameter, little pale gold roses against the background of silver feathers. Correlated with the copious vegetative multiplication of the plant by its runners is the fact that it does not often perfect its seed.

CXXII.—THE TORMENTIL.

Potentilla erecta Hampe.

THE slender spreading trails, the flat leaves with their divergent lobes, and the widely-spaced petals among *Potentillas* attract attention to the number of their parts. Habit of growth, foliage, and epicalyx all make the affinity of the Tormentil to the *Potentillas* obvious; but no less obvious is the fact that, whilst most *Potentillas* have five sepals and five petals, the Tormentil has four leaves in each whorl. Such considerations of mere number of parts long held botanists in thrall. While many species of our modern genus *Potentilla* have five digitate leaflets and were thus, as we have seen, known as *Pentaphylloides* or *Cinquefoil*, the stipules of the Tormentil are so large and leaf-like as to be counted as leaflets, so that as early as the work of Apuleius Platonius, in the fourth or fifth century, it was named *Septefolium* (seven-leaved); while Fuchs and Turner in the sixteenth speak of it under the Greek form *Heptaphyllon*.

Parkinson, a century later, is amusingly precise in this matter, though, curiously enough, his woodcut shows the usual four petals, while the text speaks of five.

"The common Tormentil," he says, "(is so like unto Cinquefoile, that many doe mistake it, for it may well be reckoned as one of them) hath many reddish slender, weake branches, rising from the roote, lying upon the ground, or rather leaning, than standing upright, with many short leaves that stand closer to the stalkes, than the other *Cinquefoiles* doe, with the foote stalke encompassing the branches at severall places, but those that grow next to the ground are set upon long foote stalkes, each whereof are like unto the leaves of *Cinquefoile*, or five leaved grasse, but somewhat longer and lesser, and dented about the edges, many of them divided but into five leaves, but most of them into seaven, whereof it tooke the name Setfoile . . . yet some may have sixe and some eight, as the fertilitie of the soile and nature list to worke: at the toppes of the branches stand divers small yellow flowers, consisting of five leaves, like unto those of *Cinquefoile*, but smaller: the roote is smaller than Bistort, somewhat thicke but blacker without, and not so red within, yet sometimes a little crooked, having many blackish fibres thereat."

Commenting on the name *Setfoile* or *Seven leaves*, he adds:—

"they are not seaven leaves, but the number is seven of the divisions of every leafe; for to speake properly, it is but one leafe, cut into five or seven divisions, and not seven leaves: for this is a generall rule in all leaves, whether of herbes or of trees, that what leafe falleth away wholly together with his stalke and not in partes, and at severall times, is but one leafe."

Linné kept *Tormentilla* as a genus distinct from *Potentilla*, mainly on the ground of its four petals, calling this species *T. erecta*; and Sir James Edward Smith defends his action on the ground that "the difference is obvious, and as constant as in any other similar instance," scouting Scopoli's argument that "a one-eyed man is no less a man." Nestler, however, in his "Monographia de *Potentillâ*" in 1816, named the plant *Potentilla Tormentilla*, and Necker had named it *P. sylvestris* as early as 1768. As, however, according to our present rules, the earliest specific name must, if possible, be retained, it bears Linnæus's name *erecta*, though the binominal *Potentilla erecta* was only published by Hampe in 1837.

The stout, woody, almost tuberous, rhizome is red internally and extremely astringent, whence come the German names *Rotwurtzel* and *Blutwurtzel*, the English or Scottish Border equivalent of the latter, *Blood-root*, and the use of the plant in



THE TORMENTIL—continued.

dysentery. Parkinson begins a long enumeration of the plant's many "vertues," by saying that it is

"most excellent to stay all kindes of fluxes of blood or humors, in man or woman, whether at the nose, mouth, belly, or any wound in the veines, or anywhere else";

and Linné frankly admits that its colour is its recommendation, writing "*Tormentilla* in dysenteria quod rubra est."

The rhizome is stated to contain 17 per cent. of tannic acid, a higher percentage than Oak bark; and Lightfoot says that it was largely used in tanning in the Hebrides in the eighteenth century; whilst in the "*Flora of Shetland*," published in 1845, the year of his death, Thomas Edmonston (who, at the age of twenty, was accidentally shot, on the shores of Peru) writes that, under the name of *Earth bark*, it was then so employed in his native islands. It is used in Lapland as a red dye for skins; and, as undoubtedly very astringent, it is still sometimes employed in veterinary medicine.

The annual aerial stems are slender, erect, and branched, seldom rooting at their nodes, and clothed with curly hairs: the long-stalked radical leaves are quinate, their lobes being from three- to four-toothed at the top; whilst the cauline leaves are sub-sessile and ternate.

The flowers are said to produce nectar in abundance in Norway, and to be there visited by humble-bees; whilst farther south it does not produce the nectar and is not so visited. As the flowers are homogamous they may often be self-pollinated; but that they are also insect-pollinated may be inferred from the occurrence of several apparent hybrids with closely allied species.

Although, perhaps, rejoicing most in the warm, sunny, open spaces on a sandy heath, the species does not seem to be very particular as to soil and situation, its cheerful little blossoms occurring commonly in shady woods and its rhizomes managing to hold their own amid dense pasture grasses. From June to September it contributes by its flowers to the gaiety of the country-side.

CXXIII.—THE MARSH CINQUEFOIL.

Comarum palustre Linné.

THE genus *Potentilla* when given its most comprehensive signification, as in Hooker's "Student's Flora," is divided into four Sections or Sub-genera, viz. *Potentilla* proper, with a concave floral receptacle, including the Silver-weed, the Tormentil, the Barren Strawberry, and six or more other British species; *Trichothalamus*, shrubby, with a very hairy receptacle, including *Potentilla fruticosa* Linné, our only shrubby British *Potentilla*; *Sibbaldia*, with few stamens and carpels on a concave downy receptacle, including the Scottish alpine plant *P. Sibbaldi* Haller filius (*Sibbaldia procumbens* Linné); and *Comarum*. Linné's genus *Comarum*, which we retain, though Hooker treated it merely as a Section of *Potentilla*, is mainly characterised by its enlarged, conical, spongy receptacle, which is downy and seems to approximate to that of the Strawberry, but is dry, not succulent, and does not fall off. Our one British species, *Comarum palustre* Linné, was named by Nestler *Potentilla Comarum*; but, if included under *Potentilla*, would by the present rules bear the name of *P. palustris* Scopoli. As for Linné's generic name *Comarum*, it occurs in Theophrastus, or rather the Greek κόμαρος, *komaros*, does so, and also in Aristophanes's comedy "The Birds"; but this Greek name seems to have been applied to an *Arbutus*. It was chosen, however, for this herbaceous plant, no doubt, because, whilst the *Arbutus* is called from its fruit the Strawberry-tree, this species somewhat suggests the Strawberries in leaf, calyx, and fruit. It is, in fact, known as *Bog Strawberry* in the Isle of Man.

Draining has, probably, rendered this plant less frequent nowadays than formerly; and even where it does occur it is not generally very abundant. Though remarkable in colour, even more than in form, it is, perhaps, not a plant to attract much notice and has not received many popular names. With a reddish-brown or purple colour suffusing alike stem, leaves, and flowers, it was naturally one of the supposed remedies for "the purples," spots of extravasated blood produced in fever, and was accordingly known as Purplewort. William Coles in his quaint seventeenth-century "Art of Simpling" terms it "an excellent remedy"; but the name is also given to a purple-leaved variety of the Dutch Clover (*Trifolium repens* Linné). The long woody rhizome is powerfully astringent, like that of the Tormentil, and has, for that reason, been used in tanning; and it yields a red or dull yellow dye; while the fruits of the plant are said to be known in some places, both in England and in Scotland, as *Cow-berries*, on account of their being used to rub the inside of milk-pails for the purpose of thickening the milk. As the rhizome is also stated to give a rich colour to milk, it may also be used for this purpose. In spite of its extreme astringency the rhizome is said to be eaten by boys in Ayrshire and to be there known in consequence as *Meadow Nuts*.



THE MARSH CINQUEFOIL—continued.

The rhizome gives off fibrous roots and the ascending aerial stem, which rises to a height of a foot or more, is, as we have said, tinged with a reddish-brown. Its upper portion is slightly hairy and branched. The lower leaves are stalked, have from five to seven pinnately-arranged, sharply-serrated leaflets, and are downy and whitish or glaucous beneath. They have large membranous stipules attached to the petiole, often with cut margins. The upper cauline leaves are sub-sessile and ternate.

The flowers are few together, in a loose cluster, on downy stalks; and, being an inch or more in diameter, their lurid dark purplish hue, suggesting clotted blood, is certainly striking. The leaves of the epicalyx, or *bracteoles*, as some botanists call them, are smaller than the sepals, and these latter are prolonged into long points, whilst the pointed lanceolate petals are smaller even than the bracteoles. There is no perfume; but the flower is protandrous.

"When the flower opens," writes the late Lord Avebury, "the stamens erect themselves and open gradually. Some of the pollen falls on the stigmas, but has no effect, as they are not mature. When the anthers have dropped, the filaments of the stamens curve downwards towards the petals, while the styles, on the contrary, elongate and take their places."

We have often found this handsome plant growing actually in the water of shallow bog pools, associated with the grand blue of *Gentiana Pneumonanthe* Linné, or the little Marsh St. John's-wort (*Hypericum elodes* Linné); but we do not think its ecology is altogether clear, since it is recorded alike from the swamps on the limestone hills of the Pennine range, which may have alkaline or neutral water, and from association with the Bog Asphodel (*Narhecium ossifragum* Hudson), where the water is probably acid. The following summary, by Mr. W. M. Rankin, of a "marginal association," where the edge of the estuarine Foulshaw Moss in Lonsdale abuts on the adjacent slate hills, is typical:—

"The extreme edge is occupied by an alder wood, in which the dominant tree (*Alnus rotundifolia*) is accompanied by willow (*Salix caprea* and *S. cinerea*), alder buckthorn (*Rhamnus Frangula*), mountain ash (*Pyrus Aucuparia*), yew (*Taxus baccata*), oak (*Quercus sessiliflora*), juniper (*Juniperus communis*), and birch (*Betula tomentosa*). The floor of this wood is very swampy, with many pools, in which grow bog-bean (*Menyanthes trifoliata*), marsh cinquefoil (*Potentilla palustris*), the great stooled sedge (*Carex paniculata*), and other species of *Carex*, *Phragmites vulgaris*, and ferns (*Lastrea aristata*, *L. spinulosa*, *Blechnum Spicant*). *Gentiana Pneumonanthe*, *Hottonia palustris* and *Osmunda regalis* also formerly occurred in this association, but they are now extinct."

In "Types of British Vegetation," Mr. Rankin and others describe the occurrence of the Marsh Cinquefoil in other associations, such as the plashes and reed-swamps of the New Forest, with some of the above-mentioned associates, with *Pedicularis* and *Utricularia*: but the precise interpretation of the conditions is not yet known.

CXXIV.—THE COMMON AVENS, OR HERB BENNET.

Geum urbanum Linné.

SORDID with the dust of the road in the driest of hedge-banks, in the full glare of the sun, at the outskirts of the town, or holding its own amid a dense vegetation of brambles and ferns in some moist shady lane, or alone in the bare chalk rubble under the dense shadow of a yew-tree on the scarp slope of the downs, this species does not seem particular as to soil, shade, or moisture. It is, by far, the commonest British species of the genus *Geum*.

Belonging to the Tribe *Potentilleæ*, this genus forms with *Dryas* the Sub-Tribe *Dryadinae*, characterised by styles which elongate after the opening of the flower and by a solitary ascending ovule in each carpel. *Geum* comprises some thirty-six species, natives of Temperate and cold regions in both hemispheres. The name *Geum*, which is used by Pliny, is derived from the Greek γέωω, *geo*, I give a relish, from the aromatic clove-like taste of the rhizomes. For the same reason these plants were known to the botanists of the Renaissance as *Caryophyllata*, which name has been literally translated in the German *Nelkenwurz*, i.e. "Clove-root." The rhizomes are very astringent as well as aromatic, and thus served as both preservative and flavouring to beer and wine; and such liquors were considered specially useful against dysentery, and also apparently against poison. It is related of St. Benedict that when a monk handed to him a cup of poisoned wine and he blessed it the cup broke in pieces; and from this story this plant got the names of *Herba Benedicti*, our *Herb Bennet*, and the German *Benedicten-kraut*. These names were at an early date misunderstood, *Herba Benedicti* being taken for *Herba benedicta*, "Benedict's herb" for "Blessed herb." Thus the twelfth-century physician Matthæus Platearius is quoted as writing:—

"Where the root is in a house the devil can do nothing, and flies from it; wherefore it is blessed above all other herbs, no venomous beast can hurt the carrier, or approach it when growing."

In the "Ortus Sanitatis," printed in 1491, in which this quotation occurs, the plant is called *Anancia*, the origin of the modern French name *Avance* and our *Avens*; and most probably Dr. Prior is right in his suggestion that this name was the Greek ἐναντία, *enantia*, an antidote.

The aerial stem in this species is round and softly hairy and rises erect to a height of from one to three feet, branching slightly above, and bearing a cymose succession of flowers. The radical leaves have long stalks and are lyrate and interruptedly pinnate, the large terminal leaflet being round, lobed, and crenate. The veins are prominent on the under surface. The cauline leaves are shortly stalked and often ternate, but vary considerably in their lobing; and their large stipules are leaf-like, lobed, and toothed.

The flowers are erect, on slender stalks, and but little more than half an inch in diameter. The epicalyx and calyx are green and become reflexed in the fruit



THE COMMON AVENS, OR HERB BENNET—continued.

stage ; whilst the spreading, bright yellow, obovate petals are about as long as the sepals. The crowded stamens and the stigmas reach maturity at about the same time, or the latter a little in advance ; and, as in the case of the Tormentil, the flowers are stated to secrete more honey in the North than with us. Some flowers are occasionally entirely staminate.

The flowers are succeeded by a conspicuous chestnut-brown bur, the development of which is extremely curious. The numerous carpels are borne on a flat, or only slightly projecting, hairy receptacle, and their ovaries are also thickly covered with hairs. The terminal styles are at first straight ; but later a projection springs from each a little below its apex and elongates in an upward curve, ending in the stigmatic surface. The apex of the original style then bends over the base of this projecting portion. In this species the upper joint has a few minute hairs at its base and reaches a length of about half an inch, which is considerably less than that of the main body of the style. After fertilisation the base of the style becomes dry and rigid, while the upper joint shrivels and becomes detached at its base, leaving the extremity of the original style as a strong, sharp hook. The one-seeded achenes are so arranged on the receptacle that these hooked *awns*, as they are sometimes termed, spread outwards almost in a sphere, whilst the attachment of the ripe carpel at its base is but loose. This arrangement thus forms a most effective bur, the hooks catching in the fur of any passing animal of a height of one or two feet from the ground, as they do in the clothes of any human being, and the carpels being thus carried either singly or collectively to a distance.

Such elaborate adaptations for the dispersal of seed—whether by wind, for which purpose we find various forms of wings and parachute-like plumes of hair, or, as here, by animals, for which there are countless varieties of bur and of attractive succulence—are, perhaps, more variable within the limits of single genera than are the equally elaborate contrivances for pollination by wind or by insects. To the evolutionist this would suggest that they are of more recent geological date.

CXXV.—THE WATER AVENS.

Geum rivale Linné.

THE Water Avens (*Geum rivale* Linné) is a less common, but far more attractive, plant than *Geum urbanum*. Geographically it has, it is true, a wider range, existing in South America and in Australasia, where the more abundant species is unknown. It is more common in the North, and it extends to higher altitudes by the sides of Highland streams ; but, though locally abundant, it is less generally distributed within the limits of the countries in which it occurs. Though not apparently very particular as to soil, being found on rich alluvial loams, on siliceous and on calcareous sub-soils, the fact that it is more frequent by running water than in stagnant marsh ground suggests that it prefers neutral soil-water to any that is acid. It seems certainly to prefer shade, since not only does it grow commonly by streams passing through copses, but when, with Forget-me-not and Golden Saxifrages, it follows the rivulet out into the open it is commonly overtopped by taller plants, by the big leaves of *Caltha palustris*, by Meadow-sweet, Hemp Agrimony, Valerian, Yellow Meadow-rue, or Globe-flower.

Its larger, blackish, woody, deep-growing rhizome shares the aromatic astringency of the other species (*G. urbanum*), so that, like it, it has been employed as a preservative flavouring for beer, and is said to be valued in North America as a tonic and febrifuge. The aerial stem seldom exceeds a foot in height and is but little branched : its lower portion bears soft reflexed hairs ; while above it is more densely covered with a shorter pubescence.

The radical leaves are stalked and lyrate interruptedly pinnate, the very large terminal leaflet being rounded, lobed, and sharply crenate. The stem leaves are few in number, stalked and ternate, with small ovate toothed stipules, which are often tinged with red. In texture the leaves are thinner and softer than those of *G. urbanum*.

As the flower-bud expands, during the summer months, it bends gracefully downwards, thus protecting its pollen and honey from the rain ; whilst, as the fruit forms, the peduncle resumes its erect position. The richly-coloured, long-pointed, brownish-red, downy sepals spread widely in their broad, flat basal cup and then grow upward to the extreme level of the tops of the petals ; and at a later stage embrace the fruit. Wellnigh indescribable is the colouring of the broad, obcordate petals. Opening a pale green, they flush with pink and then become, as it were, tanned with a tawny yellow-brown with strongly marked darker reddish veins. The erect position of these petals and the stamens crowded round the honey-secreting ring probably restrict the honey to rather long-tongued insects ; and, as the anthers are seldom mature until after the stigmas, cross-pollination is probably the rule.

The head of achenes is raised on an axis or *carpophore* almost as long as the sepals. The achenes themselves and the bases of the styles are hairy : higher up,



THE WATER AVENS—continued.

there are shorter glandular hairs ; but below the attachment of the upper joint the styles are glabrous. The two joints are nearly equal and the lower part of the deciduous upper joint is very hairy.

These characters serve to explain the names given to the plant by the older botanical writers, all of whom, before Linnæus, knew it as *Caryophyllata*. Thus Lobel called it *Caryophyllata septentrionalium rotundifolia, papposo flore*, or "Round-leaved Clove-root of the north with a pappose flower." Clusius named it *Caryophyllata montana, nutante flore*, or "Mountain Clove-root with a nodding flower" ; Camerarius terms it *Caryophyllata aquatica*, or "Water Clove-root" ; and Johnson, *Caryophyllata montana purpurea*, or "Red-flowered mountain Clove-root."

We well remember, thirty years ago, our pleasure in finding a double redder-flowered variety growing by the Water of Leith just where it winds out into the more level ground after leaving the Pentland Hills. This variation is stated by Sir James Edward Smith to be not infrequent in mountainous countries and to be "readily produced by transplanting the wild roots into a dry gravelly soil." The carpophore is also often elongated, when the sepals become more leafy. This variety is entirely distinct from the *Geum intermedium* of Ehrhart, which is almost certainly a hybrid, resulting from the pollination of the stigmas of *G. rivale* with the pollen of *G. urbanum*. It has much of the habit of *G. rivale* ; but with a more deeply cut terminal leaflet, larger cauline leaves and stipules, green calyx and yellow petals, larger than those of *G. urbanum*, but not so large as those of *G. rivale*. Sir James Edward Smith says that he suspected that it "might be a variety of *rivale*, caused by the pollen of *urbanum*" ; and the fact that it is found not infrequently associated with *G. rivale* but not with *G. urbanum* renders this parentage more probable than the reciprocal cross, i.e. the pollinating of *G. urbanum* by *G. rivale*. The crossing of *G. rivale* by *G. urbanum* is said to have been produced artificially, and the hybrids are reported to have proved fertile. The chief difficulties as to this hybridism being produced by insects is the want of similarity in the colour of the flowers of the two parent species ; but there may be an identity in the smell of their nectar which is perceptible to the insect's sense of smell, though not to ours.

A considerable number of more showy species of *Geum* are cultivated in our borders and rock-gardens, several of them having large semi-double blossoms of a brilliant scarlet, or feathery-tailed heads of achenes of a purple or reddish-brown colour. The best are, perhaps, the alpine *G. montanum* Linné, sometimes placed in another genus *Sieversia* ; *G. coccineum* Sibthorp and Smith, from the Balkan Peninsula ; and *G. chilense* Balbis from the island of Chiloe.

CXXVI.—THE MOUNTAIN AVENS.

Dryas octopetala Linné.

THE vivid greenness of their compact cushions of foliage, early in the year, and their many, and relatively large, gaily-coloured blossoms closely nestling among the leaves, have not unnaturally brought about a cult for alpine plants among garden-lovers. They are seen at their best when, in their natural surroundings, their roots or rhizomes holding fast in some hidden crevice through which trickles the melting snow, they cling to some steeply sloping surface of bare grey rock in what the ecologist terms an open community of chomophytes. In winter—for they are almost always perennial—they may be sufficiently protected from frost by the snow that drifts on to the rock-ledges: their habit of growth enables them to defy the fierce winds to which they are constantly exposed; and they rejoice in the full glare of the sun, which they can utilise, when it is at its lowest altitudes, to unfold their blossoms and to ripen their fruit. The species that can endure these conditions are not numerous; and the small modicum of soil which even they require will not apparently support many individuals. Their struggle for existence, in fact, is rather a struggle against physical disabilities than against competing plants; and this is what is implied when these *chomophytes*, or screes-plants, are said to be in an *open* community. Their conspicuous flowers often produce more or less concealed honey, so as only to reward the visits of long-tongued insects, such as the butterflies, which frequent greater altitudes in the mountains than any other group of insects. There are, however, wind-pollinated Rushes among their associates, and Dwarf Willows that occupy a physiologically intermediate position. It is not because the situation of these alpine chomophytes is deficient in water-supply that their leaves exhibit xerophytic adaptations; but rather, perhaps, that the low temperature of the soil-water largely inhibits the absorptive action of their roots. Transpiration has, therefore, to be lessened, and the leaves have accordingly a leathery texture with thick epidermis and hypodermis and with stomata, or transpiration-pores, sunk below the general level of their surface or protected by dense woolly hairs. A polished upper surface and a serrate margin are, perhaps, protections against the prolonged adhesion of the crystals of snow.

Among British plants there is no more typical or more beautiful a representative of this alpine type than *Dryas octopetala* Linné. Though Petiver apparently applied the English name *Mountain Avens* to *Geum rivale*, it would seem to belong yet more appropriately to this species.

The genus to which it belongs is a small one, consisting but of two or three species; but well distinguished from *Geum* by its simple leaves, solitary flowers, the absence of an epicalyx, and the styles which have no articulation but grow out into long feathery awns, as in *Clematis* and *Ancmone Pulsatilla*. This last character is one of the many interesting parallelisms between the *Rosaceæ* and the *Ranunculaceæ*. In



THE MOUNTAIN AVENS—continued.

distribution the genus is distinctly "Arctic-alpine," extending from Spitzbergen and Iceland to the mountains of Macedonia and Dalmatia, the Alps and the Pyrenees, and into corresponding latitudes in North America; but not into the Mediterranean peninsulas. Our own species does not occur south of Staffordshire in Britain and reaches altitudes of 2,700 feet in Scotland, while it descends to sea-level in the north and west of Ireland. It is equally at home on the mica-schists of Scotland and on the limestones of West Yorkshire and Ireland.

The oak-like outline of the leaves attracted the attention of early writers. Clusius, Lobel, and Dalechamps call it *Chamædryas* (from the Greek χαμαί, *chamai*, on the ground; δρῦς, *drus*, an oak), a name which we retain as a specific name for species of *Veronica* and *Teucrium* with leaves of a similar outline; while Linnæus gave it the more poetical *Dryas*, from the Greek Δρυάς, *Druas*, a Dryad, or nymph of the oak-woods. The large delicate white blossoms with their numerous golden anthers certainly resemble those of the *Cistus*, so that Clusius's full name for the plant was *Chamædryas alpina, cisti flore*, "the alpine Ground-oak with the flower of a *Cistus*"; while Johnson, relying mainly on leaf form, placed it under *Teucrium* as *Teucrium alpinum, cisti flore*. The acumen of Robert Morison placed it near *Geum* under the name *Caryophyllata alpina, chamædryos folio*, "Alpine Clove-root with the leaf of a Ground-oak."

It is certainly characteristic of the genus to have both the slender stipules and the long leaf-stalks hairy and the under surface of the leaves of a hoary whiteness, and to have the number of leaves in both perianth-whorls increased above five; but those of the calyx are all in one whorl, so that there is no indication of an epicalyx. Though eight leaves is the rule in our species, nine frequently occur. The beautiful white petals of our British species are replaced in the North American *Dryas Drummondii* Richardson by golden yellow ones. In the Alps *Dryas octopetala* is *androdiaecious*, i.e. some plants bear flowers that are entirely staminate.

Though the crowded stamens conceal the honey on the concave hairy receptacle, and there is sometimes some difference in the period of maturation of the anthers and stigmas, self-fertilisation can readily occur, if insect visits fail. After flowering, the peduncle lengthens considerably; and the dense head of feathery awns from one to two inches long may obviously prove of service in the dissemination of the seed. Glandular hairs on flower-stalk and sepals may be a protection against unbidden guests, i.e. crawling, honey-robbing insects useless as fertilisers.

CXXVII.—THE COMMON AND ALPINE LADY'S-MANTLE.

Alchemilla vulgaris Linné and *A. alpina* Linné.

THE Tribe *Sanguisorbeæ* includes the three genera *Alchemilla*, *Agrimonia*, and *Poterium* represented in this and the two following Plates. It is characterised by having a small cup-like floral receptacle within which the carpels—which are from one to five in number—are enclosed when ripe.

The genus *Alchemilla*, which comprises some forty species, natives of Temperate climates, has several well-marked characters which mark it off sharply from the rest. Though all are herbaceous, some of the species are annual and others perennial. The orbicular, more or less deeply divided, and serrate leaves, from which the plants derive all their popular appellations, are an easily recognised feature; and they have generally the well-developed leafy stipules so frequent in the Family. The flowers are individually minute, an exceptional character among *Rosaceæ*; but, massed together, their pale shade of green renders them fairly conspicuous, and they secrete honey which is attractive to flies, though not usually to other insects. The symmetry of the flower is often tetramerous instead of the more frequent pentamerous arrangement, though the presence of either four or five leaves in each floral whorl is not distinctive even of particular species. The presence of an epicalyx is unique in this Tribe and serves to link *Alchemilla* to the *Potentilleæ*; whilst the absence of a corolla seems to mark the degenerate rather than the primitive type. Stamens or carpels are often also absent or rudimentary, so that the flowers are practically monoëcious. The honey is secreted by a ring-shaped nectary round the mouth of the receptacular tube, from beneath the outer margin of which spring the stamens, usually four in number, between the sepals—opposite, that is, to the smaller leaves of the epicalyx. The anthers burst transversely and have the peculiarity not only of opening only in dry weather but of closing again in wet if they have not discharged all their pollen. Though there may be as many as five carpels, there is generally but one, which rises from one side of the apex of a short stalk or *gynophore* springing from the base of the hollow cup-like receptacular tube. Its style rises from its base, as if a continuation of the *gynophore*, and the apex of the ovary and the style between them nearly block the mouth of the receptacular tube narrowed as it is by the nectariferous ring. A single ovule rises from the base of the ovary.

On a summer morning we may generally notice, in the moist lowland or sub-alpine pastures in which *Alchemilla vulgaris* grows, an interesting function of its leaves. Though all the surrounding vegetation may be dry, these leaves bear a glistening coronal of what are apparently dew-drops resting on the apex of each of their many finely-pointed serratures. These drops may trickle down the grooves over the palmately-radiating veins to the base of the leaf without wetting the hairy general



THE COMMON AND ALPINE LADY'S-MANTLE—continued.

surface and are then retained, by a tuft of hairs, from running down the leaf-stalk. This feature, to which the plant owes its Old English name *Syndow* or "Ever-dew" and its modern Border name *Dew-cup*, is not produced by dew or rain, but by water distilled out of the leaf itself in the process of transpiration by special "water-stomata" or pores at the points of the serrations. The name *Syndow* is identical with that which has been corrupted into Sundew in the case of *Drosera*.

The rhizomes of the perennial species, such as the two here represented, are astringent and mucilaginous, and have, therefore, been employed as an anti-spasmodic; but there seems little to justify the application to these humble herbs of a name so important as Tragus's *Alchemilla*—a prettily formed Latin diminutive—or rather of its original the *Al-kemelyeh* of the Arab physicians, as if they embodied the whole science and practice of alchemy.

How an early Latin name runs through the modern languages of Europe is illustrated by the *Pes leonis* of Brunfels and Fuchs, which appears as *Pied de lion* in Lyte, as *Lion's paw* in Gerard, *Leuwenklauw* in Dutch, and *Löwenfuss* in modern German; whilst that the modern English *Lady's-mantle* was originally *Our Lady's Mantle* is manifest, not only from the testimony of the ultra-Protestant William Turner, but curiously enough from the popular names in two Protestant countries, the *Onze Vrouwe mantel* of the Dutch and the *Marieka* of Sweden. Turner says:—

"Alchimilla other wyse called Pes leonis, is called in english our Ladies Mantel or syndow. It groweth in middowes like a Mallowe."

The root-leaves of the Common Lady's-mantle (*Alchemilla vulgaris* Linné), the larger of the two species represented on our Plate, may reach six inches in diameter and eighteen inches in the length of their stalks; and the stipules of the sessile cauline leaves unite by both edges so as to form a leafy *ochrea*, or sheath, round the stem. The whole plant is slightly hairy; but the leaves are green on their under surfaces. Although occurring in moist lowland pastures, this species finds its way up to 3,600 feet in the Scottish Highlands. A smaller, more silkily pubescent form, often hitherto confused with it, is the *A. filicaulis* of Buser.

The pretty little Alpine Lady's-mantle (*A. alpina* Linné), with its deeply divided leaves with silvery under surfaces, is, on the other hand, a typically Arctic-alpine species. It occurs as a chomophyte on exposed rock surfaces, with *Dryas*, *Sibbaldia*, the purple-flowered *Saxifraga oppositifolia*, and the Woolly Fringe-moss (*Rhacomitrium lanuginosum* Bridel), Reindeer-moss and Dwarf Willows, up to altitudes of 3,000 feet or more, on Ben Lawers and other Highland peaks, where, as Dr. W. G. Smith has pointed out, it is often dominant over large areas; but, carried down by mountain streams, it may also occur at not more than 400 feet above the sea. Its silvery foliage will add a grace to any rock-garden; but it requires good drainage.

CXXVIII.—THE COMMON AGRIMONY.

Agrimonia Eupatoria Linné.

GRAZED down by sheep on the common, or adorning the strip of turf by the road-side with its spikes of yellow bloom, few plants of the country-side are more familiar to every passer-by than the Common Agrimony (*Agrimonia Eupatoria* Linné). It is the typical species of a well-marked genus; and, although there are several closely-related forms, whether "sub-species" or truly distinct, its specific characters are not very difficult of definition. The explanation and history of the names which the plant has borne are, however, more obscure, as may appear from the following passage from John Parkinson's "Theatrum Botanicum" (1640):—

"The first is called in Greeke *Ἐννατάριον*, *Eupatorium*, and so the Latines call it also, of *Eupator* the first finder of it, as *Pliny* saith, who calleth it *Eupatoria*, and as it is thought is his *Argemone in arvis nasens*, but *Dioscorides* sheweth that this was an error in his time, in mistaking *Argemone*, for *Agrimonia*. Some also call it *Hepatorium* quoniam *hepati præcipue medetur*: because it is a chiefe helpe to the Liver: it is also called *Agrimonia* of divers; some other names are also given unto it, as *Marmorella*, *Concordia*, *Lappa inversa*, and *Ferraria*. The *Arabians* call it *Cafal*, *Cafel*, and *Gafel*: the *Italians* *Agrimonia*, and so doe the *Spaniards*. . . . All the Apothecaries of our Land, especially of *London* nowadays, doe use this first kinde of Agrimony, as the most assured *Eupatorium* of *Dioscorides*: howsoever in former times, both we and they beyond the seas, did usually take the *Eupatorium Cannabinum*, which they called *Eupatorium vulgare*, for the true kinde."

In spite of *Dioscorides*'s protest, the most plausible etymology for the name *Agrimonia* would seem to be the Greek *Ἄργεμόνη*, *Argemone*, from *ἄργεμον*, *argemon*, cataract in the eye, though it is curious that while the Poppies called *Argemone* are credited with efficacy against this disease in all the herbals, it does not occur among a long list of ailments for which Agrimony is recommended. Agrimony was clearly one of the numerous remedies the discovery of which was traditionally ascribed to *Mithradates Eupator*, otherwise *Mithradates the Great*, king of *Pontus*; but for what disease he recommended it does not appear. The rhizome is astringent and yields a yellow dye; and the green parts of the plant, being aromatic and slightly bitter, have some value as a tonic, and as such have often formed an ingredient in the various herb teas which are now generally forgotten.

The genus comprises some ten species, all perennial and herbaceous and natives of North Temperate regions. Their leaves are generally, as in our British species, interruptedly pinnate, though sometimes ternate: they have stipules adnate to their petioles; and a spike of numerous small yellow flowers. These flowers are perfect and pentamerous, but do not apparently produce any honey, although there is a ring-like disk lining the receptacular tube. This receptacular tube persists and becomes hardened, closing over the carpels, in the fruiting stage, and is surrounded with spines externally. The stamens vary in number from five to twenty; are perigynously inserted with the petals round the ring-shaped disk; and have small anthers and capillary filaments; and the carpels, one to three in number, each has its style terminated in a two-lobed stigma, and contains a pendulous ovule.

Agrimonia Eupatoria grows from one to three feet in height, and is seldom branched, whilst the whole plant above ground is hairy. Its rhizome is short and



THE COMMON AGRIMONY—continued.

woody. The leaves are all pinnate, the lower ones reaching a length of from three to seven inches and made up of from three to ten pairs of deeply serrate leaflets, the larger from one to three inches long, alternating with others less than half an inch in length. They are shaggy with soft silky hairs on their under surfaces; and, when bruised, give off a not unpleasant aromatic smell, suggesting the presence of coumarin or a comparison with the Tansy, to slight resemblances to which it owes the name of Wild White Tansy formerly applied to it.

The numerous distant flowers are about half an inch across, and are, in fact, shortly stalked, so that the inflorescence is technically a raceme. They expand in the early morning and remain open for three days. At first the stigmas are receptive, but the anthers are not mature: then, according to the late Lord Avebury, the anthers open extrorsely, *i.e.* turned away from the stigmas; and finally they bend towards the stigmas. Thus, failing cross-pollination, self-pollination is ensured.

After fertilisation, the spikes elongate still more, and the pedicels bend downward. The obconic receptacular tube shrinks in deep furrows throughout its length, and the little hooked spines which form a dense *chevaux-de-frise* round its upper end spread outward, ready to catch in the fur of any passing animal.

The Sussex name *Church-steeple* for the tall inflorescence is at least more elegant than the Durham name *Rat-tail*; while the New Forest term *Harvest-lice* for the clinging burs is certainly expressive.

A closely-related form, treated by Sir Joseph Hooker as merely a sub-species, is the *A. odorata* of Philip Miller, which is taller and more branched; has its flowers closer together and larger, its receptacular tube bell-shaped and scarcely at all furrowed in the fruit stage; while the lower spines point downward; and minute glands on the under surface of the leaves give off a resinous lemon-like perfume.

CXXIX.—THE SALAD BURNET.

Poterium Sanguisorba Linné.

THOUGH, as we have seen by the instance of *Alchemilla*, there are small-flowered plants among the *Rosaceæ*, the general characteristic of that Family is certainly the possession of conspicuous, pentamerously-symmetrical, insect-pollinated flowers. When we find a group of plants in such a Family as this, unquestionably related to that Family in its general structural characters, but with inconspicuous blossoms adapted in several respects to wind-pollination, we suspect it to be rather a case of degeneracy or reversion than the survival of a primitive type of the Family. This seems certainly to be the case with the Burnets, all of which are now often included under the genus *Poterium*.

The genus comprises some thirty species of perennials, mostly herbaceous, though sometimes shrubby. Their pinnate leaves with small, toothed leaflets gave them the name of *Pimpinell* or *Pimpernel*, by which they were very generally known, the mediæval Latin *bipennella* becoming the Italian *Pimpinella* and the French *Pimprenelle*. As in so many of the *Rosaceæ*, here again we find stipules adnate to the petiole.

The small flowers are crowded together in dense heads, each flower having a bract and two bracteoles, a four-cleft calyx, but no corolla. The terminal or central flower of the head opens first, and the flowers are often polygamous. The stamens vary in number from four to thirty. When few, as in *Poterium officinale* Hooker filius (*Sanguisorba officinalis* Linné), they are short and rigid and are associated with honey in perfect flowers; but when many, as in the Salad Burnet (*Poterium Sanguisorba* Linné), they have slender filaments hanging out of the honeyless flowers, and the stigmas consist of the mop-like tuft of threads characteristic of wind-pollination. Thus it would seem that the Great Burnet (*Poterium officinale*) is more frequently entomophilous itself and nearer to the originally entomophilous ancestry of the group than the Salad Burnet (*Poterium Sanguisorba*). Even the latter, however, is stated to be occasionally visited by flies, solitary wasps, and other insects. There are from one to three carpels, each with one pendulous ovule; and the adherent receptacular tube becomes hardened and four-angled in the fruit stage.

The name *Burnet* probably belonged in the first instance to the larger species, the rich brown of its sepals recalling a particular brown cloth known in Italian as *brunetta*, in French as *brunette*. The red sepals of *Poterium Sanguisorba*, with their olive-green margins, have no such suggestion. Possibly Fuchs's name *Sanguisorba*, from the Latin *sanguis*, blood, *sorbeo*, I absorb, which Linnæus took both as a generic name for the larger, and as a specific one for the smaller, species, referred originally to the blood-red colour with which these plants, like the similarly acidulated Docks,



THE SALAD BURNET—continued.

are so strikingly suffused. It was, however, taken, as a matter of course, to indicate the medicinal use of the plant, and Gerard says :—

“Burnet is a singular good herbe for wounds, and commended of a number : it stancheth bleeding, and therefore it was named Sanguisorba, as well inwardly taken as outwardly applied.”

While the Great Burnet inhabits damp meadows, the Salad Burnet often forms a considerable portion of the turf in the thinnest soil on chalk downs. We do not yet know enough of the ecology and physiology of the plant to say whether this preference for a calcareous soil is in any way connected with the acidulous character of its juice ; but this gives it a refreshing cooling flavour of cucumber to which it owes various uses and names. An Italian proverb runs :—

“L' insalata non e bella ove non e la pimpinella.”
“The salad is not good in which there is no pimpinella.”

Gerard says :—

“The lesser Burnet is pleasant to be eaten in sallads, in which it is thought to make the heart merry and glad, as also being put into wine, to which it yeeldeth a certaine grace in the drinking.”

A century later Nicholas Culpeper writes of it as “a most precious herb.” “It is,” he says,

“a friend to the heart and the liver. Two or three stalks put in a cask of ale or wine, especially of claret, are known to quicken the spirits, refresh and cheer the heart, and drive away melancholy.”

This was the origin of the generic name *Poterium*, from the Greek *ποτήριον*, *poterion*, a drinking-cup, which Linnæus took from Dioscorides (who had applied it to some other plant) and gave to the Salad Burnet.

The smooth, cut-edged leaflets, marked with radiating veinings and whitish below, are quite fern-like in their charm ; and the red angular peduncles and red-tinged heads of flowers often give their colour to a whole hill-side. The flowers at the top of each head are commonly female and they first expand their crimson stigmas. The lateral flowers, which are next to open, are perfect but protogynous ; whilst the lower ones are generally staminate. Thus when the anthers, hanging in tassels of red silk-like filaments, are ready to burst and discharge their pollen to the wind, most of the stigmas in the same head will probably have been already pollinated by pollen blown from another.

CXXX.—THE BURNET ROSE.

Rosa spinosissima Linné.

A REMARKABLE character in the Family *Rosaceæ* is that, whilst some of its genera, such as *Rubus* and *Rosa*, exhibit such infinite variability that, as we have before seen, it has been said that their species are still "in the making," many points of structure and of affinity with other Families suggest that the Family itself must be one of great geological antiquity. One of these points is the marked distinctness or isolation of its main divisions.

The Tribe *Roseæ* is almost co-extensive with the genus *Rosa*; and we may say of either that it is specially characterised by its fruit, the well-known "hip," a fleshy urn-shaped receptacular tube enclosing an indefinite number of distinct dry one-ovuled carpels and surmounted by the withered remains of the calyx.

But how can we hope to do any justice here to the Rose, when many volumes have been devoted to its honour. When we compare the varied beauties of flowers, we generally leave the Rose out of consideration as not canvassing the beauty of the Queen of Beauty when speaking of that of her court. As Gerard says:—

"The Rose doth deserve the cheefest and most principall place among all flowers whatsoever, being not onely esteemed for his beautie, vertues, and his fragrant and odoriferous smell, but also because it is the honore and ornament of our English Scepter."

Our gardens are credibly said to owe the Damask Rose-bush (*Rosa damascena* Miller) to Thomas Linacre, tutor to Prince Arthur and physician to Henry VIII; and the Musk Rose (*Rosa moschata* Herrmann) to Thomas Cromwell; but, long before this, and before the historic brawl in the Temple Gardens which is said to have begun the Wars of the Roses, the White Roses of our island had been singled out for special mention. Pliny, discussing the etymology of the word Albion, writes:—

"Albion insula sic dicta ab albis rupibus, quas mare alluit, vel ob rosas albas quibus abundat."

"The island of Albion is so called from its white cliffs washed by the sea, or from the white roses with which it abounds."

Who shall say whether this fancied etymology refers to the White Rose of our hedgerows (*Rosa arvensis* Hudson), or to the Burnet Rose (*Rosa spinosissima* Linné); for this latter, liking a warm dry soil, grows in thickets on chalk or limestone hills as well as among the shifting sand-dunes of the shore?

In the sober facts of geography we find this genus of scrambling and most prickly shrubs almost confined to Northern Temperate regions and belonging more to the Old World than to the New. Lady Banks's thornless Rose (*Rosa Banksiæ* R. Brown) is a native of China, and the genus extends into India, Abyssinia, and Mexico; but the number of American species is comparatively small. The name, *ῥόδον*, *rhodon*, in Greek, is common to both the Celtic and Hellenic divisions of the Aryan languages; and is probably connected with the words "red," the German *roth*, Latin *ruber*, Greek *ἔρυθρός*, *eruthros*, and the Sanskrit *rudhira*, meaning "blood"; so



THE BURNET ROSE—continued.

that, whether or not, the distillation of the red Damask and Hundred-leaved Roses (*R. damascena* Miller and *R. centifolia* Linné) for the manufacture of Otto or Attar is of equal antiquity, the recognition, and possibly the cultivation, of the Rose dates probably from before the Aryan migrations.

The total number of species in the genus has been variously estimated at from thirty to two hundred and fifty; but the variability is so bewildering that Linné himself, stout champion as he was of the fixity of species, confessed his belief that in this genus Nature had prescribed to them no certain limits. The cultivated varieties, which are numbered by the thousand and are added to every year, are obtained as seedlings, mostly hybrid, from a limited number of species, even the most "double" forms yielding occasional pollen and carpels sufficient to produce some seed. The warmer summers of the Continent allow more of these seeds to ripen thoroughly than does our climate, so that there are more varieties of foreign origin.

Sir William Hooker described nineteen British species; but his son, in consultation with Mr. John Gilbert Baker, reduced them to seven.

"As with the *fruticosa Rubi*," he says in the "Student's Flora," "all the so-called species are connected by intermediates; but, whereas, in the *Rubi*, the 4 or 5 most distinct British forms are connected by so many links that various botanists regard them as forms of one species; in *Rosa*, the five most distinct British forms are connected by so few (comparatively) intermediates, that no botanical authority has reduced them to one species."

The prickles of the Roses, which, like those of the Brambles, may be mingled with stiff bristle-like or glandular hairs, are purely superficial structures, not connected to the wood of the stem, and can thus be removed so as to leave a clean scar. They vary greatly in form, many climbing species having them curved; whilst in the Burnet Rose, though very varied in length, they are all straight and apparently mainly protective against browsing animals.

The leaves have adnate stipules and are in nearly all species pinnate, those of the Burnet Rose and its nearest allies having generally nine roundish, serrate leaflets, the likeness of which to those of the genus *Poterium* has given the plant its name which in full would be Burnet-leaved Rose. A form, differing mainly in having glandular hairs on the flower-stalk, was called *Rosa pimpinellifolia* by Linnæus.

Unlike our hedgerow Roses, in which the sepals are variously pinnately lobed, those of the Burnet Rose are entire; and a further distinctive character is the short globular fruit which ripens in September to a dark purple or black. Sometimes known in Lancashire as *Barrow Rose*, from its abundance among the sand-hills or "barrows" on the coast, it is generally in flower between the twentieth and the twenty-fifth of April, a succession of blossoms continuing for many weeks.

Though often known as the *Scotch Rose*, the species is nowhere more abundant than on the shores of the north-west of England and of Wales.

CXXXI.—THE DWARF CHERRY.

Prunus Cerasus Linné.

IF *Rosa* is an isolated genus, *Prunus*, in the wide sense, is even more so. With the exception of a remarkable North American genus *Nuttallia*, which has five free carpels of a leathery texture and thus appears to form a link with the Sub-Family *Spiræoideæ*, it constitutes the entire Sub-Family *Prunoideæ* in Dr. Focke's classification of the *Rosaceæ*; and this group has long been generally known, on account of the fruit of *Prunus*, as the *Drupaceæ*. This type of fruit, consisting of a single carpel, superior, *i.e.* entirely free of all adhesion to the receptacular tube, containing two pendulous ovules, only one of which usually becomes a seed or "kernel," and forming three distinct layers in its pericarp, the "skin," "flesh," and "stone," or *epicarp*, *mesocarp*, and *endocarp*, does not occur precisely with these characters in any other genus. All the members of the Sub-Family are woody plants and all have simple leaves with stipules not united to the petiole. The flowers are pentamerously symmetrical and produce honey: the calyx is deciduous and the stamens are not more than twenty in number. A physiological affinity running through the whole of the genus is shown by the formation to a greater or less extent of almond oil and prussic acid in leaves and kernels, and by the occurrence of what are termed "extra-floral nectaries" on the leaf-stalks. These structures, which commonly appear as two or more blackish spots near the base of the leaf-stalk, exude nectar, and in other cases in which they occur are supposed to be useful in attracting ants, which protect the tree from the ravages of other insects—an explanation that seems hardly sufficient in the case of these trees of Temperate latitudes.

The genus *Prunus* in its widest sense is readily subdivided by the methods in which the leaves fold in the bud, the character of the surface of the epicarp and that of the "stone" or endocarp. Almonds, Peaches, Nectarines, Cherries, and Cherry-laurels agree in having their leaves folded lengthwise down the midrib like the two halves of a sheet of note-paper, or, as it is technically termed, *conduplicate*; whilst those of Plums and Apricots are *convolute*, or rolled up like a scroll. Almonds, Peaches, and Apricots have a downy epicarp; Nectarines, a smooth but not much polished one; Plums, a covering of glaucous waxy "bloom"; and Cherries and Cherry-laurels, a high polish, without either down or bloom. Lastly, the Almonds, Peaches, and Nectarines are widely separated from the rest by having the endocarp or stone of the fruit deeply corrugated with furrows or pitted with large holes, so that these are commonly detached as Linné's genus *Amygdalus*.

The Cherries and Cherry-laurels have also often been erected into a distinct genus, *Cerasus*, characterised by the conduplicate leaves, polished fruit, and smooth endocarp, and it may be subdivided into the *Laurocerasi*, or Cherry-laurels, with evergreen leaves and flowers in racemes; the *Padi*, or Bird Cherries, also with their



THE DWARF CHERRY—continued.

flowers in racemes, but with deciduous leaves; and the true *Cerasi*, with deciduous leaves and their flowers either solitary or in "fascicles" or umbel-like clusters. All the seventy or eighty species of *Prunus* belong essentially to Northern Temperate regions; and our three British species of Cherry, *Prunus Padus* Linné, *P. Avium* Linné, and *P. Cerasus* Linné, belong entirely to the Old World. Despite Pliny's statement that there were no Cherries in Italy before Lucullus brought them in triumph from Pontus after his victory over Mithradates about 68 B.C., but that "in less than a hundred and twenty years after, other lands had Cherries, even as far as Britain beyond the ocean," it seems probable that these three species may be truly indigenous in this country. It is, however, certainly remarkable that for so conspicuously beautiful a group of trees almost all the common names should be, as they are, derivatives of the *Κέρασος*, *Kerasos*, of the Greek, the Latin *Cerasus*. Pliny derives this from Cerasonte, now Kereson on the Black Sea, near Trebizond; and, no doubt, the Romans first introduced the cultivation of the tree as an orchard fruit into Britain, so that the Old English name *Ceris baum* is a Teutonised adoption from the Latin.

It may be noted that there has been an unfortunate confusion in past times of the English and Latin forms of the name Bird Cherry and *Prunus Avium*, which ought to, but do not, belong to one and the same species. The Bird Cherry is the small tree, *Prunus Padus* Linné, with pretty racemes of small blossoms; whilst *P. Avium* Linné is the Gean, a tree sometimes reaching twenty, thirty, or more feet in height, growing in dry soil, in woods, with drooping, long-stalked leaves; soft, limp, deeply notched petals; and a firm, bitter fruit yielding but little juice, which, however, stains the hands.

Coppiced specimens of this tree have often been mistaken for *Prunus Cerasus* Linné, which is usually a mere bush, with copious suckers, and is frequently known as the *Dwarf Cherry*. It has short-stalked, erect leaves, broader and with more wavy veins than *P. Avium*; firm, slightly notched petals; and a round, red, juicy, acid fruit, the juice of which does not stain one's hands. Whilst the Gean, from which the German Kirschwasser is distilled, is the probable origin of our Morella Cherries, our sweet garden varieties are probably derived from *P. Cerasus*.

The glistening brown-green leaves, coated with a film of gum as they open in early spring, the snowy clusters of bloom, the round, glossy crimson fruit, and the wonderful combinations of blood-red and clearest yellow that appear in the autumn foliage, combine to place the Wild Cherries among the most attractive of our woodland trees.

CXXXII.—THE BLACKTHORN OR SLOE.

Prunus spinosa Linné.

SO closely related are the "stone-fruits" which constitute the Tribe *Drupaceæ* or *Prunoideæ* that almost all of them have, at one time or another, been included in the genus *Prunus*. All are woody plants, with scattered, simple leaves which have generally some sugar-excreting glands or "extra-floral nectaries" on their stalks; white, pink, or red flowers; calyx and corolla of five leaves each and both deciduous in the fruit stage; numerous stamens rising from the margin of a cup-like receptacular tube which encloses the monocarpellary ovary without adhering to it; and two ovules of which only one as a rule reaches the mature condition of a seed.

While, however, the Peaches, Almonds, and Apricots have a woolly skin or "epicarp" to the fruit, the Cherries and Cherry-laurels have smooth and polished drupes; and the Plums—the genus *Prunus* in its most restricted sense—have their fruits covered with a glaucous "bloom" or coating of wax-particles. There are further differences in the "stones" or "endocarps" of the fruits, which are corrugated in Peaches, pitted with holes in Almonds, and smooth in the other groups; in the inflorescences; and in the folding of the foliage-leaves in their buds. In the Cherries and Cherry-laurels the leaves are *conduplicate*, folded, that is, down the midrib like the two halves of a sheet of note-paper; whilst in the Plums they are *convolute*, or rolled up with one margin inside, as in a scroll.

Among the remains of Stone-Age folk found in the Swiss lake-dwellings are the stones of the fruits of Sloes and Bullaces, suggesting that these types were then used as food and, perhaps, cultivated; but what we should call distinctively a Plum is not found and may not at that time have been evolved by the cultivator's selective art. It is, at the present day, difficult to draw the line between Sloe, Bullace, and Plum, or to say that hedgerow trees of the two latter groups are anything more than escapes from cultivation. We may, however, discriminate between the three by the following characters. If the bark is dark grey or black, the branches spread in all directions, every twiglet ending in a thorn; if the flowers come out before the leaves and have smooth stalks, while the leaves are small, finely-toothed, and smooth beneath, and if the fruit is globular, purple-black, not more than half an inch in diameter and very austere in taste, it is the bush we call a *Blackthorn* when it is in flower or leaf, and a *Sloe* when in fruit. If the bark is brown, the branches straight and downy, with but few thorns, the leaves larger, broader, more coarsely serrate and downy below; if the flowers and leaves expand at the same time, the flower-stalks are downy, and the globular fruit is purple or yellow, nearly an inch in diameter and less austere, we call the tree a Bullace or Damson. Or, lastly, if the bark is brown, the branches are straight and thornless, the flower-stalks smooth, the leaves downy only along their veins, and the fruit oblong and over an inch in length, we call it a Plum, and admit that it is almost certainly an escape from cultivation.



THE BLACKTHORN OR SLOE—continued.

Botanically these three types may be known as *Prunus spinosa* Linné, *P. insititia* Hudson, and *P. domestica* Linné.

The close relationship of these forms was early recognised. Thus William Turner, in his "Names of Herbes" (1548), writes :—

"Prunus is called in greeke Coccimelea, in englische a plum tree, in duche ein pflaumen baume, in frenche Vun prunier. Prunus sylvestris is called in englische a sloe tree, or a sle tree."

The cold dead-white of the blossoms of the Blackthorn appearing "precociously," *i.e.* in advance of the leaves, in April, contrasting with the sombre hues of the bare boughs, have such associations with bleak weather in our minds as to make the plant unpopular and even to blind some people to its beauties. As Gilbert White says in the "Natural History of Selborne" :—

"The tree usually blossoms while cold north-east winds blow ; so that the harsh, rugged weather obtaining at this season is called by country people 'Blackthorn winter.'"

At that season we may well, from a little distance, mistrust our eyesight and wonder if it is indeed a line of lingering snow-drift, brought by the north-east wind of the previous night, that lies on the slopes of the hills.

When, a few weeks later, the small leaves make their appearance, the stout spines protect them from being browsed, and also afford protection to many nesting birds and sprouting seedlings. In some parts of France the shrub is known as *Mère du bois* (Mother of the forest), partly from this function and partly from the spreading of its suckers, since by its means the margin of woodland may readily extend itself over adjoining meadows.

With their branches cut off as rounded knobs, straight stems of Blackthorn make excellent walking-sticks ; and the leaves have been used to adulterate tea. When dry they are said to have some of the fragrance of green tea.

In autumn the bush is, perhaps, more ornamental than in spring. The unripe fruits are a purple-blue, becoming blackish-purple as they ripen and lose their bloom, or reddish if mellowed by frost. Though pleasing to birds and schoolboys, they are, at their best, but harsh and barely edible. They have undoubtedly been used in the concoction of spurious port wine ; but are more legitimately employed in the manufacture of an excellent liqueur. The unripe fruits in France are sometimes pickled as a substitute for olives.

CXXXIII.—ANALYTICAL DRAWINGS OF THE FAMILY ROSACEÆ.

MORE numerous and more varied in size than the Buttercup Family, the Rose Family have yet so many points of resemblance to that more primitive group as to suggest a relationship and much parallelism of development in the long distant past. The main difference, however, between the two groups is in the receptacle or base of their flowers; for whilst in the Buttercup and its allies this is a simple tapering cone from which the floral leaves spring one above the other, in the Rose Family the receptacle expands outwards into a flat disk or upwards into a tube, carrying sepals, petals, and stamens into a ring round, instead of beneath, the carpels, making them *perigynous*, instead of *hypogynous*. This indicates a type distinctly more specialised or higher than that of the Buttercup Family. The individual flowers in the *Rosaceæ* are mostly of one simple type, having generally their parts in fives and equal, so that the flower is polysymmetric. There is a conspicuous corolla, indicative of insect visits; but with honey so slightly concealed that there is no restriction as to these visitors, short-tongued flies and bees being as well able to supply themselves as insects with a longer proboscis. The stamens are generally at least twice as many as the petals, and often three, four, or more times as numerous. They usually mature their anthers before the stigmas; but the Burnets (*Poterium*) are exceptional in being wind-pollinated and protogynous.

It is, however, chiefly in the gynæceum that variety occurs in the Family and upon this its main subdivisions are based. The carpels vary in number from the single one in the Plums and in Lady's-mantle, to the five of the Apple and the indefinite number in the Rose and the Strawberry; and they vary in the extent to which they are imbedded in the receptacle as much as in number. Each carpel contains one, two, or rarely more, ovules, which become exalbuminous seeds.

Of six Sub-Families into which the Family is divided, two are Tropical or sub-tropical and are not represented among our eighteen British genera.

The *Spiræoideæ* is the Sub-Family represented by the Meadow-sweet (Figs. 1-5). In it the carpels are from two to twelve in number, arranged in a whorl on a flat receptacle, neither raised nor imbedded: they are mostly two-seeded and split open when ripe. Fig. 1 shows a flower, natural size; Fig. 2, the same, with the petals removed; Fig. 3, the calyx and gynæceum enlarged; Fig. 4, the gynæceum, slightly enlarged; and Fig. 5, two detached carpels, one of which is in section so as to disclose the seeds.

The Sub-Family *Pomoideæ* comprises the Apples, Pears, Mountain Ash, Hawthorn, Medlar, etc., which have from one to five carpels, imbedded in the adherent, fleshy receptacular tube, which forms the fruit known as a *pome*, with a parchment-like or stony core and the withered persistent calyx at its summit. In the Apple (Figs. 6-12), Fig. 6 represents a flower, seen in section; Fig. 7, the same,



ANALYTICAL DRAWINGS OF THE FAMILY ROSACEÆ—continued.

without the petals ; Fig. 8, a later stage, when the petals are withering ; Figs. 9 and 10, the gradual swelling of the base of the receptacular tube to form the fruit, after the petals have fallen ; Fig. 11, the fruit in longitudinal section ; and Fig. 12, the same, in transverse section. It is interesting to note in Fig. 11 how the stigmas still remain above the young fruit ; and in a transverse section it will be found that, though imbedded, the carpels are not themselves actually united.

The Hawthorn is represented in Britain by two sub-species, with one and two carpels respectively, and it is the former which is shown in Figs. 13-18. Fig. 13 is a flower ; Fig. 14, the same, without its petals ; Fig. 15, the calyx ; Fig. 16, a section of a flower ; Fig. 17, the fruit, showing the one withered stigma surrounded by the withered sepals ; and Fig. 18, the same in section.

The Sub-Family *Rosoideæ* has one-seeded, indehiscent carpels, generally numerous and forming dry achenes. It comprises several Tribes, three of which have British representatives. The Tribe *Potentilleæ* has usually a number of distinct carpels arranged spirally ; and comprises the Brambles and Raspberries, in which each carpel forms a fleshy miniature drupe or *drupel*, the Strawberries, Potentillas, Avens, etc. In the Strawberry (Figs. 19-22) there is an epicalyx, a fleshy outgrowth from the receptacle, and a lateral style to each of the carpels scattered over it. Fig. 19 is a flower ; Fig. 20, one without its petals, showing the epicalyx ; Fig. 21, the fruit ; and Fig. 22, a single carpel. In the Herb Bennet (Figs. 23-27), Fig. 23 is a flower ; Fig. 24, the calyx ; Fig. 25, the gynæceum, when young ; Fig. 26, a ripe carpel, showing the curious kink in the style which gives rise to the hook of the bur ; and Fig. 27, a petal.

The Tribe *Sanguisorbeæ*, in which the receptacle forms a cup which hardens round the carpels in the fruit, comprises the Lady's-mantles, Agrimony, and Burnets. Fig. 28 represents one of the little green flowers of *Alchemilla vulgaris* ; Fig. 29, two of the four stamens, one bursting ; and Fig. 30, the solitary carpel on its *carpopore*, with its basilar style, and also a view of it in section. Fig. 31 is a flower of *Alchemilla alpina* ; and Fig. 32 shows the centre of it so enlarged as to make clear the honey-secreting ring round the mouth of the receptacular tube.

In the Tribe *Roseæ* the hollowed receptacle becomes fleshy in the fruit and encloses, without imbedding, the numerous achenes. Fig. 33 is a flower of the Burnet Rose ; Fig. 34 shows the same, without the petals ; Fig. 35, the fruit ; Fig. 36, the same, in section ; and Fig. 37, a single carpel.

The Sub-Family *Prunoideæ* has simple leaves and a fruit formed from a single carpel with no persistent calyx or enlargement of the receptacle. *Prunus*, in a wide sense, is the only British genus. Fig. 38 is the flower of the Blackthorn or Sloe ; Fig. 39, its calyx ; Fig. 40, the flower in section and enlarged ; Fig. 41, the young carpel in section, so as to show the pendulous ovule, enlarged ; and Fig. 42, the fruit in section, also enlarged.

CXXXIV.—THE PETTY WHIN.

Genista anglica Linné.

IN spite of their undoubtedly close relationship, the contrasts between the *Rosaceæ* and the *Leguminosæ* are most remarkable. The latter, which is often known as the Pea and Bean Family, is the second largest Family among Flowering Plants, numbering some eleven thousand species in some four hundred and fifty genera. It comprises many larger trees than occur among the *Rosaceæ*, is, perhaps, more truly cosmopolitan, and is certainly far better represented in the Tropics than that Family. In place of the great variety of fruits that we have seen to characterise the *Rosaceæ*, the *Leguminosæ* take their name from the one type of fruits which prevails, with merely trivial variations, throughout the entire Family, viz. a single, superior, many-ovuled carpel, becoming generally a dry dehiscent pod or *legume*.

Living in every variety of climate and soil, the species in the Family *Leguminosæ* include a very great variety of habit of growth, trees, shrubs, lianes, water-plants, tendril-climbers, small herbs, xerophytes, etc. One physiological peculiarity, apparently universal in the Family, which may well account largely for its success in the struggle for existence, is the capacity for utilising the free nitrogen in air by means of tubercles on the roots, produced and occupied by symbiotic Bacteria.

The leaves are, like those of *Rosaceæ*, usually scattered and stipulate; but the stipules are more often free, and the leaves themselves nearly always compound. The high organisation of the leaf, with stipules, articulations often numerous and accompanied by "sleep" mechanism, and sometimes tendrils, indicates the advanced grade of specialisation of the Family.

Uniform as they are in their fruit, the members of the Family fall into three very "natural," *i.e.* well-marked, Sub-Families in respect of their flower-structure, though in all the odd sepal is at the front of the flower (*anterior*), instead of being, as it is in the *Rosaceæ*, *posterior*. The *Mimosoideæ*, including the Acacias, have polysymmetric flowers with small valvate perianths and prominent stamens varying in number from four upwards. The *Casalpinoideæ*, which include, among well-known plants, the Judas-tree (*Cercis Siliquastrum* Linné) and the Cassias, have monosymmetric flowers, usually with imbricate perianths, conspicuous corollas, and ten stamens; but the corolla is not papilionaceous. These two Sub-Families are mainly Tropical. The *Papilionatæ*, the only Sub-Family represented among British plants, all have the peculiar arrangement of the petals known as *papilionaceous*, in which the posterior petal, generally the largest and known as the standard, overlaps both the side or "wing" petals and they in turn each have their other edge over (*i.e.* external to) an edge of one of the two anterior or "keel" petals. Whilst the "claws" or bases of all five petals remain distinct, these two keel petals are more or less united above the base by their outer edges. The calyx consists of five sepals united below into a flat or convex receptacle, so that the insertion of the petals and stamens is perigynous;



THE PETTY WHIN—continued.

but in some cases, as in the plants represented in this and the three following Plates, the union between the upper portions of the sepals is so unequal that the calyx appears two-lipped. The ten stamens, which are inserted in two whorls, are generally *diadelphous*, the nine anterior being united into a split tube by the lower half of their filaments, whilst the posterior stamen is free; but in the genera *Genista*, *Ulex*, *Sarothamnus*, and *Ononis*, the Greenweeds, Gorses, Brooms, and Rest-harrows, all ten stamens are united (*monadelphous*).

Most *Papilionatæ* secrete honey at the base of the staminal tube, in which it accumulates round the base of the ovary. It is thus concealed and requires the insect obtaining it to have a moderately long tongue. The *Papilionatæ* are, in fact, bee-flowers, *i.e.* they are mostly pollinated by that highly-organised group of insects; and this, like other examples of the highly-specialised structure and physiology of the group, points to its geologically-speaking recent origin. A heavy insect visiting one of the blossoms alights on the wing petals, often grasping them with its legs. These wing petals are usually interlocked with the keel petals within by a remarkable series of protuberances and hollows in the one moulded over those in the other, so that the two pairs of petals are depressed together by the bee's weight. The anthers and stigmas are thus exposed, and pollen is usually dusted on to some portion of the bee's body which in visiting another flower will come in contact with the stigma. The stamens are usually somewhat protandrous; but, except in a few cases, self-pollination may occur if cross-pollination has failed to do so.

In addition to many elaborate modifications of this mechanism for pollination, many *Leguminosæ* have admirable contrivances to secure the dispersal of their seeds. One of the most frequent of these is well seen in the genus *Genista*, in the short pods of which an outer layer of cells becomes densely woody, while the inner layers are less dense. As these layers part with almost the last moisture they contain, in warm sunny weather, the denser layers contract more than the less dense, with the result that the pod splits open with a jerk, thus throwing the seeds to some distance from the parent plant.

The nineteen genera, including in all some eighty species, of British *Leguminosæ* belong to six different Tribes. Of these, the *Genistææ* are shrubby plants, with leaves of three leaflets, ternately arranged, or reduced to one leaflet, or absent altogether, a two-lipped calyx, and monadelphous stamens. Its British representatives belong to the three genera *Genista*, *Ulex*, and *Sarothamnus*.

CXXXV.—THE COMMON GORSE.

Ulex europæus Linné.

WHEN, in "The Tempest," Ariel reports to Prospero that Caliban, Trinculo, and Stephano have followed his music

^{"through}
Tooth'd briers, sharp furzes, pricking goss, and thorns,"

the Rev. H. N. Ellacombe (from whose "Plant-lore of Shakespeare" I have gained great assistance) suggests that by "pricking goss" and "sharp furzes" different plants were, perhaps, intended. The "pricking goss" was, he suggests, *Genista anglica* Linné, while the "sharp furzes" were *Ulex europæus* Linné.

However this may be, we have in the plant which we now name indiscriminately *Gorse* or *Furze* a plant of much beauty and of great physiological interest. Whilst in *Genista* only one of our three British species is spinous, or in any marked degree xerophytic, *Ulex* is a genus of some twenty species, all of which are densely spinous. There are few better illustrations either of what is known as the Law of Recapitulation or of the direct influence of physical conditions upon structure than those afforded by the development of seedlings of the Common Gorse. The exalbuminous seeds in sprouting spread out their two oval green cotyledons and then produce several little trefoil leaves. Under ordinary circumstances these are soon succeeded on the main axis or stem of the seedling by narrower, more pointed, and stiffer leaves, and these by spines which no longer bear any semblance of leaf-nature. The adult plant is leafless, the functions of leaves being carried on by straight, green, fluted, polygonal, much-branched, spinous branches, and transpiration (performed by stomata sunk in the grooves) being reduced to a minimum. This markedly xerophytic character, however, would seem to have been acquired as the result of dry air; for if seedlings are grown under a bell-glass, or in air which is otherwise kept in a state of saturation, the production of trefoil leaves is prolonged, and that of spines is postponed. These facts naturally suggest the descent of our spinous Gorse from a more leafy ancestry, the development of the individual at the present day, or, as it is termed, its *ontogeny*, recapitulating the history of the ancestry of the race, or *phylogeny*. Darwin, in his "Origin of Species," points out that characters are often inherited at slightly earlier ages in successive generations; and this principle, which we have termed that of "anticipatory inheritance," suggests how the effects of drought upon the Gorse made their appearance at successively earlier stages until they now appear in the earliest seedling development.

That the spines, both primary and secondary, are branches is indicated by their bearing flowers. These are flanked by two ovate bracts. The calyx is yellow, but paler than the petals, shaggy with spreading black hairs, and so minutely toothed (its upper lobe into two, and the lower one into three, teeth) that it is often difficult to see anything but the main division into two. The deep golden-yellow petals exhale



THE COMMON GORSE—continued.

a delicious perfume of apricots, especially when the sun is shining with its full heat, or when we crush the flowers in our hands; and this advertisement of the pollen attracts a numerous crowd of bees. The claws of the petals are short, the wing petals are longer than those of the keel, and both these pairs are obtuse in front. The ten stamens are all united below; but the two whorls differ in their anthers, which are alternately short and versatile and long and basifixed.

Delpino and Hermann Müller distinguished four main types of pollination-mechanism among *Papilionatæ*, viz. (i) explosive flowers, in which only one insect's visit has any effect in pollination; (ii) the piston mechanism, which requires numerous insect visits, as in *Ononis* and *Lotus*; (iii) the brushing arrangement, not very dissimilar, as in *Vicia* and *Lathyrus*; and (iv) flowers in which both stamens and stigma emerge from the keel under the pressure of the bee upon the flower, but return to their former position when its weight is removed, so that repeated visits may prove efficacious. This last group includes *Melilotus*, *Trifolium*, and *Astragalus*. *Genista* and *Ulex* are examples of the first type. The anthers mature in succession, some of them in the bud stage, and all of them discharge their pollen into the space between the stigma and the anthers at the apex of the keel. Their filaments then shrivel up.

The keel petals are at first united along both their upper and their lower margins and are, like the standard petal, nearly horizontal. This position is one of tension, the curved style pressing like a spring against the united upper edges of the keel petals. When a bee alights on the flower in search of pollen—for honey there is none—and thrusts its proboscis down the middle line of the standard petal to the base of the receptacular tube, the claws of the wing and keel petals curl backward, the keel petals separate along their upper edge, the pistil springs upward with a jerk, and the keel petals themselves fall downward and backward into a vertical position, throwing out a shower of pollen.

The Common Gorse flowers from February to June and again from August to September; but the fruit is mainly the product of the first flowering. The thick black pods, covered with brown hairs, are about three-quarters of an inch in length, but little longer, that is, than the calyx; and on a warm summer's day we can hear them explode on all sides of us as we walk over moor or common. In this way, we have known the seeds to be thrown fully twenty feet.

The Gorse belongs essentially to West Central Europe, from Italy to the Canaries and the Azores and northward to Denmark. Even in the south of England it often suffers severely from the frost, while it is specially luxuriant on the hills of the west within reach of the sea-breezes. It may, in fact, be included in the list of the Atlantic or Lusitanian flora.

CXXXVI.—THE DWARF GORSE.

Ulex minor Roth.

THE beauty of the golden blossoms of the Gorse, rich alike in colour and in perfume, against their admirable background of dull blue-green is a landscape feature better seen, perhaps, in England than in any other country. Gorse is one of the few social plants which is so strikingly dominant as to give a popular name to its associations. Enclosures have lessened the number of "Furze-brakes," and it is not very easy to state the ecological conditions under which they occur. The Common Gorse seems to prefer a well-drained sub-soil: it flourishes even in the loose shingle of the sea-shore, on pure sand or on limestone; but it seems to do better on chalk when there is a surface layer of loam or on a clayey gravel, rather than on stiff clay. Gerard writes:—

"The greatest and highest that I did ever see do grow about Excester, in the West Parts of England";

and certainly on the high ground of Exmoor or the Devonian hills from Minehead to the Cornish border the plant luxuriates in the mild climate and reaches dimensions seldom elsewhere exceeded. The Red Deer is frequently well concealed in brakes seven or eight feet in height.

Nor is the beauty of its masses of bloom dependent merely upon our associations with our own land. The circumstantial tradition that Linnæus, when in England in 1736, on first seeing the Gorse in blossom, on Putney Heath, fell on his knees and thanked God for its beauty, is said to be apocryphal; but the testimony of the late Dr. Alfred Russel Wallace, if suggestive of a love of home, is based upon a clear artistic reason.

"I have never seen in the Tropics," he writes in his "Malay Archipelago," "such brilliant masses of colour as even England can show in her Furze-clad commons, her glades of wild Hyacinths, her fields of Poppies, her meadows of Buttercups and Orchises, carpets of yellow, purple, azure blue, and fiery crimson, which the Tropics can rarely exhibit."

There is a well-known proverb that kissing is not out of season as long as the Gorse is in bloom, which is based upon the fact that some Gorse can be found in flower at almost any season; but those who have made this observation in Natural History have not, perhaps, noticed that it depends upon the existence of two, if not three, distinct species, each of which has its own season of flowering. The Common Gorse (*Ulex europæus* Linné) does, it is true, bloom twice in the year and puts out occasional blossoms at all seasons; but from July to November the most conspicuous Gorse blossoms in the landscape are those of the Dwarf Gorse (*Ulex minor* Roth).

It is true that, when stunted by wind and weather on the beach, or when, as it may be, browsed down by cattle, the Common Gorse may appear low-growing; but it can generally be readily distinguished from *Ulex minor* by its blossoms. Roth, who first described this latter species in his "Catalecta Botanica," in 1797, says of it that it is but half the size of *U. europæus* in all its parts: its branches are more



THE DWARF GORSE—continued.

recumbent: its flowers are smaller and paler, with very minute, rounded, closely adpressed bracts, a calyx which is finely downy and has distinct spreading teeth, a narrower standard petal, and the wings shorter than the keel. Its pods do not ripen until nearly a year after their formation. This species, which has been very generally known by the name *Ulex nanus* given it in 1798 by Thomas Furley Forster in Symons's "Synopsis Plantarum," is a very striking feature, growing and flowering with the Fine-leaved Heath (*Erica cinerea* Linné) on sandy upland commons in the south-eastern counties. The first notice of it as a British plant appears to be by Thomas Johnson, who noticed it on his western tour near Southsea Castle. Calling it *Genistella anglica spinosa*, sive *Chamæspartum supinum*, or "Creeping Dwarf furze or Whins," he describes its occurrence, in the Second Part of his "Mercurius Botanicus" (1641), as

"Non procul a Castro South Sea Castle in Comitatu South-hampton provenit, ubi floret Julio et Augusto, gracilibus ramulis procumbentibus."*

In 1846, Jules Planchon, afterwards Professor at Ghent and Montpellier, but then assistant in Sir William Hooker's Herbarium, distinguished what he considered another species of Gorse; and, in describing it in the "Annales des Sciences" for 1849, he named it, after the French botanist Le Gall, *Ulex Gallii*. This is the most frequent dwarf form in the west of England and the only one in Ireland; but it is sometimes nearly as large as *U. europæus*. Its spines are stiffer than those of *U. nanus* and are often strongly deflexed. The branches are more erect, and the flowers, which open in the autumn, are of an orange colour, with minute adpressed bracts, as in *U. nanus*, but with the wing petals longer than the keel. The calyx is practically the same as that of *U. nanus*, from which it is difficult to separate the plant specifically; but the pods burst in the spring.

The so-called *Irish Furze* (*Ulex strictus* Mackay) is a fastigiate variety of *U. europæus*, with soft, slender four-angled spines, which grows a foot or two in height in Lord Londonderry's park at Down; but does not even come true from seed.

The double-flowered variety of the Common Furze is an attractive plant on a lawn or in a garden hedge, and, as it is quite tolerant of the pruning shears, can be easily kept under control.

* "It occurs not far from Southsea Castle in the County of Southampton, where it flowers in July and August, having slender procumbent branches."

CXXXVII.—THE BROOM.

Sarothamnus scoparius Wimmer.

THE large pea-like blossoms of the Broom, "yellow and bright as bullion unalloyed," swinging freely in the wind on slender foot-stalks from the glossy green flexible shoots have quite an exhilarating effect on the beholder. Like many other *Leguminosæ*, the shrub seems to luxuriate in a warm dry soil, especially pure sand, and in the sunniest aspect, as if reminiscent of an origin Mediterranean rather than northern, recking little of a scarcity of water or of exposure to wind. Though absent from the mainland of Scandinavia, it is distributed over the whole of Britain and ascends to altitudes of 2,000 feet in the Scottish Highlands. Its tough woody stems may in time reach five or six feet in height and are surmounted by a dense mass of long, erect, flexible, and angular twigs. These are tough, furrowed, and of a bright green, becoming bluer with age, and are clothed with fine silky hairs. Their stomata, or transpiration-pores, are confined to the bottoms of the furrows; so that, although small leaves do exist, the plant is obviously adapted to the economy of water by a lessened transpiration which its habitat suggests.

The little leaves are stalked and mostly ternate, the obovate leaflets being from a quarter to half an inch long; but the upper ones have generally only a single leaflet. The stipules are minute and the leaves, when young, are silky. Leaves are sometimes almost absent and, in any case, the green branches perform most of their physiological functions in the plant's economy.

The gay blossoms form one of the glories of the month of May; and, though they yield no honey, are visited by many bees and other insects for the sake of their pollen. These visits would seem to be wellnigh essential to pollination. Darwin writes:—

"In the Broom, if the flowers be protected from insects, the parts [stamens and pistils] do not spring out, and scarcely any pods are produced."

The pollination-mechanism belongs to the explosive type and is similar to that of *Genista* and *Ulex*, with some differences in detail. Of the ten stamens, five are long and five are short; and pollen is thus shed so as to accumulate near the tip of the keel (the two petals forming this being united along both edges) and also about half-way along its length. The long spirally-coiled style is very characteristic. It brings the stigma, which is later than the anthers in maturing, into the extreme tip of the closed keel. When a bee alights on an opening flower-bud, the pressure of its hind feet separate the wing petals, and the keel begins to split along its upper edge from its base towards its apex, probably from an irritability of the claws of its petals when touched by the insect's proboscis, as is the case in *Genista*. The shorter stamens then alone emerge and dust the under side of the bee's body with pollen. If greater pressure be produced, as by the weight of a heavy humble-bee, or when the flower is a day or two older and is visited for a second time, the split extends



THE BROOM—continued.

towards the apex of the keel, and the long stamens and the style, which have been in a condition of considerable tension, escape explosively, striking the insect on the back. As the stigma will touch it first there is then a chance of cross-pollination if the insect bears any pollen from a flower previously visited.

"When," continues Darwin, "the bee flies away, the pistil curls still more, and the stigmatic surface becomes upturned and stands close to the protruded anthers of the shorter stamens. We have seen that the bee gets dusted on its abdomen from the shorter stamens of the younger flowers; and this pollen will be left on the upturned stigma of the curled pistil of the older flowers. Thus both the upper and lower surface of the bee gets dusted with pollen, which will be transferred to the stigma at two different periods."

The spiral style thus secures for the plant a double chance of crossing, whilst most other explosive flowers have but one.

The dark brown flat pod, from one to two inches long, and fringed with stiff hairs along each margin, bursts open elastically when ripe, its two valves curling up spirally so as to jerk out the fifteen or sixteen seeds. There are traces of transverse partitions across the interior of the pod, between the seeds, and the seeds each have a fleshy swelling or *strophiole* at their base.

Several genera in this Tribe being very closely similar, there have been many changes in the name of the Broom; but its spiral style and flattened pod are now recognised as the chief characters of Wimmer's genus *Sarothamnus* (from the Greek *σαρόω*, *sarōō*, I sweep; *θάμνος*, *thamnos*, a shrub); whilst the old specific name *scoparius* comes from the Latin *scopæ*, twigs used as a besom.

The plant has often been used medicinally and Gerard writes:—

"The young buds of the floures are to be gathered and laid in pickle or salt, which afterwards being washed and boyled, is used for sailets, as capers be, and be eaten with no less delight";

but as the plant contains the poisonous alkaloid Sparteine, though less dangerous than its relative the Laburnum, it is more safely let alone.

The sprig of Broom worn in his cap by Geoffrey of Anjou, father of our Henry II, was probably an emblem of humility; and the motto of the Order of the Geneste founded by St. Louis in 1234 was "*Exaltat humiles*," "He exalteth the humble"; but this humble wilding, the *Planta genista* of the heaths of Northern France, gave a surname to the longest and proudest dynasty of England's kings.

CXXXVIII.—THE REST-HARROW.

Ononis repens Linné.

THERE is much less waste land in England than there was in former times. Even though the low price of corn has led to the conversion of much arable land into what is termed "permanent pasture," the ridge and furrow often still visible in the turf tell of a time when this ground was under the plough. The proportion of our area which has at no period been under cultivation is, in fact, but small. Plants, such as the Rest-harrow, which have strongly developed root-systems or underground stems, calculated to render them a serious obstacle to the cultivator, may, it is true, have occasionally regained a hold upon our fields through the farmer's neglect; but they are very generally confined to the roadside waste, the untended but much grazed common, or the sandy links by the sea marge.

The characteristic of the Rest-harrow which most impressed the early English agriculturist was not its beautiful pink blossom, nor its sweet liquorice-like root and pungent smell, but the long, tough, branching suckers which give to *Ononis repens* Linné so strong a hold upon the ground. This is probably the origin of the Old English name *Cammock*, from *cam* meaning "crooked," as when in William Langley's "Book of Piers the Plowman," we find

"Communlike in contrees Cammoke and weedes
Foulen the fruyt in the feld ther thei growen togideres."

Theophrastus's name *ὄνωνις*, *ononis*, refers probably, it is true, to the plant being eaten by the ass (from *ὄνος*, *onos*, an ass), or growing in such waste ground as that in which the ass is pastured; but the more general names, as Turner says, "of the herbaries" were *Resta bovis* and *Remora aratri*, "the stoppage of the ox" and "the hinderer of the plough." These reminders of the now wellnigh vanished age of the leisurely ploughing by oxen entered into most of the languages of modern Europe. We have *Arresta bué* in Italian, *Arrête-bœuf* in French, *Rête-bœuf* in Guernsey, and *Restaboy* in Portuguese; it appears as *Rastylbow* in the "Promptorium Parvulorum" of the fifteenth century, as *Ochsenbrech* in German, as *Ossenbrecke* in Dutch; and in Spanish we have *Detienebuey* and *Remora de arado*. As Lyte graphically puts it:—

"The roote is long and very limmer, spreading his branches both large and long under the earth, and doth oftentimes let, hinder, and staye, both the plough and oxen in toying the ground, for they be so tough and limmer that the share and colter of the plough cannot easily divide, and cut them asunder."

The genus *Ononis*, though agreeing with the *Genisteæ* in being monadelphous, is placed by Hooker, Taubert, and other authorities in a Tribe *Trifolieæ*, with *Melilotus*, *Trifolium*, and other genera, with which it agrees in having trefoil leaves generally with toothed margins. It comprises some eighty species, natives mainly of the sunny Mediterranean region, with pink, white, or yellow honeyless blossoms; but there has been considerable difficulty in unravelling the relationship of the various forms



THE REST-HARROW—continued.

included under the two perennial Linnæan species *O. repens* and *O. spinosa* which we have in England. It may well prove, as in other cases where there are two so-called species existing side by side, that they are rather races presenting a case of what is now known as Mendelian segregation of characters. In general terms, however, it may be said that *O. spinosa* does not produce suckers, is erect and usually spinous, has two rows of hairs along its branches, and produces a pod longer than its calyx; while *O. repens* does produce suckers, is more usually prostrate in its mode of growth, is seldom spinous, is covered all over with sticky hairs, has a more fetid, goat-like smell, somewhat larger flowers, and a pod shorter than its calyx. Intermediate forms (the *O. arvensis* Linné of Wilkomm and Lange) occur.

The woodiness of the erect *O. spinosa*, and the fleshy texture, abundant hairs, and strong smell of *O. repens*, are alike suggestive of the xerophytic character of the Mediterranean flora; and all the forms occur chiefly in dry places, whether sandy or calcareous. The leaves are, however, larger than in the more typically xerophytic genera *Genista*, *Ulex*, and *Sarothamnus* with which we have been dealing. They have large, leafy, toothed stipules united to their petioles, and the veins of the leaflets run out at the apex into teeth.

The solitary axillary flowers are shortly stalked, and one of the most marked characters of the genus is the deep division of the five lobes of the calyx. The pollination-mechanism is what is known as the "piston" system. There is no honey and the keel petals are united by both edges into a tube, closed except at its pointed apex, where there is a small hole. The united filaments are broadly thickened below the anthers so as to form a piston: the pollen is discharged in the bud stage into the apex of the keel and the stigma lies amongst it, but is not receptive until rubbed. When the keel is depressed by the weight of the insect-visitor the piston forces out a portion of the pollen in a little stream through the hole at its apex. When the weight is removed the keel resumes its former position, so that repeated visits of insects are generally necessary for the discharge of all the pollen. In this genus, at a later stage, the keel splits along its upper surface, so that stamens and style emerge; but the keel does not drop into the vertical position, as in the Broom.

The sweet roots are eaten by boys in the North, under the name of *Wild Liquorice*, and in France and the Channel Islands as *Reclisse* or *Reglisse*, a corruption of the Latin *Glycyrrhiza*; but the green part of the plant is believed in the south of England to impart its goatly smell to the milk, butter, and cheese obtained from cows feeding upon it, and they are then said in consequence to be "cammocky."

CXXXIX.—THE COMMON YELLOW MELILOT.

Melilotus altissima Thuillier.

COMING to the members of the Tribe *Trifolieæ* in which the uppermost stamen is not united to the other nine, which, so far as British plants are concerned, comprise the genera *Trigonella*, *Medicago*, *Melilotus*, and *Trifolium*, the Fenugreeks, Medicks, Melilots, and Clovers, we find them all to be herbaceous, with pinnately trefoil leaves having toothed margins, and flowers that secrete honey. They may be distinguished from one another by their inflorescences and pods. *Trigonella* has a short raceme and a curved dehiscent pod, longer than the calyx; *Medicago* has a short raceme and a pod which is usually spirally coiled; *Trifolium* has its flowers in a head and a short pod; and *Melilotus* has its flowers in a long raceme, with somewhat similar straight pods. Linnæus, however, united Tournefort's genus *Melilotus* with *Trifolium*, to which it is unquestionably very nearly related.

Melilotus includes some twenty species, natives of the Warm and Temperate regions of the Old World, two or three of which may be indigenous in Britain. They are mostly annuals which are apt to form some wood in their stems during the first season and to survive into a second year, especially if browsed down during the first. The species occurring in this country include two with yellow blossoms and one with white ones. Of the former, *M. altissima* Thuillier, the common species, is the more robust; has the deeper yellow flowers, with petals nearly equal in length; and black, pointed, compressed, hairy pods; whilst *M. officinalis* Lamarck has pale buff flowers, with wing and standard petals longer than the keel, and olive-brown, blunt, rounded, smooth pods. There has been a good deal of unfortunate confusion over the name of this latter, rarer species.

It requires some little care to discriminate among leaves of three leaflets between those which are formed on the pinnate, and those formed on the palmate, type. In this genus it is fairly obvious, but in *Medicago* less so, that the terminal leaflet has a longer foot-stalk or *petiolule* than the two lateral leaflets in the same leaf. This is an indication of their pinnate arrangement, abnormal extra leaflets arising lower down the main petiole than the normal lateral leaflets. In *Trifolium*, on the other hand, all three leaflets have equal stalks, and in "Four-leaved Clover" the fourth leaflet generally arises palmately at the same point as the normal three.

The compound leaves of the *Leguminosæ* afford many admirable examples of the so-called "sleep" movements of fully-formed organs. One general result of these is that the leaflets, which are generally horizontal, or at right angles to the incidence of light, during the day, become vertical at night; and Darwin suggested a reason for this by showing experimentally that leaves which are fixed in a horizontal plane suffer more from the cold of frost radiated from the ground beneath them. The mechanism by which the leaflets fall into the vertical is the flow of the watery contents of the thin-walled cells of the *pulvinus*, or swelling at the base of each leaflet,



THE COMMON YELLOW MELILOT—continued.

from the cells on one side of that structure to those on the other, so that the osmotic tension is reduced to a minimum on one side.

A mediæval Latin name for *Melilotus altissima* was *Corona Regis*, "King's Crown," "because," Parkinson fancifully explains, "the yellowe flowers doe crowne the toppes of the stalkes." These little flowers hang downwards in a *secund* manner, all, that is, on one side of the axis. They have five nearly equal teeth to the calyx; and petals, nearly equal in length, which fall immediately after fertilisation. The surfaces of the wing petals are at one part so interlocked with those of the keel that, when the flower is visited by an insect, they move together both downwards and upwards. There is no true explosive or piston action, the filaments being slender above. The copious honey gives its name to the genus (from the Greek μέλι, *meli*, honey; λωτός, *lotos*, a name applied to various plants); and, under the weight of insects coming for it, the wing and keel petals are depressed and both stamens and stigma emerge, the parts resuming their former position when the pressure is removed. Repeated visits may thus occur in which cross-pollination may be brought about.

When dried, the Melilot acquires a strong fragrance like that of new-mown hay. This is due to the presence of *coumarin* or coumaric anhydride, a compound that takes its name from the Tonka bean (*Coumarouna odorata* Aublet). Coumarin has now been found in a great variety of plants, in the Sweet-scented Vernal Grass (*Anthoxanthum odoratum* Linné), the Northern Holy Grass (*Hierochloë odorata* Wahlenberg), *Angræcum fragrans* Reichenbach filius, the "Faham Tea" of Mauritius, and various species of Orchis, the Sweet Woodruff (*Asperula odorata* Linné), the Wild Vanilla of North Carolina (*Liatris odoratissima* Willdenow), and the Fenugreek (*Trigonella Fœnum-græcum* Linné), a near ally of *Melilotus*. This last-named plant, which has been cultivated since the time of Theophrastus, in the third century B.C., gets its specific and English names, which mean "Greek hay," from its ancient use in the fraudulent improvement of sour hay; and *Melilotus alba* Desrousseaux is grown as *Bokhara Clover* and recommended for the same purpose. The powdered flowers of *M. cærulea* Linné, the *Ziegerkraut* or Curd-plant of Switzerland, are used to flavour the well-known Chapziger cheese; and, while Gerard writes of *Melilotus altissima* itself as *Plaster Clover*, because

"with the juice hereof, oyle, waxe, rosin, and turpentine, is made a most soveraigne healing and drawing emplaister, called Melilote plaister, retaining both the colour and savour of the herbe";

Sir James Edward Smith speaks of the "odious scent" of the plaster which was "of no use whatever."

For perfumery coumarin is now largely produced synthetically.

CXL.—THE WHITE CLOVER.

Trifolium repens Linné.

WHEN we rejoice in the delicious smell of a field of Clover we do not often think of cards ; and, perhaps, Clover is equally distant from our thoughts when we look at the suit known as "Clubs." The two things are, however, closely connected. The name *Clover* is commonly *Claver* in old writers, and the latter form is still in use in the North. This is identical with the Flemish *klaver* and so close to the Old English *claefer* that it is hardly necessary to speculate, as Dr. Prior does in his invaluable "Popular Names of British Plants," on some possible Frisian word as its source. It is, as he says, evidently a noun in the plural number, so that we may, perhaps, connect it etymologically rather with the Latin plural *clavae* than with the singular *clava*. Jamieson's Scottish Dictionary, it is true, connects it with the Old English verb *cleafan*, to cleave, "because of the remarkable division of the leaves" ; but Dr. Prior reminds us that the suit of cards that we call "Clubs" is known in French as *Trèfle*, i.e. trefoil, and that Hercules is described as carrying a *clava trinodis* or club with three knots. It is, however, possible that the name of the plants known as Clover may have had reference originally to the round, club-like head of flowers rather than to the trefoil leaf.

Although undoubtedly a most natural genus, Linné found *Trifolium* difficult to define according to his own arbitrary principles, and accordingly made use of the capitate character of the inflorescence as part of its definition, to the horror of Sir James Edward Smith, who is always more Linnæan than Linné himself. These flower-heads prove on examination to be in fact merely close, short racemes ; while the most distinctive other characters of the genus are the generally palmately trefoil leaves ; the five unequal teeth of the calyx ; the slight adhesion of the wing and keel petals to one another and to the filaments of the diadelphous stamens ; the persistence of the withered corolla ; and the deciduous one- or few-seeded pod.

The genus comprises some two hundred and fifty species, mostly low-growing herbs, which are natives mainly of the North Temperate regions, though also represented in the South. They are either annual or perennial, the twenty British species including fifteen annual and five perennial. The latter, such as the White Clover (*Trifolium repens* Linné), have frequently a creeping, wiry rhizome which branches freely on or below the surface of the ground, rooting at intervals. In *T. repens* this stem is solid.

The leaves of the White Clover rise on long petioles with a pair of narrow, lanceolate-acuminate stipules adnate to the base of each. Lord Avebury ingeniously contrasted these with the broader ones in the Red Clover (*T. pratense* Linné), pointing out that, whereas these last serve to protect the young head of flowers, in the White Clover the peduncle so elongates as to bear the flower-head while still very young far away from the covering of stipules. The leaflets are on short, equal stalks, are



THE WHITE CLOVER—continued.

usually obcordate, finely toothed at the margin, and generally variegated, either with a pale whitish crescentic, transverse stripe, or less commonly with dark purple or blackish stains at their bases, or with a reddish under surface. The leaf is glabrous with the exception of a marginal fringe of long hairs and some glandular hairs secreting wax on the under surface. Even heavy rain fails to wet the leaf, the water hanging only to the marginal hairs and the midrib on the under surface. "Sleep" movements, somewhat similar to those of the Melilot, take place at night: the lateral leaflets bend down from the horizontal to a vertical position, while the middle leaflet rises, and so twists its stalk as to become inverted.

The flower-heads are borne erect on angular peduncles above the leaves, and the flowers are white or tinged with pink, or, in the case of a Scilly Island variety, with a deep lilac; whilst after fertilisation they uniformly wither to a light brown and fall one after the other into a downward, drooping position. Darwin states that they are incapable of being pollinated with their own pollen; and certainly the abundant honey, the consequent insect visits, and the readiness with which crossing is effected, render self-pollination quite unnecessary.

Various popular names refer to the abundance of honey in the flowers, such as *Suckies* and *White Honeysuckle*. It is significant that *Honeystalks* is said to be still in use in Warwickshire, as it probably was when Shakespeare wrote of

"Words more sweet and yet more dangerous
Than baits to fish or honeystalks to sheep
When as the one is wounded with the bait,
The other rotted with delicious feed"—

a passage explained in Nares's "Glossary" by the statement that "it is common for cattle to overcharge themselves with clover and die." In the North, the plant is sometimes known as *Lamb's Sucklings*.

The standard petal is marked with fine honey-guides; but, except for the closer adhesion between petals and filaments, the pollination-mechanism is practically identical with that of the Melilot. The little, smooth, oval, two- to four-seeded pod remains enclosed within the persistent withered corolla.

Though the plant is, in all probability, truly indigenous, an improved cultivated variety, to which alone the name *Dutch Clover* would seem to belong, may have been introduced at some time from Holland. The species forms unquestionably a most valuable fodder plant, especially on dry, thin soils.

CXLI.—LADY'S FINGERS.

Anthyllis Vulneraria Linné.

THE Tribe *Loteæ*, which includes the two British genera *Anthyllis* and *Lotus*, though mostly herbaceous, has some members that attain the dimensions of shrubs. Their leaves may be pinnate or palmate and have four or more leaflets. The stamens are occasionally monadelphous and very frequently one whorl has its filaments dilated below the anthers, pollination being effected by a piston-mechanism, as in the Rest-harrow, but with the difference that the flowers in this Tribe secrete honey. The pod is sometimes indehiscent, or nearly so, but generally two-valved; and in no case is there a longitudinal partition or *septum* down its interior.

The genus *Anthyllis* comprises some twenty species, natives of the North Temperate regions of the Old World. They have pinnate leaves, with a terminal leaflet, and with small stipules, or none at all. The yellow, reddish, or white flowers are crowded together in a terminal pair of heads. This suggests that the primary branching of the inflorescence is a dichasial cyme, a very exceptional method in *Leguminosæ*; and this gives to the inflorescence as a whole the form of two rounded lobes. The inflated calyx, which encloses the pod, is one of the chief characters distinguishing *Anthyllis* from the allied genus *Lotus*. The long claws of the petals, of which the four anterior are united to the filaments, form a long tube to the flower which restricts its honey to long-tongued bees. The filaments may be all united (monadelphous), as in the British species, or the upper one may be free; but the anthers are rounded and all alike. Although in contact with the pollen in the keel, the stigma does not become receptive until it is rubbed. The small pod contains one or two seeds, which, unlike those of other plants known as Vetches, are kidney-shaped, and have thus given the British species the book-name, never truly "popular," of *Kidney Vetch*.

Most of the species are more or less covered with a soft, silky pubescence of long hairs, and it is from this that the genus derives its name *Anthyllis* (from the Greek *ἄνθος*, *anthos*, a flower; *ἰούλος*, *ioulos*, down) which was used by Dioscorides. The illustrious Conrad Gesner (1516-65) of Zurich seems to have been the first to suggest that our British species, which occurs also throughout Europe, was valuable for stopping bleeding. Hence it obtained the name *Vulneraria* (from the Latin *vulnerare*, to wound), which was used generically by Haller and the Bauhins, and is, therefore, written with an initial capital when used specifically by Linné. The plant's action in such cases is probably purely mechanical, like that of cobweb or cotton-wool.

It is extremely difficult to be certain as to the relation of plants to the chemical composition of the soil. Though it is true that Babington speaks of *Anthyllis Vulneraria* as inhabiting "dry pastures" and Hooker's "Student's Flora" says "dry rocky banks," it would be very natural to assume that there was a relation of cause



LADY'S FINGERS—continued.

and effect in the circumstance that it generally occurs on a calcareous soil. Dr. C. E. Moss, for instance, in "Types of British Vegetation," enumerates it with such plants as *Hippocrepis comosa*, *Poterium Sanguisorba*, *Helianthemum Chamæcistus*, *Asperula cynanchica*, *Campanula glomerata*, and *Ophrys apifera*, as "characteristic of calcareous grassland but absent from or rare in siliceous grassland." In the same volume, however, it occurs, with such another species usually taken as calcicole, viz. *Blackstonia perfoliata*, in a list of the species in the grassland of the hollows in the Lancashire sand-dunes. The very first record of the species as a British plant would seem also to have been from sand; for Gerard, in 1597, mentions *Anthyllis leguminosa* as growing "upon Hampstead Heath near London."

Our one British species has a short, branched, woody rhizome; herbaceous, silky aerial stems, often prostrate and seldom rising more than a foot; and imparipinnate leaves of from 3-13 narrow distant leaflets. The involucre of linear bracts or "fingered bractes," as Smith calls them, is the apparent origin of the most generally popular English name of the plant, *Lady's Fingers*. The pale, inflated, membranous, hairy calyx has five teeth, is as a whole longer than the petals, and encloses the very small, pointed, smooth, one-seeded pod.

Several varieties have been described, of which the most marked is the *Anthyllis coccinea* of Linné, the *A. Dillenii* of Schultz, so called because recorded in 1724 by Dillenius. This plant, which is represented to the left of the type form on our Plate, is smaller, prostrate, with the leaves of the involucre almost as long as the flowers, which are cream-colour with scarlet tips. Though first recorded from Pembrokeshire, it is specially characteristic of the South Coast. Babington described a variety *ovata*, with a large, broadly-ovate, terminal leaflet, which the root-leaves on the right-hand side of our Plate resemble. The var. *Allionii* of De Candolle has its stems clothed with spreading hairs, whilst those of the type are generally adpressed; and the var. *maritima* of Koch is a very hairy, tall, erect, branched form, with little but general luxuriance to distinguish it. The mere colour of the flower seems specially variable in coast stations, such as the Lizard, where yellow, cream-coloured, white, scarlet, and red may be seen growing together.

Several species are grown in rock-gardens and shrubberies, such as the rose-coloured alpine *A. montana* Linné; the shrubby, yellow-flowered *A. Hermannie* Linné, from the Eastern Mediterranean, often misnamed *Cytisus græcus*; and the evergreen Silver-bush or Jupiter's Beard (*A. barba-Jovis* Linné) of Italy and Provence, a shrub covered with silvery down.

CXLII.—THE GREATER BIRD'S-FOOT TREFOIL.

Lotus uliginosus Schkuhr.

THE genus *Lotus*, which comprises some eighty species, natives of Temperate climates, is distinguished from *Anthyllis* by having generally trefoil leaves with leafy stipules; a calyx which is not inflated; a pointed keel to the corolla; a detached upper stamen and a many-seeded pod, longer than the calyx and having transverse partitions between the seeds. As the shortly-stalked flowers are very generally arranged in a few-flowered umbellate cluster, the straight pods which succeed them spread out like the toes of a bird, and have given the British representatives of the genus the name of *Bird's-foot Trefoil*.

The leaves exhibit the *nyctitropic* or "sleep" movements (so termed from the Greek *νυκτός*, *nuktos*, of night; *τροπή*, *trope*, turning) so general among the members of this Family, and the pollination-mechanism is a piston system much like that of *Anthyllis*. The wing petals are interlocked with those of the keel by a projection on each, fitting into a corresponding depression on the keel petal, so that the two pairs move together under the weight of an insect-visitor. The stamens are at first alternately of unequal length, those of the outer whorl becoming markedly dilated just below their anthers, so as to form the piston. All the anthers discharge their pollen into the pointed space in the apex of the keel before the flower expands, and those of the inner row then shrivel up. Honey is secreted at the bottom of the staminal tube and is rendered accessible to insects by the separation of the uppermost stamen from the other nine and by a slight upward bend in its filament. When wings and keel are depressed by the weight of a bee, some of the pollen is forced out in a little stream at the apex of the keel against the under side of the insect; but on its departure the petals spring back into their former position, so that the process may be repeated. Not only is the flower usually protandrous but the stigma does not become receptive until rubbed.

In addition to two or three uncommon species, we have throughout the British Isles two very common forms. Of these, the lower-growing *L. corniculatus* Linné occurs chiefly in dry pastures, whether on calcareous or sandy soil, but extends up into the sub-alpine zone in the Scottish Highlands to altitudes of 2,800 feet, and is abundant on sand-dunes and loose sand alike on heaths and on the sea margin. Its flowers are in clusters of from five to ten, and the calyx-teeth are erect or pressed against the corolla in the bud stage, the two upper ones, at the back of the standard petal, converging toward one another.

The bright little flower-heads of this species, generally only an inch or two from the ground, with the petals often beautifully varied with scarlet and orange, have gained for it an immense array of nicknames from children, such as *Butter-and-eggs*, *Eggs-and-bacon*, *Fingers-and-toes*, and *Shoes-and-stockings*. These and many others appear in Messrs. Britten and Holland's "Dictionary of English Plant



THE GREATER BIRD'S-FOOT TREFOIL—continued.

Names." The much larger *L. uliginosus* Schkuhr, which, as its specific name (from the Latin *uligo*, marshiness) indicates, inhabits wet places, has not, perhaps, been popularly distinguished, and has accordingly no distinctive English popular names of its own. Being, however, a perennial, with an elongated, branched, and sucker-bearing rhizome, it is known in Guernsey as *Grand Rête-beuf*, a name transferred from the Rest-harrow. It may straggle among rushes, or other water-side vegetation, to a height of two or three feet; and it bears, on long peduncles, clusters of from five to twelve flowers, with calyx-teeth all spreading and divergent from the bud stage.

Our Plate shows the tubercles on the roots which are so important a feature among *Leguminosæ*. In a recent little book entitled "Plant Life," Professor J. B. Farmer gives the following lucid explanation of these structures:—

"These swellings are due to luxurious growth of the tissues of the cortex or rind. Examined microscopically the cells are found to contain enormous numbers of bacteria-like organisms to which the name of *Bacillus radicola* has been given.

"The root becomes infected by this bacillus from the soil, in ordinary samples of which it is apparently always present. The bacillus enters through a root-hair, and when it reaches the interior of the cortex it multiplies there, producing the nodular outgrowths in question. It feeds and grows mainly at the expense of the sugars and other substances supplied by the host-plant, these having, of course, been produced as the result of the photosynthetic activity of its leaves.

"But when thus provided with carbohydrate food, the bacillus is able to manufacture the essential nitrogenous compounds necessary for the production of protoplasm by utilising the free nitrogen of the air. Most plants have to take in their nitrogen in a combined form, as ammonia salts, nitrates, etc., for nitrogen is a very inert element, and difficult to force into combination with others. *Bacillus radicola* is one of the very few organisms which can perform this really stupendous task, provided that it is supplied with the means of obtaining the energy required for the process in the form of appropriate carbohydrate nutrition. . . . After the bacilli have thriven for a while, mainly at the expense of the food supplied by the root in which they are living and multiplying, a change comes over them. Many of the individuals become weaker, and undergo a sort of degeneration, whilst a few pass into a resting stage in which they become highly resistant to adverse conditions of life. The leguminous plant, which hitherto has been paying out carbohydrate food to the bacillus, now begins to receive, and the harvest is a rich one, for it acquires from the degenerating mass of bacilli the stores of nitrogenous matter they have accumulated, and this affords a very good return for the sugars, etc., which it has previously expended."

CXLIII.—THE SWEET MILK-VETCH.

Astragalus glycyphyllos Linné.

ONE of the most ancient games in the world is that of huckle-bones, known in Latin as *tali* and in Greek as ἀστράγαλοι, *astragaloi*, in which the tarsal bones of sheep and goats are used as dice. It is difficult, however, to trace any connection between the name of these bones and that of the large genus of *Leguminosæ* to which it has been attached since the time of Theophrastus.

The genus *Astragalus* is one of the largest in the Vegetable Kingdom, containing as it does some twelve hundred species. It has spread over the greater part of the globe, with the exception of Australia and South Africa; but belongs mainly to extra-tropical regions, especially in Asia. There are 120 species in Europe, of which only three occur in Britain. Most of the species are natives of steppes, prairies, or dry alpine plateaux, and are more or less markedly xerophytic in their adaptations. Though sometimes shrubby, often woody, and always perennial, they are mostly low-growing plants with relatively large flowers. Many species are spinous, the spines being formed by the stiffening of the main rhachis or midrib of the leaf after the fall of the terminal leaflet. The dry hills of Persia, Syria, and Anatolia are often covered with a variety of these spinous species; others are among the beauties of the Alps, and others again are found in the punas or upland plateaux of the Andes. Though the genus extends into Arctic regions and to high altitudes, it seems most probable that its original home was the warm, dry Warm Temperate region of the Old World, which we may term, in a wide sense, Mediterranean, lying, that is, between the Indus and the Tibetan plateaux on the one hand and Spain and Morocco on the other.

Several of the shrubby spinous species of south-west Asia and Greece, especially *Astragalus gummifer* Labillardière, yield the gum long known as Gum Tragacanth. Theophrastus uses this name also, speaking of *A. creticus* Lamarck, and it is explained as from τράγος, *tragos*, a goat, and ἀκανθα, *akantha*, a thorn, with reference to the fancied resemblance of the bush with its crowded mass of more or less parallel thorns to a goat's beard. As the name Tragacanth has been corrupted into the French *Gomme dragant* and in English into Gum Dragon, it may be suggested that *Astragalus* itself was originally based upon *Tragacantha*. The gum is the result of the breaking down of the cell-walls of the pith and rays of the stem into mucilage. In the heavy mists which are said to hang frequently over the hills where these species of *Astragalus* grow, their wood is stated to take in much moisture, which causes the mucilage to swell and force itself in thin flakes through narrow splits in the bark. A better quality is now obtained from artificial incisions in the lower part of the stem. It is considerably used in medicine and dentistry, and in the stiffening of crape, being free from the brittleness and gloss of Gum Arabic, Smyrna being the chief



THE SWEET MILK-VETCH—continued.

port of export. Its Arabic name is *Neca'at*; and it is suggested that it is the Hebrew *Necóth* or *Nhad*, translated "spicery" in Genesis.

Astragalus belongs to the Tribe *Galegeæ* which is characterised by being diadelphous, and having the pod divided internally by a longitudinal partition formed by the ingrowth of one of the sutures. Whilst in the allied genus *Oxytropis*, two species of which occur in the Scottish Highlands, this partition is formed by the ingrowth of the *ventral* suture, *i.e.* the inrolled margins of the carpellary leaf which form the upper edge of the pod, that nearest to the standard petal, in *Astragalus* a similar structure is produced by a double fold inward from the *dorsal* suture or midrib of the carpellary leaf, *i.e.* the lower edge of the pod or that nearest to the keel.

The Sweet Milk-vetch (*A. glycyphyllos* Linné) is known as Milk-vetch because it, or some plant confused with it, was supposed to increase the yield of milk in cows, one of its old names being *Polygala*, from the Greek *πόλυς*, *polus*, much, and *γάλα*, *gala*, milk. The specific name *glycyphyllos* (from *γλυκὺς*, *glukus*, sweet; *φύλλον*, *phullon*, a leaf) refers to the first taste of the leaves, which, however, soon turns to a nauseous bitter, so that cattle do not willingly eat the plant. This taste may also be shared by the root, though Dalechamps's name for the plant, *Glycyrrhiza sylvestris*, of which the translation, *Wild Liquorice*, is sometimes used in books, may be justified from the general resemblance of the plant to the nearly related true Liquorice (*Glycyrrhiza glabra* Linné).

Though, as will be seen by our Plate, this plant may develop a massive root and thick stem, it has a prostrate, straggling habit, like that of many of the Everlasting Peas. This is suitable to its habitat, growing as it does among grass and other vegetation in thickets, or on field-margins or sloping banks, on a chalky or gravelly soil. The large leaves have five or six pairs of leaflets and a terminal one, while the stipules, unlike those of many other species of the genus, are free. The flowers, which appear from June to September, are borne in shortly-stalked, dense, axillary racemes, with bracts which, though small, are longer than the stalks of the individual flowers. The calyx has five nearly equal teeth and is about half the length of the corolla, which is, perhaps, generally rather a pale greenish sulphur-yellow than the creamy white which it has been called. The bunches of smooth erect pods, tipped with the remains of the styles, and elongating considerably after fertilisation, are almost as conspicuous as the flowers. They each contain a number of pale, flattened seeds.

Though somewhat widely distributed in Great Britain, the species is far from common, and it does not occur in Ireland.

CXLIV.—THE HORSESHOE VETCH.

Hippocrepis comosa Linné.

THE Tribe *Hedysarææ*, to which the Horseshoe Vetch, the Bird's-foot (*Ornithopus*), and the Sainfoin (*Onobrychis*) belong, presents evidence in several points of structure, such as the pollination-mechanism and that for seed-dispersal, of being one of the most highly specialised divisions of the *Leguminosæ*. Not only have its members honeyed flowers, with diadelphous stamens and a piston-mechanism, similar to that of *Lotus*, but their pods, instead of dehiscing lengthways, as do most of the Family, are either one-seeded and indehiscent or form a *lomentum* or fruit which has transverse partitions and breaks up by their means into one-seeded joints. While in this way sufficient seed is produced and it is thrown to some little distance, it is, perhaps, protected against premature germination, or rotting, for a somewhat longer period than seeds would be, if scattered naked upon the ground, as in other groups.

The Tribe takes its name from the genus *Hedysarum*, to which the Sainfoin was formerly referred, and which was also known as *Pelecium* or *Hatchet Vetch* from its fruit, which in some species resembles a Malay kris and breaks up into hatchet-shaped segments, *πέλεκυς*, *pelekus*, being the Greek for an axe. Closely allied to *Hedysarum* is the remarkable Telegraph or Semaphore Plant (*Desmodium gyrans* De Candolle), which has a pinnately trefoil leaf, the lateral leaflets of which, during warm weather, keep up a series of movements in elliptical orbits throughout the day, and "sleep" at night.

The genus *Hippocrepis* was so called by Linnæus, from the Greek *ἵππος*, *hippos*, a horse, and *κρηπίς*, *krepis*, a shoe, with reference to the segments of the fruit, on the ground that the older name *Ferrum equinum*, with the same significance, was inadmissible because made up of two words. It comprises twelve species of low-growing herbaceous plants, mostly natives of the Mediterranean area; but our one British form (*Hippocrepis comosa* Linné) extends into southern Scotland. They may be annuals or perennials; and while our species undoubtedly presents at first sight considerable resemblance to the Bird's-foot Trefoil (*Lotus corniculatus* Linné) it can be at once distinguished by its pinnate leaves of several pairs of leaflets with a terminal one. This terminal leaflet and all the lateral ones are of the same size, and small, membranous, undivided stipules are generally present. As they are glabrous, the specific name *comosa*, which Linné adopted from Rivinus, and which generally means "hairy," is as inappropriate to our species as to any other, though botanists seem to have agreed to consider it as in this instance meaning "tufted." Though the yellow flowers are sometimes solitary, they are generally, as in *H. comosa*, in an axillary umbellate group borne aloft on a relatively rather long peduncle. The calyx is divided into five acute segments, the two posterior segments being less deeply divided from one another than are the rest. The petals



THE HORSESHOE VETCH—continued.

have long claws, that of the standard having a triangular flap-like outgrowth which extends over the entrance between the upper stamens leading to the honey in the staminal tube. It is necessary for the bee to lift this in order to reach the honey, and this secures the thorough carrying out of the pollination. The keel is pointed, incurved, and resilient, springing back, that is, into its former position when the weight of the visiting insect is withdrawn. While the anthers are all similarly rounded in outline, the filaments of the five stamens of the outer whorl are dilated below their anthers so as to constitute the piston.

The following is Lord Avebury's excellent description of the fruit :—

"The pod forms almost a complete circle, the concave margin of which is continuous, while the convex side is thrown into abrupt undulations. It might have been supposed that the pod would break up at the narrowest parts. As a matter of fact, however, the lines of dehiscence are in the centre of the thickest parts, so that the detached portions have the forms of horseshoes. Each segment would normally include two seeds, but as a rule one is aborted."

In this species the peduncle is, in general, more slender than that of *Lotus corniculatus*, and bears from six to ten flowers: the pod is rough with minute prominent granulations or points and, though flattened and two-edged, has not got the membranous flange-like margin of other species in the genus; and the seeds are curved in a crescentic manner.

These characters of the fruit and seeds chiefly impressed the older botanists. Parkinson says of it :—

"It hath no Greeke author to speake for it, but being of later invention it is generally called *Ferrum equinum*, after the manner or form of the coad, in *Italian Sferro cavallo*, and of the Chimicks there and in Germany, *Lunaria siliquata*."

In her interesting volume on "Herbals," recently published, Mrs. Arber reproduces a plate from the "Phytognomonica" of Giambattista Porta (1543-1615), of Naples, published in 1588, in which a fruit-bearing plant of *Hippocrepis* appears alongside a plant of the fern *Botrychium Lunaria* Swartz, which has half-moon-shaped leaflets, with a crescent moon below it, both being termed "lunar plants." This belief in a connection between plants and the heavenly bodies culminated in the next generation in "The English Physician . . . an Astrologo-Physical Discourse of the Vulgar Herbs of this Nation," by Nicholas Culpeper (1616-54), in which a marvellous tale is told of how "Moonwort," or "Unshoo the Horse," pulled the shoes off thirty newly shod horses in the Earl of Essex's army at Tiverton.

CXLV.—THE TUFTED VETCH.

Vicia Cracca Linné.

THE genus *Vicia* resembles the great Family *Leguminosæ*, to which it belongs, alike in the varied interest of its structure and in its economic value to man; but this particular British species *Vicia Cracca* Linné appeals to us more especially by its fascinating beauty and grace.

While the Family is not only world-wide in its distribution but comprises plants of all sizes, from large trees to tiny herbs, the Vetch Tribe are all herbaceous and belong mainly to the North Temperate Zone.

The genus, some species of which have been cultivated from the earliest times, either as fodder for cattle, or as yielding seeds used as food by man, bears an ancient Classical Latin name, which has been connected with *vincio*, I bind or twine, and also with a Celtic word *gwig*. The etymology of the specific name is more doubtful. The name of a genus, as the initial capital indicates, *Cracca* seems to have been coined by Dodoens in the sixteenth century, possibly from the Greek *ἄραχος*, *arachos*. Many of the popular names of this conspicuous hedgerow plant, such as *tine-grass*, refer to its clambering mode of growth, while others, such as *fitch*, are merely provincial pronunciations of vetch.

Like the majority of the *Leguminosæ*, the Vetches bear on their roots those remarkable tubercles which have been shown of late years to play so important a part in the economy of Nature. It appears that the root-hairs become infected by a bacillus which is seemingly nourished by some of the substance of the root, possibly effete matter. Some of the bacilli become hypertrophied and distorted within the tissue of the Vetch, when they are termed "bacteroids," and seem to be at least in part consumed by the host-plant. The great value of these bacterial organisms is, as we have seen, that they possess the power, denied to flowering plants, of assimilating the free nitrogen of the atmosphere. On the other hand, it is found that the nitrates so valuable in the soil as manure to most plants are actually injurious to these bacilli and their tubercle-forming; but that members of the Family *Leguminosæ*, with the help of their bacterial companions, add to the nitrates in the soil.

The Tufted Vetch belongs to a perennial section of the genus, having a creeping rhizome, from which it sends up its slender angular stems, often upwards of six feet in length and able by means of the tendrils to clamber to the top of high hedges or thickets.

The graceful leaves, each three or four inches long, consist of some twenty pinnately-arranged leaflets, seldom in opposite pairs, each narrow and pointed. At the base are two slender stipules, each shaped like the half of an arrow-head: at the apex the terminal and several lateral leaflets are replaced by delicate tendrils; and both stems and leaves are either downy or silky with silvery hairs.



THE TUFTED VETCH—continued.

The flowers are borne in axillary racemes on peduncles longer than the leaves, from ten to thirty of the pendulous little pea-shaped blossoms being crowded together in each raceme. They hang by short pedicels in a one-sided cluster, each being about half an inch long, pink at first, becoming blue to violet later. The mechanism of their pollination is most elaborate. The two lateral or "wing" petals are tightly interlocked with the two united anterior ones which are termed the "keel," protuberances on the former fitting into hollows in the latter; so that, when the flower is visited by a bee in search of nectar, wings and keel are depressed together by the insect's weight. Of the ten stamens, nine are united below the ovary in a tube, from the end of which their filaments sweep slightly upward, instead of bending abruptly, as in the allied Vetchlings and Everlasting Peas. Nectar is excreted by the inside of this staminal tube and accumulates round the base of the ovary. To render it accessible, the tenth or uppermost stamen is free from the rest, and on either side of its base are two openings into either of which the bee inserts its tongue. The anthers are ripe and discharge their pollen into the apex of the keel-cavity before the flowers open; and the slender style is furnished with a brush of hairs all round its upper portion. When wings and keel are depressed by the weight of the visiting bee, the stigma is first extruded from the keel and will receive any pollen brought on the bee's body from another flower, and then the pollen is brushed out by the tuft of hairs. It is stated that pollen will not germinate upon a stigma until the delicate surface of the latter has been scratched by the bee. So elastic are the parts that, as the bee flies off, they resume their former position, and in so doing may secure self-pollination if crossing has not been effected.

Another interesting mechanism exhibited by this species is that by which the numerous small globose black seeds are dispersed from the ripe pods. The pod is smooth, straight, and about an inch long, terminating in the persistent style; but it has in both its sides some obliquely-disposed woody cells, and the unequal contraction of these in drying, as compared to that of the adjacent tissue, causes each half of the pod to coil violently into a spiral, thus throwing the contained seeds to some distance as the two valves split apart.

The plant is in flower from June to August; and if it is wished to cultivate it for the wild garden, the rhizome may be divided in early autumn or in spring, or the seed may be collected and sown in the open border either in spring or autumn. The plant will, of course, require some support over which it may clamber.

CXLVI.—ANALYTICAL DRAWINGS OF THE PEA-AND-BEAN FAMILY.

(*Leguminosæ*.)

THE description of the last twelve Plates will have plainly demonstrated the unity in variety of the Family *Leguminosæ*, or, perhaps, one should say, of the Sub-Family *Papilionatæ* which alone is represented in the British flora. They agree for the most part in having compound leaves, papilionaceous flowers, with five sepals, five petals, ten stamens, and a single carpel, and in that carpel forming a dry, pod-like fruit. The compound leaves generally exhibit nyctitropic movements: the flowers illustrate a variety of modifications of one type of insect-pollination; and, in the majority of cases, the pod contains several seeds and dehisces elastically so as to secure their dispersal.

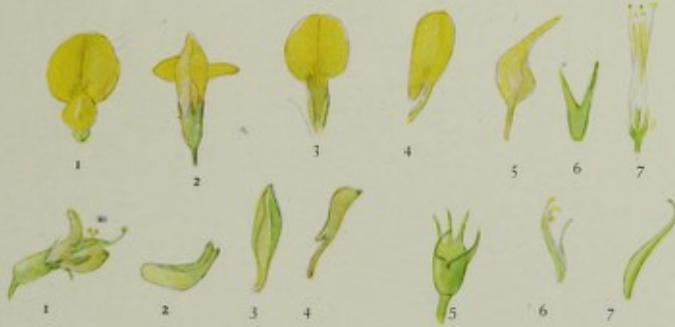
We may, perhaps, add here that the power of utilising free atmospheric nitrogen, which *Leguminosæ* possess in virtue of the symbiotic Bacteria in their root-tubercles, enables them to flourish in poor soils; that many of them produce an abundance of succulent green foliage which is valuable as fodder for cattle; and that the relatively large exalbuminous seeds are well known to be exceptionally rich in nitrogenous matter, making some of them most nutritious articles of human food. At the same time, it is well to add the caution that—unlike the *Cruciferae*—in addition to valuable nutritive materials many of them form poisonous alkaloids, so that their seeds cannot be eaten indiscriminately.

In this Plate we have analyses of the flowers and fruit of ten genera, and comparison is facilitated by the arrangement of the dissections as nearly as possible in the same order in each series.

The first line of figures represents the Petty Whin (*Genista anglica* Linné). Fig. 1 is a flower as seen from above, of the natural size; Fig. 2 is the same, enlarged; Fig. 3, the calyx, from behind, showing its two lobes, the posterior bifid and the anterior trifid; Fig. 4, the same as seen in side view; Fig. 5, the calyx and essential organs, slightly enlarged; Fig. 6, the calyx, with a young pod retaining the whole style; Fig. 7, a ripe pod; and Fig. 8, the same opened so as to show the seeds attached half to one valve and half to the other.

The second line of figures represents the Common Gorse (*Ulex europæus* Linné). Fig. 1 is a flower, natural size, as seen from below; Fig. 2, the same in side view; Fig. 3, the standard petal; Figs. 4 and 5, wing petals; and Fig. 6, the keel, seen sideways. Fig. 7 shows the essential organs removed from the keel; Fig. 8, the pistil or gynæceum in the flower stage; Fig. 9, a young pod; and Fig. 10, the same artificially opened. All this row of figures are of natural size.

The third line is the Broom (*Sarothamnus scoparius* Wimmer). Fig. 1 is a flower as seen from above, with the standard petal removed; Fig. 2 is the essential organs and keel separated at an early stage; Fig. 3, a longitudinal section through an



ANALYTICAL DRAWINGS OF THE PEA-AND-BEAN
FAMILY—continued.

entire flower ; Fig. 4, the gynæceum, showing the spiral loop of the style ; Fig. 5, the bi-lobed calyx ; Fig. 6, a ripe pod ; and Fig. 7, the same artificially opened. Here again all the figures are of natural size ; but the last two are small specimens.

The fourth line is the Rest-harrow (*Ononis repens* Linné), Fig. 1 being a flower seen from below ; Fig. 2, the same seen from above, showing the anterior sepal in the former and the other four in the latter ; Figs. 3 and 4 are wing petals ; Fig. 5, the keel ; Fig. 6, the united stamens ; Fig. 7, the gynæceum in the flower stage ; Fig. 8, a pod ; and Fig. 9, the same in longitudinal section, showing two seeds, all of natural size.

The fifth line is the Melilot (*Melilotus altissima* Thuillier), Fig. 1 being a flower seen from behind ; Fig. 2, the standard petal ; Fig. 3, a wing petal, and Fig. 4, a keel petal ; Fig. 5, the calyx ; Fig. 6, a spray of fruits ; and Fig. 7, a single pod in section. Of this row, only Figs. 1 and 6 are of natural size.

The sixth line is the White Clover (*Trifolium repens* Linné), Fig. 1 being a flower in side view ; Fig. 2, the same seen from above ; Fig. 3, the standard petal ; Fig. 4, the wings and keel ; Fig. 5, the stamens ; Fig. 6, the gynæceum ; and Fig. 7, a pod, all natural size.

The seventh line is the Bird's-foot Trefoil (*Lotus uliginosus* Schkuhr), Fig. 1 being a flower seen from the front ; Fig. 2, the same seen from below ; Fig. 3, the standard petal from the front ; Fig. 4, a wing petal ; Fig. 5, a keel petal ; Fig. 6, a side view of the calyx to show the sinus ; Fig. 7, the essential organs ; and Fig. 8, a group of bursting pods.

The eighth line represents the Sweet Milk-vetch (*Astragalus glycyphyllos* Linné), Fig. 1 being a flower in profile ; Fig. 2, the keel ; Fig. 3, the standard ; Fig. 4, a keel petal ; Fig. 5, the calyx ; Fig. 6, the stamens ; Fig. 7, the gynæceum ; Fig. 8, a pod ; Fig. 9, a side view of the same ; Fig. 10, the same broken across to show the longitudinal septum ; Fig. 11, a pod opened ; and Fig. 12, a seed, all of natural size.

The ninth line represents the Horseshoe Vetch (*Hippocrepis comosa* Linné), Fig. 1 being a flower in profile ; Fig. 2, a front view of the same ; Fig. 3, the standard ; Fig. 4, a wing petal ; Fig. 5, the calyx and keel ; Fig. 6, the stamens ; and Fig. 7, the fruit opened longitudinally, so as to show the curved seeds in the middle of the horseshoe segments, enlarged.

The last line represents the Tufted Vetch (*Vicia Cracca* Linné), Fig. 1 being the corolla in profile ; Fig. 2, the same from the front ; Fig. 3, the calyx ; Fig. 4, the standard ; Fig. 5, the keel ; Fig. 6, a young pod ; Fig. 7, the same enlarged and opened ; and Fig. 8, the same unripe and not opened, but showing the seeds through its transparent valves.



