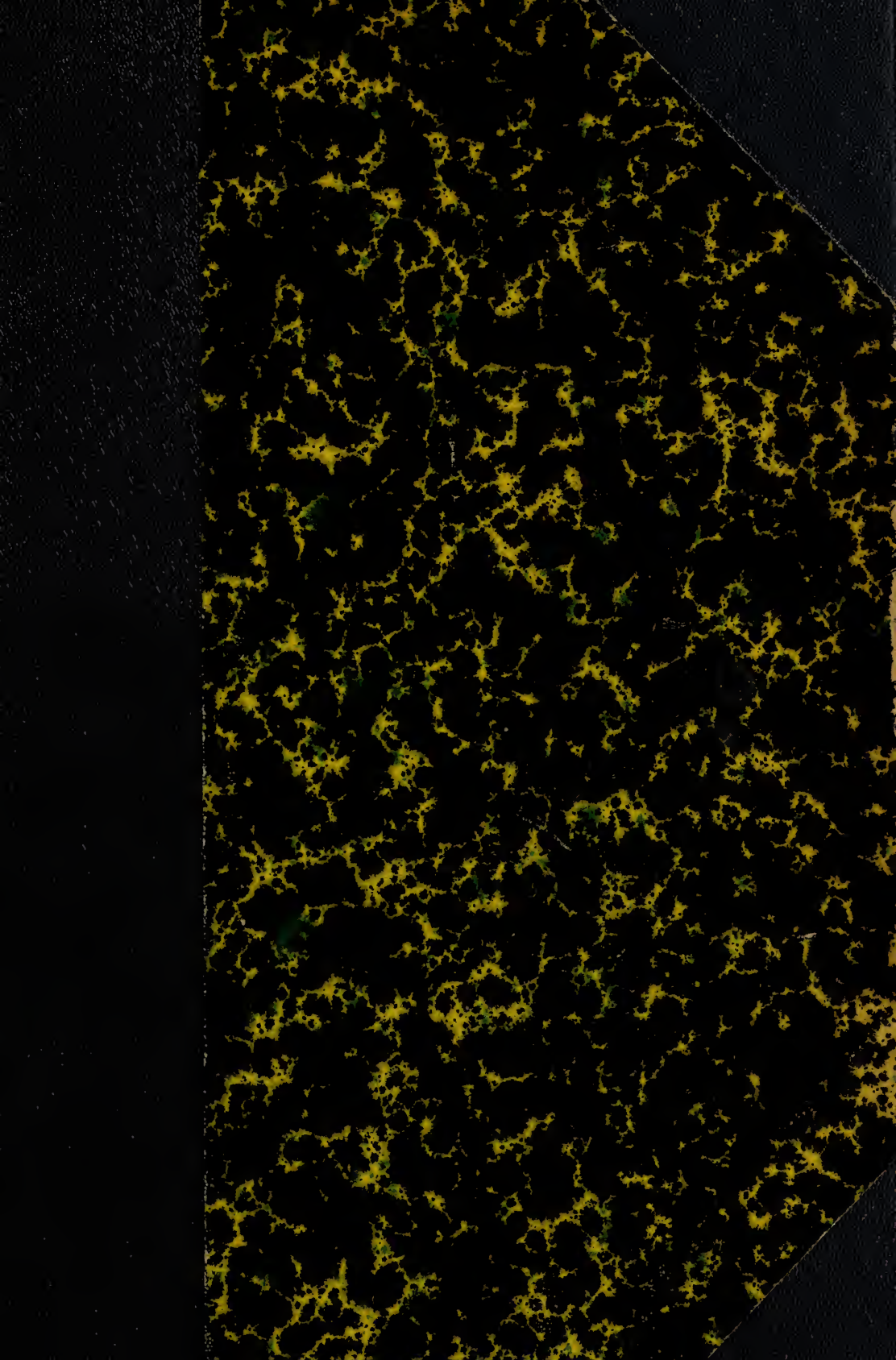

THE AMERICAN BOTANIST

DEVOTED TO ECONOMIC
AND ECOLOGICAL BOTANY

EDITED BY WILLARD N. CLUTE

Volume VIII

BINGHAMTON, N. Y.
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WILLARD N. CLUTE, - - - EDITOR.

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Books Recommended

In this department we shall, from time to time, recommend books that to us seem of special value to readers of this journal.

III.—Fern Books.

It all depends upon what you want the book for. If a technical manual with descriptions of the North American species, get Underwood's "Our Native Ferns" ($1.08); if a popular handbook for Eastern America select either Parson's "How to Know the Ferns" ($1.63), Water's "Ferns" ($3.34) or Clute's "Our Ferns in Their Haunts" ($2.15). Parson's book is well written but the keys are difficult. Water's book has two technical keys and is illustrated with many photographs. Clute's book has more text than either, has illustrated keys, colored plates and the 225 other illustrations are by an artist of ability. The real fern lover needs all three. Eastman's "New England Ferns" ($1.25) is a new book that is useful but not so comprehemsive as the others, while Dodge's "Ferns and Fern Allies of New England" (50 cts.) is a complete little technical mannal. Clute's "Fern Collector's Guide" (50 cts.) tells where to find ferns and how to press, mount and identify them. Useful to take into the field.

For the above books, or any others, address,

WILLARD N. CLUTE & CO., Binghamton, N. Y.

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THE AMERICAN BOTANIST.

VOL. VIII. BINGHAMTON, N. Y., JANUARY, 1905. No. 1.

THE FOREST OF ARDEN.

BY WILLARD N. CLUTE.

IT will doubtless be a surprise to many to learn that probably the largest botanical garden in North America is located in the Middle West near Joliet, Illinois, and bears the poetic title of The Forest of Arden. Nowhere else, so far as I am aware, is there eight hundred acres of woodland and meadow in one piece given over to the cultivation and display of our native trees, shrubs and herbs, nor one in which the purely natural features are given greater importance. The Forest boasts of neither conservatories nor museums and derives its value solely from the display of plants that will endure the climate. Thanks to the activity of those in charge, the number of such plants in the Forest is rapidly increasing and will in time include everything that can be made to grow there.

Unlike other botanical gardens, The Forest of Arden is not a public institution though it is as freely open to the plant-loving public as if it were. It is part of the estate of Mr. H. N. Higginbotham, a Chicago millionaire, and its beginning is both curious and interesting. In Mr. Higginbotham's youth long before the land came into his possession, he had fished in its waters, hunted in its woodlands and rambled over the surrounding countryside. It was but natural, therefore, when fortune smiled upon him that he should turn again to the pleasant scenes of his boyhood, and locate his country home amidst them. The house is called Harlowarden and the wood was named the Forest of Arden possibly in remem-

brance of that other Forest of Arden and in the hope that here, too, might one

"Find tongues in trees, books in the running brooks
Sermons in stones and good in everything."

In the Forest of Arden proper there are three hundred acres and in the adjoining woodland, also preserved, and commonly known as "the East Woods" there are five hundred acres more. Only part of this area is heavily timbered, there being numerous forest glades which permit the growth of many shrubs and herbs that delight in partial sunshine. Through the park Hickory Creek winds its way in a valley some two hundred feet wide and being dammed in two places forms long stretches of quiet water that afford opportunities for most effective planting. In its course it is joined by Francis Creek along which grow many water-loving plants.

The alluvial plain through which the main stream flows supports a fine growth of maple mostly of the *Acer nigrum* form, there being more than two thousand trees of good size. North of this belt is apparently an older and abandoned creek bed now become a swampy area grown up to ashes, willows, dogwoods and other shrubs which here and there give place to thickets of cat-tails, sedges and other swamp vegetation. From this the land rises to an elevation of about one hundred feet above the creek, being cut by several small ravines and covered with a dense second growth of oaks. The largest ravine is nearly two thousand feet long and shelters many shade-loving plants. Some of the finest views in the park are found here. The more open slopes give a home to an immense number of hawthorns, hazels, wild crabs, etc. The hawthorns are noted for the abundant forms displayed. One of these has been named *Cratægus arduenæ* by Dr. Sargent in honor of the park.

The first survey of the Forest of Arden was made in 1898 under the direction of O. C. Simonds. At first it was apparently intended only as a preserved woodland but with the advent in 1900 of the present Forester and

Botanist Mr. H. C. Skeels, a graduate of the Michigan Agricultural College, a botanical interest began to be added to the park. Recognizing that a great variety of plants would add both interest and value to the forest, with characteristic energy he set to work to obtain them and already has under cultivation upwards of a thousand species. These have been planted along the five miles of drives in the park according to the natural relationships of the plants, as outlined by Engler and Prantl. In this effort Mr. Skeels has been seconded by Mr. Higginbotham who is himself somewhat interested in the subject of botany, and after whom the genus *Higginbothamia* has been named. Nor has nature, herself, failed to properly endow the region. During the spring months there are many acres in the park where it is impossible for one to walk without crushing the flowers at every step. Such lavish displays of spring beauties, white and yellow adder's-tongues, trilliums, bloodroot, phlox, Dutchman's breeches, anemones, cowslips and the like are seldom seen elsewhere. There are five kinds of trilliums to be found in abundance in the park and where the two species of adder's-tongues grow there does not seem room for another plant.

Later in the year the marvellous prairie flora makes itself noticeable and the autumn closes with a blaze of asters, goldenrods, helianthemums and all the allies of the sunflower tribe. Among the less common plants in the region may be mentioned the Kentucky coffee-tree, the western crab (*Pyrus Ioense*) with fruits often two inches in diameter, and the curious pawpaw. Of this last there is a solid acre of trees of bearing size.

Although there is no museum in the park, the Forester maintains a well mounted herbarium which contains specimens of practically all of the plants of the surrounding country as well as those growing in the park. This herbarium is constantly receiving additions and is most valuable and satisfactory in deciding questions regarding plants of the region. Not only are visitors welcome at the park, but the schools near by receive a cordial

co-operation in their studies of botany and zoology. In botany sspecially a large amount of material for laboratory work is annually furnished. A finely mounted collection of the plants of the vicinity has recently been presented to the Joliet Township High School and a duplicate collection will be received by the Field Columbian Museum of Chicago. Considered from the standpoint of either beauty or utility there are few parks that compare with The Forest of Arden.

Joliet, Ill.

THE HORSETAILS AND CLUB-MOSSES OF WELLINGTON COUNTY, ONTARIO.

BY A. B. KLUGH.

THE most ubiquitous member of either of these two families is certainly the field horsetail (*Equisetum arvense*). It grows in thickets, it flourishes in swamps and it fairly revels in a sandy field. The fertile stems appear very early and the spores are scattered about May 6th. At this time the sterile shoots are only a few inches high and but little branched; by the end of May they have assumed the characteristic appearance which gives them, and through them the family, the name of "Horsetail."

Another spccies of the "non-evergreen" section of the horsetail family (Equisetaceæ) also puts in an early appearance. This is the wood horsetail (*Equisetum sylvaticum*) the rarest and by far the most beautiful of the family. It only grows in one damp thicket in the county as far as known. The spores are scattered toward the middle of May, after which the fertile stems branch out as much as the sterile ones.

Late in May the shoots of the swamp horsetail (*Equisetum fluviatile*) came up in the bogs and shallow water of lakes and ponds, and about June 9 the spores are shed. At this time both fertile and sterile stems are but little branched, and many of the sterile and most of

the fertile are totally without branches. At the end of June the sterile stems are widely branched.

The stems of the common scouring Rush (*Equisetum hiemale*), being evergreen, are in sight at all times of the year. About May 23 the new shoots begin to appear. They make very slow growth and before any fruiting spikes have appeared on them some of last year's fertile stems have occasionally sent out slender branches from just below the old fruiting spike, and these are tipped with minute fruiting spikes. By July 3 the fruiting spikes begin to show from the top sheaths of the fertile stems, and about August 5 the spores are scattered. This species is an inhabitant of dry soil and is common but not abundant.

A little plant very easy to pass over is the sedge-like horsetail (*Equisetum scirpoides*). It is an evergreen inhabitant of banks and hummocks at the base of trees and old stumps in swamps, and is frequent in this locality. About July 16 the fruiting spikes begin to appear, and during August many mature and shed their spores. The rest remain with the spores enclosed over winter.

Of the club-mosses found in Wellington County by far the commonest, is the shining club-moss (*Lycopodium lucidulum*). It is, as are all our species, an inhabitant of hemlock woods. The spore-cases are borne in the axils of the leaves and the spores are shed about October 15. It has, however, another means of propagation besides by spores, as many of the stems both fertile and sterile, produce near the tips bud-like bodies which fall to the ground and become new plants.

The ground pine (*Lycopodium obscurum*) is rare in this locality, only a few small patches at present being known. The spores are shed about September 25.

The stiff club-moss (*Lycopodium annotinum*), while scarce in the county, is known to exist in great abundance in one hemlock woods in company with the shining club-moss and the common club-moss. Here it forms dense mats many yards in extent and when in fruit

presents a very handsome spectacle. The spores are shed about October 13.

The common club-moss (*Lycopodium elavatum*), whose club-like fruiting spikes give the name of club-moss to the whole family, is by no means common here. The spores are shed early in September.

Even when not in fruit our species of club-moss are readily distinguished, the ground pine by its tree-like habit, the shining club-moss by its broadish, sharp but not long-pointed leaves, the stiff club-moss by its narrower long-pointed leaves, and the common club-moss by its bristle-tipped leaves.

Guelph, Ontario.

HARBINGER OF SPRING.

BY EMMA E. LAUGHLIN.

THERE is a dainty little wild flower, known only to its friends and lovers, which bears the technical name *Erigenia bulbosa*, or the common name Harbinger of Spring.

Indeed it is a harbinger of spring, for it always appears a week before the spring beauty (*Claytonia Virginica*) and often a month before any other wildwood blossom. It is the first representative of the Parsley family of nature's widespread brotherhood.

Some warm spring-like day in February or early March, when you are walking in the woods, if you already know and love this tiny white flower, you will find it peeping out from among the dry leaves on a sunny southern slope. Otherwise you will never see it at all. It will not flaunt itself in your face, nor invite you to pluck it from its stem. Cuddled down close to some gnarled root in a sheltered nook, it will wait shyly for you to find it. You may pass the spot a dozen times and not see it, and the next time find it and wonder why you did not see it at the first. You will feel like bowing humbly before the faith of this little woodland plant that the springtime never failed us yet.

You will see only the white of the petals and the

reddish brown of the anthers. No green leaves appear with these first flowers. They are softly curled up beneath the dead leaves, waiting for a warmer time. If you dig down around the tender white stem you will find at the end of it a round brown tuber covered with rootlets. By and by when the season is more advanced, the stems lengthen, the leaves spread out, and larger clusters of the dainty flowers open. They never get very high in the world, for the greatest length to which they grow is not over eight inches.

It is not long that the harbinger of spring or pepper-and-salt, as it is often called from its brown and white appearance, holds sway in the vernal woods. It is soon overshadowed by the more sturdy flowers that follow —the hepaticas, bloodroots, buttercups and trilliums. Once more, in the woods of the early summer, you will meet this friend of the early spring. Some day in your wanderings, you will chance upon a bank covered with fine feathery green leaves surrounding small clusters of curved brown seeds. At this time you will find the plant still beautiful. When these seeds have fallen the plant's work is done, and it sinks drowsily into its long winter's rest. You have said goodbye for a year to this happy little flower, for

"'Tis my faith that every flower
Enjoys the air it breathes."

Barnesville, Ohio.

A FEW MAINE BLOSSOMS.

BY JESSIE SWIFT MARTIN.

AN amateur botanist in Maine has been interested for years in noting the location of certain flowers, and their absence from certain fields where they would be expected. For instance, only once has it ever come to the author's knowledge, that meadow beauty (*Rhexia Virginica*) has been found in Androscoggin County. That instance was on the shores of Trip Pond in Poland, where each mid summer finds the marshy pond edge deeply pink from the blossoms. Later, as Thoreau says,

the patch is almost as bright from the scarlet leaves and seed pods as it was in the time of flower.

In Winthrop, at the outlet of Lake Cobbosseecontee, was found a big clump of purple loose-strife (*Lythrum salicaria*) in full bloom. Consulting one better versed in flower lore than myself, I learned that the plant has not often been found nearer this location than Conway, N. H.

Many Maine ponds and lakes, notably Kezar Lake, Oxford County, bear on their bosoms the beautiful sweet-scented white water lily (*Nymphæa odorata*). Gray remarks that the blooms are sometimes pinkish, rarely pink-red. Yet in Freeport is a pond where the pink-red lily is so plenty that the lads of the town hawk them about the streets.

The pink lady's slipper (*Cypripedium acaule*) is to be met in almost all parts of the state, very frequently attended by several of the pure white balloon-like blossoms which form Dr. Asa Gray counsels one always to expect of any flower. But the yellow, the *Cypripedium pubescens*, is much less frequently met. I never saw it until it was brought into botany class in the high school at Lewiston. At that time, so scatteringly were the specimens found, that the student, who brought them from a grove in South Lewiston, refused steadfastly to reveal their haunt. Several of her specimens bore two blooms at the tip of one stalk. But the showy lady's slipper (*Cypripedium spectabile*) is rarest of all, and I know of but one locality, and that indefinitely, where it is to be found it the State. This is near where the town lines of Hebron and Buckfield join, and the few who appreciate the rarity of the plant are highly indignant that a resident there has annually uprooted and sold to out-of-the-state parties the lovely, shy habitant of the swampy places.

Tne one-flowered pyrola (*Moneses grandiflora*) has never come to my observation in Maine save from Knox County.

Fringed polygala (*Polygala paucifolia*) was one of

the commonest of the woods flowers about Lewiston and Auburn, in Androscoggin County, but I have yet to meet with it in the vicinity of Rumford Falls in Oxford County.

Another plant which I have met but once in Maine is the downy false foxglove (*Gerardia flava*) which I saw while on a launch exploring the shores of Lake Auburn, Androscoggin County.

I do not say these plants cannot be found elsewhere than in the localities I have mentioned; I simply state that in the years I have been interested in botany I have never been able to learn of them elsewhere.

Rumford Falls, Me.

WINTER STUDIES.

BY DR. WILLIAM WHITMAN BAILEY.

THE student of nature is never without objects of study. Winter may narrow his horizon, but it does not wholly shut him in. From his very occupation he is an observer, and having once learned to keep his eyes open he uses them at all times. Out of doors there is much to see; the tracery of branches, the arrangement and packing of buds, the drooping tassels, the persistent berries, the rattling oak leaf that will not fall. On every tree, too, on a damp day, we will note the green mosses. Lift off the scale of ice, itself a wonder, from yonder pool, and dip up some of the green floating filaments beneath. You will, when you return home, possess a microcosm wherein is enacted tragedy, melodrama and exquisite comedy. And as for beauty of form, what shall surpass these atoms which are alone revealed by the lens?

A walk in the wild woods is never without charm. Even in the winter we find it profitable to pay them an occasional visit. Nature never pleads the shallow and fallacious excuse of domestic engagements, but we have a suspicion that about this time she is not the least busy lady in the land. Think of all the sleeping buds she has to rock and fondle, and of all the multitudinous plans she is maturing, to delight and surprise us in the spring! Under the snow beds are myriads of slumbering blossoms,

not to speak of forms of higher life, which await but a word from the gentle goddess to come forth in vernal beauty.

We love to follow the path made by some rabbit or other wild creature which leads into mysterious depths of forest. The silence would be appalling were it not for the instinctive faith in the latent life about us. In places the snow is positively blue, where, for instance, the "sombrous pines" cast their long shadows westward and mark the progress of the sun. Wonderful palaces have been built above the little brook which bubbles and whispers and laughs as it plays sweet music on the tinkling ice. We gaze down colonnades of stately pillars, ornate as those of Thebes. Let Schliemann delve in the ruins of Mycenæ or Layard of Nineveh; they cannot unearth more wonderful remains.

It requires good courage, and something of enthusiasm besides, to travel afoot over frozen snow; but there are days when it is quite out of the question for one to stay at home. Blue skies, jingling sleigh-bells, and crisp air all summon him out of doors. If he can skate he has reached the triumph of locomotion, the poetry of earthly movement. A perfect skater suggests those exquisite statues of the Greeks, where a god is represented poised as if for flight. The anatomical absurdity of wings is dispensed with, and he seems to glide along by the very force of genius. There may be reason, perhaps, why we cannot skate. At such times we wrap up well, and start off like some Alpine or Arctic explorer, with a convenience at hand of which these adventurers are deprived; viz: the ready access to a returning trolley car.

Sometimes kind Nature undertakes a little dramatic performance in our back yard, when we engage a reserved seat in the house and witness the spectacle in comfort. Where is the artist that can paint such a scene? Does a child's imagination even create anything so dazzling and bewildering? Here is a pear tree whose withered fruit is transformed into sugared confection. For what fairy beauty are prepared these necklaces of pearl? Who

ground the iridescent facets of yonder diamonds that spangle in the sunlight and, catching the subtle colors of the spectrum, gleam like shattered rainbows? The oak has sheathed himself in mail, and even the tiny twigs are guantleted. A little breeze causes the armor to creak and the joints to rattle, but the fabric is well wrought and can endure the strain.

Beautiful beyond all description is the view adown the garden path, when the overarching shrubs have found a fret-work of crystal. There are hung strings of orient pearls; tapestry and lace-work of superb patterns recall the splendors of mediaeval times; and here is a film or veil of frost so delicate that a breath would endanger it. The most homely objects are fringed with opaline icicles. A cluster of barberries, which has escaped the birds, is now an ear-drop of costly coral. What could the island home of Monte Cristo show that was any way comparable to this splendor?

"Loveliest of lovely things are they
On earth, that soonest pass away."

Even as we look, the enchantment is broken. The rare decorations are dashed upon the ground, for with a shudder and a sigh, each branch seems to bow itself slightly and then cast off its armor; the jewels are dissolved in rain.

Brown University, Providence, R. I.

BOTANY FOR BEGINNERS--XVIII.

ORDER II.—THE NAIADALES.

There are few plant families with which the collector has less to do than with the Naiadales. Like their nearest allies, the cat-tails and bur-reeds, they are water and marsh plants, inconspicuous enough as to individuals, but often occurring in such abundance as to be noticeable for their numbers alone. The flowers, of a low and primitive type, often without petals or other showy organs, attract only the scientist. The average plant lover can hardly be expected to become enthusiastic over limp, dripping, dirty plants lacking beauty and fragrance,

fished up from the waters of some slow stream or pond, and offering no characters by which they may be easily identified. Nevertheless, these plants are of interest for the link they form in the chain of plant families and are well worth a careful study.

The Naiadales are named for the genus *Naias*, or *Najas* as it is often written in the Old World, of which the widely distributed *Naias flexilis* may be considered the type. The order is also frequently called the Fluviales and the Helobiæ, but the title we use seems the one likely to prevail. Four families compose this group in North America and two or three additional families are found in other parts of the world. Those represented with us are the Naidaceæ which includes the pondweeds (*Potomogeton*), the Scheuchzeriaceæ, the Alismaceæ containing the water-plantains (*Alisma*) and the arrowheads (*Sagittaria*) and the Vallesneriaceæ best known from the eel-grass (*Vallesneria*).

In the simplest plants of this order the flowers consist of single stamens and carpels. Sometimes the two are borne in the same flower, but often each sex is borne alone. These flowers are seen to be much reduced for in the group as a whole the regular three-parted type of the Monocotyledonous flower prevails. One noticeable exception is found, however, in the pondweeds which have four-parted flowers.

As regards the floral envelopes, the flowers of this order fare rather better than those of the Pandanales, for even in *Naias* where the flowers consist of single stamens and carpels borne separately, the staminate flower, at least, not only has a rudimentary sac-like perianth but is borne in a spathe as well. In the Scheuchzeriaceæ (formerly the Juncaginaceæ) there is a sepaloid perianth of two whorls of three, while in the Alismaceæ the flowers have a two whorled perianth, the outer green and the inner petal-like and colored. The pondweeds have usually been considered as having a perianth of four petaloid segments, but these are now regarded as outgrowths from the anther. While they answer the requirements of petals, they are not petals or sepals in origin.

In some members of the order, notably in the arrow-heads and water-plantains there is a tendency to a multiplication of stamens and pistils but in the majority there is a definite number of these organs, usually six as to stamens and three as to pistils. In many of the plants there is also seen a tendency to surround the flower or flowers with a spathe.

The order is remarkable for the variety and strangeness of ways in which the flowers are pollinated. The showy flowers of the Alismaceæ are pollinated by bees and other short-tongued insects. In *Alisma plantago*, the water-plantain, according to Rendle, the fleshy ring formed by the base of the filaments excretes twelve drops of nectar. In the arrow-head (*Sagittaria*) the large and showy flowers are noticeable for appearing in whorls of three, the upper whorls containing only staminate flowers, the lower pistillate. In the pondweeds, although the flowers contain both pistils and stamens and are wind pollinated, there is considerable likelihood of cross-pollination since the stigmas ripen before the anthers. The eel-grass is famous from the fact that its pistillate flowers rise on long stems to the surface of the water, while the short-stemmed staminate flowers, in order to reach them break loose from the plant and rise to the surface, being helped thereto by a bubble or balloon of oxygen gas providently excreted before the journey begins. Still other members of the order have flowers always beneath the water and the pollen instead of being round, as is usual, is long and thread-like and of the same specific gravity as water. It, therefore, neither rises to the surface nor sinks to the bottom, but swims about until caught upon the fringed stigmas. The seeds are usually, if not always, distributed by water.

In addition to seeds many plants of this order have other methods of distribution. Runners which form tuber-like bodies capable of producing new plants are common in the eel-grass, the pondweeds and the arrow-heads. In the former the tips of the shoots in autumn becomes detached and sink to the bottom to give rise to

new plants in spring. In the frog-bit (*Hydrocharis*) the runners produce rosettes somewhat after the manner of the strawberry, and the plant also forms resting buds in autumn. Our common ditch-moss (*Elodea canadensis*) is rapidly propagated by off-shoots and though seldom fruiting has become a great pest abroad through its rapid multiplication. Indeed, it is said that the pistillate plant, only, has gone abroad. These extra means of propagation seem essential to water plants whose more complicated methods of reproduction are often interfered with by varying heights of the water.

The order is represented in both fresh and salt water and in both warm and temperate climates. It is noticeable, however, that certain families show a preference for one or the other of these conditions. Thus the pondweeds are found only in fresh water while the species of *Ruppia* and *Zostera* are found in salt or brackish waters. There are about a hundred species of Naiadaceæ of which nearly three-fourths are pondweeds. The Scheuchzeriaceæ are a small family with less than a dozen species. Alismaceæ has about seventy-five species, nearly half of which belong to *Sagittaria*. The Vallisneriaceæ (known also as the Hydrocharitaceæ) has about forty species many of them tropical.

THE JAMAICA WALKING FERN.

(*Fadyenia prolifera.*)

Walking ferns, in the sense of ferns whose fronds bend over and take root at the tip, are fairly common in the fern world. Our own most noted example is the interesting little *Camptosorus rhizophyllus* not uncommon on limestone rocks, but we have several others that occasionally root at the tip, such as the hartstongue (*Scolopendrium vulgare*), the ebony spleenwort (*Asplenium ebeneum*), the pinnatifid spleenwort (*A. pinnatifidum*) and that curious hybrid named *Asplenium ebenoides.*

In the colder parts of the Old World *Camptosorus sibericus*, a species much like our walking fern, is found, but we must turn to the Tropics to find walking ferns in

abundance. In Jamaica, especially there are numerous species with this habit. One of the most characteristic is the one we have selected for illustration under the title of the Jamaica walking fern. Fadyenia, as it is often called, has more claim to our attention than the mere

FADYENIA PROLIFERA.

fact that it is a walking fern. It is the only fern of its kind in the world and the entire genus *Fadyenia* consists of this single species *prolifera*. Its fronds, too, are odd

enough to distinguish it anywhere. There are first certain round-ended or spatulate fronds for purely vegetative functions, oftenest seen in young specimens; second, there are other lanceolate tapering fronds which do the "walking" and which are manifestly later leaves like the first form, but with prolonged, slender tips, and lastly there are the paddle-shaped fertile fronds which are like neither of the others. The margins of all are entire.

This species grows on springy banks in the open sun or partial shade and in certain localities is very plentiful. The rather thick and leathery sterile fronds spread out in the form of a rosette and the slender tips rarely fail to produce new plants which, in the genial climate of their habitat, soon reach the size of their parents. The fertile fronds are erect and their manner of fruiting, though allied to the wood-ferns, differs enough to cause the species to be placed in a separate genus. On each side of the mid-rib is a single row of horse-shoe-shaped sori pointing toward the tip, covered by oval indusia fixed by the center and base and open all round the outer margin. The sori have a general resemblance to those of the wood-fern (*Nephrodium*) tribe, and as might be surmised the genus is placed with them in the tribe Aspidieæ, which also includes the sword ferns (*Nephrolepis*). The sori are unusually large and occupy most of the space on the narrow fronds.

The fronds of the Jamaican walking fern are scarcely longer than those of our familiar native species, but the sterile are much broader and the plant appears much larger in consequence. By many it is supposed to grow only in Jamaica, but it has been reported from Cuba, also. Jamaica, however, appears to be the only laud where it is abundant.—*Willard N. Clute, in The Fern Bulletin.*

Note and Comment.

WANTED.—Short notes of interest to the general botanist are always in demand for this department. Our readers are invited to make this the place of publication for their botanical items.

SEED DISPERSAL IN THE PINE.—At the time the ovules of the pine are pollinated, the scales of the cone open allowing the pollen to reach them. After this they are tightly closed until the seeds are ripe when they again open. The cause of this second opening seems to be a lack of moisture in the outer side of the scales. This side shrinks pulling the whole scale outward. In some of the firs the scales open and shut according as the weather is wet or dry, thus loosing the seeds and ensuring that they shall be scattered only on fair days.

POLLINATION OF THE PRIMROSE.—Our British cousins are again going over the evidence for and against the theory that the English primrose is cross-pollinated. It seems that some inquisitive entomologist has been watching the primroses for an hour or so each day and not finding many bees or other insects about, has jumped to the conclusion that not enough bees visit the blossoms to properly pollinate them. It would seem, however, that until some patient investigator has watched the blossoms through the whole twenty-four hours at various times during the flowering season, he is scarcely warranted in making positive statements. There are many crepuscular or nocturnal insects like the sphynx-moths that might transfer the pollen. The sphynxes especially, are so active that a single individual is able to pollinate forty or fifty flowers a minute. A few of these insects fly by day, but many more appear only at dusk and dawn while a few are to be seen only in the middle of the night. He who studies cross-pollination must be abroad at all times, if no facts are to escape him.

Editorial.

The term Nature-Study is one that still lacks a definition that will find unanimous approval. Even the writers of books on the subject are by no means agreed as to what it means. Prof. L. H. Bailey says "it is not the study of science," and with this dictum John Burroughs agrees, but others of equal authority insist that elementary science and nature-study are synonymous. No matter which side of the argument we take, this much is certain; both nature-study and elementary science deal with the world about us, and if there is any difference between the two, it would seem to lie in the spirit with which we approach the subject. In the study of elementary science, the student young or old is concerned with the discovery of connected facts about the object studied; in nature-study, if we have properly understood the term, the desire is not so much to find out all that is possible about a given subject as to find out what is pleasing about it. The advocate of nature-study would do away with all dissection and analysis and turn attention to the beautiful, the curious and the interesting. In the hands of an intelligent teacher, herself an ardent naturalist, it is conceivable that good results may come from this view of the subject; but as the matter is at present, when any teacher with sufficient intelligence to teach in the lower grades of the school, is assumed to be fully competent to teach "nature-study" the teaching too often runs into sentimental nonsense that is worse for the child than no nature study at all. Real nature-study can rarely be taught to advantage in the school-room, for there the conditions are unnatural. If taught at all the child's knowledge is likely to be more or less out of proportion because some parts of nature are more easily studied indoors than others. For these reasons it appears to us that if anything about nature is to be taught in school, it should be elementary science

with as much the flavor of nature study as possible instead of the reverse. The teaching of nature-study out of doors is quite another matter and we think Dr. Bigelow has in the main put forth the right ideas in his recent little book on "How Nature-Study Should Be Taught." He advises the teacher to get the child's point of view, to approach nature with the same wonder and questioning. He would have no formal schedules and would teach in a somewhat haphazard fashion letting the objects to be studied for the most part suggest themselves. And he is also a believer in the theory that no teacher can be successful in this work without being, herself, possessed of a love of nature. Taken all in all the book is one of the best expositions of the way to teach nature-study that we have seen, but we hasten to add that in our opinion the book will not do as a manual for teaching about nature in the schools. The book is published by Hinds, Noble and Eldredge, New York.

BOOKS AND WRITERS.

The Massachusetts Horticultural Society has recently distributed an excellent little pamphlet on "The Protection of Native Plants" by Robert Tracy Jackson.

The first number of *The Apteryx* issued by the Roger Williams Park Museum, of Providence, R. I., has appeared and makes a very creditable beginning. C. Abbott Davis is editor.

Major George O. Squier has recently published an account of his experiments with trees in wireless telegraphy. He finds that vigorous growing trees may be used instead of kites or balloons for sending and receiving messages and thus making it possible to set up a new station in the field in less than fifteen minutes.

"The Forest Wealth of Oregon" by Edmund P. Sheldon, is apparently designed as an advertisement of the Lewis and Clark Exposition, but it is a pamphlet well worth owning by the botanist since it contains a list

of ninety-five trees and large shrubs of the State of Oregon together with description of their salient features, use and range. The pamphlet is published in Portland, Oregon.

Park and Cemetery, of Chicago, has added a most valuable feature in the form of a monthly index to the articles in other publications that are likely to be of interest to its readers. This list is made up from nearly forty papers devoted to horticulture, floriculture, forestry and kindred subjects. The list is alphabetically arranged but we suggest that it would be improved by setting the titles in italic or capitals.

"Flower Fables and Fancies" is the attractive title of an attractive little book by N. Hudson Moore which treats of several well known flowers including the rose, lily, chrysanthemum, lilac, crocus, etc. The volume makes no claims to being complete, but tells in an entertaining way with many extracts from the poets of the various fancies about the flowers. There are many illustrations from photographs and each page has a decorative border in color suitable to the subject of which it treats. (New York, The F. A. Stokes Co., $1.60 *net*.)

The Japanese are great lovers of flowers and in an intelligent appreciation of them doubtless excel the people of our own land. Such an occurrence as that of a whole nation ceasing work just to go out and look at the blooming cherry or plum trees could scarcely happen in bustling America. In the "Japanese Floral Calendar," Ernest W. Clement has given us other glimpses of the Japanese regard for flowers. The art of arranging flowers in Japan appears to be most complicated. An Englishman who has studied the theory of it required three hundred pages to properly describe it. Mr. Clement's little book treats of the flowers most popular in each month of the year, with many examples of Japanese poetry relating to flowers. There are a large number of excellent illustrations. (The Open Court Publishing Co., Chicago.)

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Books Recommended

In this department we shall, from time to time, recommend books that to us seem of special value to readers of this journal.

III.—Fern Books.

It all depends upon what you want the book for. If a technical manual with descriptions of the North American species, get Underwood's "Our Native Ferns" ($1.08); if a popular handbook for Eastern America select either Parson's "How to Know the Ferns" ($1.63), Water's "Ferns" ($3.34) or Clute's "Our Ferns in Their Haunts" ($2.15). Parson's book is well written but the keys are difficult. Water's book has two technical keys and is illustrated with many photographs. Clute's book has more text than either, has illustrated keys, colored plates and the 225 other illustrations are by an artist of ability. The real fern lover needs all three. Eastman's "New England Ferns" ($1.25) is a new book that is useful but not so comprehemsive as the others, while Dodge's "Ferns and Fern Allies of New England" (50 cts.) is a complete little technical mannal. Clute's "Fern Collector's Guide" (50 cts.) tells where to find ferns and how to press, mount and identify them. Useful to take into the field.

For the above books, or any others, address,

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CHARLES D. PENDELL, PRINTER, BINGHAMTON, N. Y.

COMMON CLEMATIS.
(Clematis virginiana)

THE AMERICAN BOTANIST.

VOL. VIII. BINGHAMTON, N. Y., FEBRUARY, 1905. No. 2.

THE COMMON CLEMATIS.

(*Clematis virginiana.*)

IN July or August the saunterer along country by-ways is pretty certain to find the flower-laden sprays of the common clematis spreading over the shrubbery in its haunts. Although lacking the tendrils of the grape and the twining stem of the bindweed, it is an expert climber and seldom rests until its topmost sprays have formed a tangled mat of green over its support. Its method of getting up in the world is somewhat out of the ordinary and consists in the coiling of the petioles about any convenient support. The tendrils of the common garden pea are evidently transformed leaflets, but the clematis is able to retain its leaflets by making its petioles do extra work. Since the stem is not annual like that of the pea it would not do to cut off leaf and petiole in autumn as other perennial plants do, so the leaflets themselves are cut off leaving the coiled petiole as a permanent support for the stem.

Although the flowers are diœcious, that is, the stamens and pistils are on separate plants, they apparently produce no nectar but are nevertheless able to secure the visits of insects by providing them with plenty of pollen. The insects that transfer the pollen are small flies and possibly a few bees. As is well known the two kinds of flowers differ slightly, the staminate ones have only the usual four-parted calyx but the pistillate have a circle of petal-like organs inside the calyx which are probably the remains of stamens. After the sepals have fallen these remain for a time to make the flower more conspicuous. After pollination the styles lengthen greatly and develop the soft fluffy hairs that aid in transporting the seed.

It is frequently assumed that the name of virgin's bower applied to this plant was given in honor of the Virgin Mary but this is a mistake. The European counterpart of our plant (*Clematis vitalba*) was named virgin's bower by Gerard "by reason of the goodly shadows which they make" and our plant appears to have had the name transferred to it. Nor does the specific name have a similar allusion for it was given because this species was first known from Virginia. The Old World plant is sometimes called white vine and old man's beard, the latter doubtless in allusion to the feathery styles when ripe. Traveller's joy is another name the plant often bears in literature, at least. The stems are said to afford the small boy with the materials for smoking.

MY SPRING GARDEN.

BY DR. WILLIAM WHITMAN BAILEY.

HAPPY is that person who has a garden bed, however small it is. Here may be watched the coming on of Spring, and after a cold, bleak winter what is more delightful? Whatever may happen to a garden later, and many things occur to mine, such as excessive shade, thieving elm-roots, drouth, burrowing dogs (dogs do burrow do they not?), the disrespectful *gamin*, and weeds sempiternal, still, the vernal season discloses a mystery and declares a dividend. I experience a delight like unto German Elizabeth, she of the immortal babies. Every morning there is a revelation.

Early in March, or some years even in February, may be seen the pretty snowdrops nodding on their stems. One is apt to consider this cernuous habit an accident, but there are few if any accidents in Nature. A little attention discloses the fact that the pretty white flower, tipped with apple green, acts like a tent to protect the pollen from rain. It is essential that it be not washed away as, in its own country, it is necessary to the perfection of fruit and seed. This rarely, if ever, attains perfection with us.

Rossetti describes the flowers as having "a heart-shaped seal of green." Of the six parts, it is the inner three that are narrow and notched at the apex. Usually there is but one flower on a stem, emerging from a sort of spathe, and attached to the ovary. The divisions of the flowers, as well as the stamens, are six in number and the anthers of the latter are golden yellow. While there are a number of species known to botanists, *nivalis* is the most satisfactory and the one oftenest seen. To double them is to "gild refined gold;" as a matter of fact, they are handsomer single—as are most flowers. They are Crimean, Caucasian or Mediterranean in origin, and *nivalis*, at least, appears perfectly hardy. We have often seen it on Valentine's day—coincident with snow and ice. The plants are of the *Amaryllis* family.

Other plants equally early and hardy are the various crocuses, all of the *Iris* family. One may at first suppose them to be of the lily alliance, but the three stamens with backs to the pistil and the flower tube adherent to the ovary, though often well under ground, show their affiliation to the *fleur-de-lis*.

The species are mostly from Eastern Europe, Greece, the Crimea and Palestine. Some extend as far as Central Europe, and others, by long cultivation, have established themselves—as in England, where one might take them to be indigenous. Even here they will hold their own in garden-bed or grass-plot for a long time. They exhibit a great range of color—from pure white through lavender to violet and purple, and from pure yellow to orange. Their species are infinite. We have an octavo, or rather folio volume in the University Library exhibiting large numbers of them in exquisite color. Besides their colors, the satiny sheen adds to their charm. On a sunny spring day I can watch them for hours envying the bees who explore their silken pavilions. By the way, how soon these busy fellows find them out, as they do also the honey-laden catkins of the willow!

One species, *Crocus saterris*, is a light purple, autumn

flowering species and its stamens and stigmas yield the saffron of commerce. The best comes from Spain and is used not only in medicine but for its coloring properties. The so-called autumn crocus or *Colchichum* does not even belong to the same family.

Everybody knows the pretty little blue squills, *Scilla siberica* and other species, a near relative of the onion and *Ornithogalum umbellatum* or "star of Bethlehem." The squills, however, possess bright blue, fragrant flowers and long narrow leaves. They occur naturally in England, and several species are cultivated.

Before any of these are well out of bloom, I generally notice that my crownimperial is up, but perhaps owing to my pronounced Republican principles, it refuses for me to don its coronal. It is an old-fashioned flower, bad-smelling but handsome and especially notable for the large, opaline glands on the inside of each segment of the perianth. These are honey-secreting. Again, the nodding position of the flower protects it from rain. Its cousin the guinea-hen Fritillaria is more peculiar than beautiful. The name Fritillaria, by the way, is said to be derived from "fritillus," a checker-board, from the mottled aspect of this species.

If I had my way, which means room and money, I should have one entire bed of narcissus. What a clean-cut type it is! Every line is decided. There is the white, pure *poeticus*, with ruby-tinted crown, the glorious golden trumpets of daffadil—"ten thousand saw I at a glance," and then the canary fluff of a doubled jonquil. There are small, delicate kinds, too, very dainty.

Hardly are these in full bloom, when lo! the hyacinths light up their beacons. They revel in most of the colors of the palette but seem to feel the weight of their responsibility; they droop heavily on their inefficient stems. I hate to uproot a hyacinth but, as a matter of fact, the new bulbs planted fresh each year do the best. The old ones gradually run out.

So is it, too, with tulips, and both, so far as culture

goes, come from Holland. I don't care for a fancy tulip; give me the clear yellow chalice, a Holy Grail, or a crimson, or rose pink one. To some flowers the name gorgeous especially applies. It is so with tulips. One feels in looking at a bed of them as if he had walked into the court of the Grand Monarch. They appear to step in stately minuettes or graceful gavottes. They courtesy and bow with formal pause and progress.

Such are some of the joys of my garden. They are above politics and outside diplomacy. If, while we watch, a robin comes, too, and chants his sweet vernal hymn, we envy neither king nor bond-holder. These treasures are ours—

"All's right in the world!"

Brown University, Providence, R. I.

THE SIGN OF THE MOON.

BY O. W. BARRETT.

YOUR note in the October AMERICAN BOTANIST on "The Sign of the Moon," quoted from transcript of the American Institute of Mining Engineers, touches a sore spot. Here in Porto Rico we are confronted with this detestable superstition concerning the weird influences of the front and hind quarters of our satellite,—affronted with it under so many forms and degrees of rationality that it gets on our nerves and makes us desperately long for its dissolution.

It is bad enough to be obliged to wait for the proper change of the moon before cutting your timber or a fence post to mend a gap in the fence, but it is worse to have to select the correct phase for harvesting your corn, planting your beans, setting your bananas, etc.; and when you are told that you must not cut your nails except in the "wane" of said orb under dire danger to your bodily and moral health,—we believe you are at liberty to form some striking conclusions.

I am pleased to note that the engineer who recorded his convictions in the article in question actually realized

that some few varieties of wood were not so susceptible to the subtile attractions of "fair Luna," but of course he misses the important fact that the environment under which the cut timber is kept after felling, the condition of the wood at time of cutting, and *the species* determine the future state of the timber.

What worries me, however, is the fact that, sooner or latter, some one of the many obviously intelligent believers in this old moon hoax will find some apparent excuse for his ideas and foist it upon the long-suffering public in such a way that many will remark "Well, there may be something in it." Let us resolve to meet all such matter in the manner it deserves.

Mayaguez, Porto Rico.

A WEED STUDY.

BY H. C. SKEELS.

IN the fall of 1903 a railroad embankment was built three miles east of Joliet, near the Forest of Arden. The earth for this was taken from a pasture next the right of way, an excavation about 2 feet deep being made over an area 75 by 250 feet. In the following February, 1904, this excavation was filled with manure from the Chicago stockyards

There is an idea prevalent among many people, of which I am one, that a manure pile is uncongenial soil for plants, because it is too rich. The above conditions gave a chance to test this, and the results of the first season of growth give some idea of the ability of plants to withstand conditions that might seem at first sight almost prohibitory to plant life.

It will be seen that it was almost necessary for all plant growth to come from seeds or plants already in the manure. All native plants were cleared away in the excavating. All seeds dispersed by surrounding plants were buried under two feet of manure, and seeds dispersed after March 1st are comparatively few. A fact which bears out these conclusions is as follows: the general

appearance of the plot all season was that of a barnyard, with a few patches of green scattered about. Nevertheless, the green was there and its character was very interesting.

Naturally, mat plants predominated as soil cover, the most prevalent one being white clover. This covered probably one-tenth of the whole area, and its presence in the manure is hard to explain. White clover is not cut for hay and is not commonly a pasture plant in regions from which cattle are shipped. Red clover was present, but not in any quantity. The other plants of the rosette form, or approaching it, were mullein, catmint, teasel, evening primrose, sweet-clover and plantain. Among these were several surprises. Mullein, a biennial, was found flowering, four plants, and many of the first year form. There was also one plant in flower of the bull thistle. These were a puzzle until pulled up. It was then evident that the plants came in the manure; and this explains the number of species of annuals common to the Joliet-Chicago regions found the first season. The manure must have been taken from a pile which had been undisturbed for at least one season.

Another surprise was the scarcity of sweet-clover. This is the most prevalent weed of the region. It lines all roadsides and railroads through the vicinity and was the first plant to gain a foothold on the immense piles of limestone along the Chicago drainage channel. Yet the bunches of sweet-clover on this particular area could be counted on the fingers of one hand, and all were the first year form.

There were three rosette plants not belonging to the region. *Verbena bracteosa* appeared in several places, covering the ground like a mat, one plant in a place. Another spreading mat with small white flowers and loaded with little green tomatoes, was *Solanum triflorum*. One of the most noticeable clumps was a plant as large as a bushel basket, with yellow flowers and prickly fruits, stems and leaves—*Solanum rostratum*. This was really

the one bit of beauty in the whole stricken area. Two other nightshades were present sparingly, *S. Carolinianum* and *S. eleagnifolium*, the former having become established previously in the region and the latter making its appearance for the first time.

Among the erect plants appear the annuals mentioned above and a few perennials which were probably growing on or near the pile in Chicago, but may have come in the cars from more distant fields. Among these plants were several species of pigweeds, one *Chenopodium ambrosioides*, being a new tenant. There were two species of dock, several smartweeds, three verbenas besides the *bracteosa*, several plants of thistle, a few amaranths, and four groups of plants that seemed so thoroughly at home as to require special mention.

Neither of the two common species of Jimson-weed is prevalent around Joliet. A few plants are occasionally seen along the old Illinois and Michigan canal, but they are not common. In this special area, three miles away from the contaminating influences of weedy Joliet, there grew two clumps of purple *Stramonium* and one of white, over four feet high and forming the most striking appearance in this barren spot. There was also another clump, over five feet high and perfectly healthy and happy—*Iva xanthifolia*.

Here then, in the midst of a fertile pasture, is an area of 18,750 square feet, entirely deprived of its beautiful covering of June grass, converted into a dumping ground for the refuse of a distant community of uninterested people, and made into a breeding place of noxious weeds. While it cannot muster sufficient plant life to allow one individual to a square foot and has representatives of only about thirty-two species all told, it must bear the odium of producing but one plant not considered a weed, and that *Œnothera biennis*, a doubtful member of the list of desirable neighbors. The only claim to respectability the area can make is the fact that, although it has produced eight weeds not previously found in the region,

none of which are worse than the weeds more common, it has proven that white clover can stand the conditions which prevail during a trip from distant pastures on a crowded cattle-car, either on the floor, or in the digestive tracts of the inmates; can be dumped on a refuse pile in the Chicago stockyards, reloaded and shipped back part way over its old route, spread out on the ground in the bleakest month of the year, and still retain sufficient vitality to appear as the most prominent covering of this desolated spot of ground, and hold out to the future a hope for the sweetest honey that bees can make.

Joliet, Ill.

THE GREENISH-FRINGED REIN ORCHIS.

BY WALTER ALBION SQUIRES.

MOST of our native orchids are at home only in the peaty loam of sphagnum bogs or the deep shade of mossy woods. The greenish-fringed rein orchis (*Habenaria leucophæa*) is a child of the prairies. With the possible exception of certain species of *Spiranthes* it is to be found farther out upon the plains than any other member of this interesting family of flowering plants. I have found it growing almost hidden in the rank grass of low moist meadows in central Kansas. In the eastern part of the state it is found quite abundantly, but here seems to prefer upland meadows.

Rising from the ground with a stout erect stem often three feet in height, its petals of a modest greenish yellow, it cannot compare in beauty and grace with the *Pogonias*, *Calopogons* and *Cypripediums*. It is, however, a handsome plant and in its structural adaptations to insect cross-fertilization one of the most interesting and wonderful plants to be found in any country. I shall never forget the day, many years ago, when in examining the flower of this plant for the first time, I placed the point of a small wire nail in the open throat of the flower. I had not then read Darwin's book on the fertilization of orchids and was taken entirely by surprise to find that

two small disc-like bodies had attached themselves firmly to the nail. On attempting to remove the nail I found that to each disc was fastened a short stalk or cord which could be drawn out to quite a length, an inch or more, like a piece of india-rubber or a small coiled spring. This coil was so elastic that it instantly returned to its former length as soon as the pollen masses were pulled out of their sockets.

The spurs of this orchis are long and narrow and so thin in texture that the clear, watery nectar at their tips can be easily seen through the tissues of the spur. Their length as well as the time of day at which the flowers give off their perfume would indicate that they depend, for cross-fertilization, upon the evening-flying sphinx moths. Pick a bunch of their flowers at almost any hour of the day and they seem to have scarcely any odor even when held close to the face; but put them in a vase and set them away until evening and just as dusk is beginning to fall they will fill the room with a perfume so strong and sweet as to be almost stifling.

The greenish-fringed rein orchis should be classed as one of our vanishing American wild flowers. So far as I have been able to determine, it is to be found only in natural meadows of native grasses. The number of such places in our Prairie States is year by year becoming less and less before the advance of the plow. When the last of this native sward has disappeared this inoffensive and interesting plant will have gone from our prairies forever.

Kooskia, Idaho.

FRINGED GENTIAN NOTES.

BY J. FORD SEMPERS.

AS many of us are aware, the fringed gentian is being rapidly exterminated in many localities. In the vicinity of towns the large showy flowers rarely go unnoticed by even the most unobservant. The wholesale gathering of the blossoms in years past has, in many cases, been followed by a corresponding wide spread dis-

appearance of the species. With a constantly diminishing number of blossoms left each year to mature seeds, the work of extinction has progressed rapidly and surely. This has been the history of the plant's existance in many localities, and unfortunately is being repeated in others in a way that is not pleasant to think of.

Efforts are now being made to find out something of the plant's life history prior to the blossoming period, with the ultimate object of making propagation possible. If these are successful some hope may be entertained of restocking many situations, or, at least, of introducing the plant in the wild garden. It may therefore be of interest in this connection to add a fact or two to those previously noted. Those are given simply as they have been gathered from observation.

It has not been possible thus far to verify by experiment, the suggestion previously made that the plant may occasionally become a winter annual. That is that the seed may germinate as soon as ripe in autumn, and develop into small plants before severe weather sets in. The seed will germinate in autumn, but not unless the soil temperature is constant and equivalent to that of late spring. Judging by the results of a number of sowings made in the field, in the garden and under glass, it seems that the average time for the young plants to appear is about May 15–20. Or at that time in this locality when all danger of frost is past. The young plants begin to appear quite uniformly whether the seed be sown in the field or in the garden.

With few exceptions, the vitality of those seeds experimented with appeared remarkably resistant to weather extremes so long as the temperature of the soil remained below that previously given. Excessive wetness, dryness or frost seeming to have little effect on the germinating quality of the seeds when the time arrived for growth to begin.

A number of seeds in each of the sowings were not influenced by heat or moisture. As these seeds were

apparently not dead, it is supposed that they would start into growth the next season.

So it seems that the gentian seed does not differ from that of certain other plants in being able to retain its vitality through periods of adverse conditions, and yet spring into life when these are replaced by others that are favorable. It is not improbable that this dormant existence may, in the case of some of the seeds, precede by a season or two the final awakening of their vitality, as commonly happens with the seeds of many other plants.

Aikin, Md.

MAT PLANTS.

Mat plants are plants with numerous prostrate branches which are usually closely crowded and form a more or less circular body a few inches to eight or more feet in diameter. This prostrate discoid body habit is quite characteristic of a small number of plants belonging to various families. Among the most typical mats may be mentioned *Amaranthus blitoides*, *Portulaca oleracea*, *Euphorbia maculata* and *Euphorbia serpyllifolia*. Mats are usually annual plants either of the ordinary herbaceous type or very fleshy. There are, however, a number of geophilous perennials which form mats, like *Verbena bracteosa*. The main radiating branches usually give rise to numerous smaller branches and they may or may not strike root. In the more typical cases there are no roots except the main central root. Mats are especially characterized by having a large number of small leaves, seeds, and flowers. There peculiarities, of course, harmonize with the shape and position of the plant.

Like most ecological groups, mat plants intergrade with other types of body habit. On the one hand they pass over into such forms as *Malva rotundifolia*, *Callirrhoe involucrata*, *Citrullus citrulus*, and the typical carpet plants; and on the other, transitions occur between them and tumble-weeds or even normally erect forms. Although it is not intended to give a definition

here of carpet plants, yet, since the terms mat and carpet are often used synonymously, it might be stated that typical carpets are perennials with numerous trailing branches or runners which take root at the nodes and develop low tufts of leaves or rosettes, finally forming a close low covering of the ground. Among this type of carpet plants may be mentioned the buffalo-grass (*Bulbilis dactyloides*) and the various species of *Antennaria*.

Mat plants are at home in open and exposed places where there is little or no individual crowding. They are abundant on prairies and appear extensively on newly plowed land. On newly broken prairie they are usually the most characteristic vegetation. They are also prominent on dry or moist sandbars, on salt marshes and in cultivated fields.

Nearly all typical mats, when growing in shaded places, assume the upright habit. But it is especially interesting to note that normally erect plants may assume the mat habit in a suitable environment. One of the most striking cases is the slender pig-weed (*Amaranthus hybridus*), which is usually erect and often attains the height of eleven feet. This plant when growing on exposed dry or moist sandbars frequently developes as a mat without a central stem but with a number of prostrate radiating branches. Sometimes there is a central erect stem a few inches high with long prostrate branches radiating in all directions from the base. The same form has been seen by the writer on sandhills in central Kansas. So peculiar is the appearance that one hardly recognizes the plant in its new form. *Eragrostis purshii* and *Diplachne acuminata* also form mat-like bodies when growing on sandbars. On exposed broken ground various normally erect, ascending, or decumbent plants also form mats. Noteworthy among these are *Echinochloa crus-galli*, *Eragrostis major* and *Cenchrus tribuloides*. In salt marshes of the interior one meets with fleshy mat plants like *Sesuvium sessile*. *Sesuvium martimum* is common on the sands of the Atlantic coast. *Dondia depressa* is

also a fleshy halophyte which commonly assumes the mat form on the salt marshes of Kansas.

It should not be difficult, with suitable physiological experiments, to determine the ecological factors which induce the formation of mats. Intense light and unobstructed space appear to be very important. The wind may have some influence. Water supply appears to have little or no effect. Thus *Eclipta alba* was observed to form perfect mats on very wet exposed sandbars but in shaded situations a little distance away it grew entirely erect, some plants being three feet high.—*John H. Schaffner in Ohio Naturalist.*

Note and Comment.

WANTED.—Short notes of interest to the general botanist are always in demand for this department. Our readers are invited to make this the place of publication for their botanical items.

THE PASSION-FLOWER MEDICINAL.—It is reported that the common passion-flower (*Passiflora incarnata*) which often becomes a weed in the Southern States is of value as a drug for inducing sleep and does not produce the bad after effects of other sleep-producing drugs. The medicinal quality is said to reside in the root and to be poisonous in large doses.

THE TONKA BEAN.—The tonqua, tonka or Tonquin bean of commerce first reached Europe from the Chinese province of Tonquin. It is the dried seed of the fruit of *Dipterix odorata* and it owes its peculiar odor for which it is valued to a crystallizable principle known as coumarin. At least two other members of the vegetable kingdom *Melilotus officinalis* (sweet clover) and *Anthoxanthum odoratum* (sweet vernal grass) are indebted to the same principle for their fragrance.—*Indian Planting and Gardening.*

THE OLDEST BOTANICAL MAGAZINE.—They apparently have more tenacity of purpose on the other side of the Atlantic than we have. According to *The Gardening World* the London *Botanical Magazine* has appeared uninterruptedly for one hundred and eighteen years. In America, publications may begin with the intention of living that long, but the publishers usually compromise by excluding the hundred years and few are able to exist for the other eighteen. We pride ourselves upon being a versatile people but stick-to-it-iveness is often as much of a virtue as versatility.

THAT STABLE NOMENCLATURE.—Less than a year ago we referred in these columns to the fate that has befallen the actinella at the hands of the name tinkers. For a great number of years certain plants were known as members of the genus *Actinella*. Since "stable" nomenclature became the rage, the name has been changed to *Picradenia* by Britton and to *Tetraneuris* by Greene. Now comes a new aspirant for fame and makes it *Hymenoxys*. If anyone can think up a more unpronounceable combination let him attack this defenseless genus. Meanwhile we will call it *Actinella* and be understood, at least.

TRIPLE JACK-IN-THE-PULPIT.—Last spring while I was searching for some specimens at the Gorge, a summer resort near Akron, I found a triple "Jack-in-the-pulpit," or "Indian Turnip" as it is sometimes called. The pulpits were well shaped and of ordinary size. Two of the Jacks were grown together and the other was slightly separated. The plant also had two well formed leaves and the bulb was of ordinary size. When it began to fade I pressed and mounted it. It is one of the many curiosities of nature. It was quite interesting to see three "Jack-in-the-pulpits" grown together and being borne by one stem. It brought a thought to my mind of three ministers of the same denomination preaching on the true text "Love of Nature is Love of God."—*Edward L. Cope, Akron, Ohio.*

JOB'S TEARS.—According to *Indian Planting and Gardening* the grass known as Job's tears (*Coix lacryma-jobi*) has been used for food and ornament from time immemorial. The round, hard, bluish-white fruits with a perforation in the middle is supposed to have first suggested the idea of beads. The stony character of the fruits incline botanists to think that this is the *Lithospermon* mentioned by Pliny. The plant also has reputed medicinal virtues.

HIBERNACULA.—Many water plants that disappear at the approach of cold weather tide over this season by means of curious propagative buds called hibernacula. These buds are formed at the tips of the stems in early autumn and differ from ordinary buds principally in being much thicker and stored with nourishment. As the plant dies these heavy buds sink to the bottom where they pass the winter. In spring the buds begin new stems and in the case of floating species bubbles of gas are evolved which soon carry them to the surface again. The species in our flora that usually form hibernacula are the duckmeats (*Lemna*, *Spirodela* and *Wolffia*), the bladder-worts (*Utericularia*), the pondweeds (*Potamogeton*) and the ditch moss (*Elodea*).

GOLDEN SEAL.—The United States Department of Agriculture has recently issued a pamphlet on golden seal (*Hydrastis Canadensis*) a wild plant of medicinal value that is fast becoming rare, though the demand for it by the drug trade is steadily increasing. The dried roots and rootstocks are the parts used and the prices paid vary with the supply and demand. Ten years ago golden seal could be bought for less than twenty cents a pound, now the average price is above fifty cents and choice lots have been sold for $1.40 a pound. Experiments made in cultivating the plants show that an acre will yield 1500 pounds of marketable roots after three years' cultivation. It thus appears that considerable money may be made in cultivating the plant in proper localities. At present the entire supply comes from wild plants.

California Red Flowers.—I find in looking over my check-list of Southern California flowers, we have a number of red flowers not mentioned in your journal and will include as a partial list of them wild gooseberry (*Ribes speciosum*), scarlet bugler (*Pentslemon centranthifolius*), Indian pink (*Silene Californica*), southern scarlet larkspur(*Delphinium cardinale*), California fuchsia (*Zauchneria Californica*), snow plant (*Sarcodes sanguinea*), and two *Castilejas*. The more I botanize the more I realize that in southern California we have a flora peculiar to this section and find it an interesting field. Every month in the year is suitable for the work.—*Mrs. Emma Buszek, Orange, California.*

Money in Wildflowers.—It is not alone for their beauty that plants are uprooted. A large number of our plants are medicinal and command prices on the market that make it profitable to dig them up for sale. Among the common species whose roots or rootstocks are in demand may be mentioned the marsh-mallow (*Althæa officinalis*), Seneca snake-root (*Polygala senega*), dandelion, burdock, poke, Indian hemp (*Apocynum cannabinum*), gentian (*Gentiana lutea*), lily-of-the-valley, lady's slipper (*Cypripedium pubescens* and *C. parviflorum*), white hellebore (*Veratrum viride*), sweet flag, crane's-bill (*Geranium maculatum*), mandrake (*Podophyllum*) and bloodroot. Many of these are so common and so easily obtained that the prices realized are not large enough to tempt the average collector, but others are steadily becoming more difficult to find and prices are advancing. Undoubtedly the time will come when the demands of the drug trade for many of these can be met only by cultivating the plants. The stems, leaves, flowers, fruits and seeds of many other wild plants are in demand. One inclined to try cultivating any of these should ascertain which are likeliest to become rare and by selecting those that bring the best prices he is likely to get very good returns for the time and money invested.

Editorial.

Mr. John H. Lovell says in a recent letter that a good subject for study would be the local distribution of plants and we heartily agree with him. In a general way we are all familiar with the distribution of the plants in which we have more than a passing interest—we do not go to the hilltops for water lilies, nor to the cliffs for fringed gentian—but possibly none of us could exactly define the habitat of the most familiar wild flower in our own locality. This matter of habitat is not simply a matter of where seeds of the plant may chance to fall. We may possibly find the cardinal flower blooming far from its favorite stream but it does not persist long in such places. The flourishing colonies are always found in about the same quality of soil with about the same amount of moisture. So it is with a majority of our plants. It is a most absorbing study to ascertain the exact amounts of water, light and heat, and the kind of soil required by each plant. It will be well to keep a record of all these features, noting any variations that may occur. In this way we may be able to ascertain why the skunk's-cabbage is not found in every swamp and why other plants are rare or absent from our locality. At first glance the migratory weeds like sweet-clover, orange hawkweed and prickly lettuce seem to thrive almost anywhere, but further thought shows us that they, too, have limits beyond which they do not go. Now would be a good time to decide upon two or three species for observation during the approaching season. It would doubtless prove a fascinating subject for leisure hours.

* * *

Readers of this magazine have doubtless noted the frequency with which articles from our pages have been reprinted in other publications. These extracts have been

made not alone by botanical publications but by newspapers and magazines as well in both this and foreign countries. It is always something of a compliment to our contributors when matter is reprinted in this way, for editors are in the habit of selecting only the best of matter for such purposes and do not clip from other publications with a view of pleasing other editors. The reason that matter from this journal is so often selected appears to us to be that the objects to which our contributors are giving attention are those that are uppermost in the public mind, at least so far as botany is concerned. In the time of Torrey, Wood and Gray new plants were constantly being discovered, and articles on the nomenclature and relationships of plants were then most attractive. But the passage of time has changed all this. A decade or two in which we have had books on the popular side of plant life has made the names of our common plants familar to a large number of people and these people now want to know more about them. The botanizer seldom goes away for a vacation among the plants nowadays without meeting other botanizers similarly engaged. We expect to see this interest in plants increase greatly in the next few years and believe that it will be due in great measure to the influence of articles like those we are publishing. In this connection it may not be amiss to point out to possible contributors the fact that a magazine so frequently quoted as this is a very desirable one in which to appear as a contributor.

BOOKS AND WRITERS.

Professors Bigelow and Lloyd of the Teacher's College, Columbia University, have recently brought out a volume on "The Teaching of Biology in the Secondary School," Professor Lloyd being responsible for the matter relating to Botany and Professor Bigelow for that relating to Zoology. In the nearly five hundred pages of the book the relations of these two sciences to education in general, and to each other are most carefully, thoroughly

and impartially discussed. Each chapter also contains a pretty full bibliography of the subject of which it treats. In the chapters devoted to zoology there is much helpful matter for any teacher of the science, but in view of the vastness of both zoology and botany we cannot agree with the author's evident opinion that a half year each of botany and zoology is a desirable high school course. We are, however, in hearty accord with the statements in the chapter on human physiology and "temperance" instruction. In the botanical part of the book Professor Lloyd recommends essentially what all teachers of botany nowadays are coming to recognize as a proper botanical course—a blending of physiology, morphology, ecology and classification, and he would begin the course with a study of the seed, tracing the developing plant from root to stem, leaves, flowers and fruit and following this with studies of plants typical of the larger groups before much is done with ecology or classification. The bibliography of this part of the work is here and there marred by an absurd and whimsical omission of books or publications that the author apparently does not like, though in many cases they are more important than any of their kind included. On the whole the book is one that it is worth every science teacher's while to possess. It will give him many new ideas and much food for cogitation. (Longman's, Green & Co., New York, 1904.)

The publishers of Britton and Brown's "Illustrated Flora" announce that the price of the work has been advanced one dollar a volume making the set now cost $12. The reason for the advance is reported to be that the work was not electrotyped and therefore cannot be reprinted when the present stock is exhausted.

The Iowa Naturalist has made its initial appearance. It is edited and published by T. J. Fitzpatrick, Iowa City, Iowa, and intended primarily for exchange. Four numbers are to be issued each year.

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Issued on the 15th of Each Month.

WILLARD N. CLUTE, - - - EDITOR.

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Books Recommended

In this department we shall, from time to time, recommend books that to us seem of special value to readers of this journal.

III.—Fern Books.

It all depends upon what you want the book for. If a technical manual with descriptions of the North American species, get Underwood's "Our Native Ferns" ($1.08); if a popular handbook for Eastern America select either Parson's "How to Know the Ferns" ($1.63). Water's "Ferns" ($3.34) or Clute's "Our Ferns in Their Haunts" ($2.15). Parson's book is well written but the keys are difficult. Water's book has two technical keys and is illustrated with many photographs. Clute's book has more text than either, has illustrated keys, colored plates and the 225 other illustrations are by an artist of ability. The real fern lover needs all three. Eastman's "New England Ferns" ($1.25) is a new book that is useful but not so comprehemsive as the others, while Dodge's "Ferns and Fern Allies of New England" (50 cts.) is a complete little technical mannal. Clute's "Fern Collector's Guide" (50 cts.) tells where to find ferns and how to press, mount and identify them. Useful to take into the field.

For the above books, or any others, address,

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THE AMERICAN BOTANIST.

VOL. VIII. BINGHAMTON, N. Y., MARCH, 1905. No. 3.

THE COLORS OF NORTHERN FLOWERS.

BY JOHN H. LOVELL.

IN northeastern America north of Tennessee and east of the Rocky Mountains there have been described some 4,020 flowering plants. The distribution of coloration in our flora is a question of much interest, but one which up to the present time seems to have received no attention. Recently I have tabulated the above species according to the predominant colors of their flowers. I find that in the area named there are 1,244 green, 956 white, 801 yellow, 260 red, 434 purple, and 325 blue flowers. White flowers, as is certainly very fitting after the snowy months of winter, are most common in early spring. Yellow flowers are common throughout the entire season, though perhaps rather more abundant in fall than midsummer. Red and blue are rarest in spring, but gradually increase as the months pass until they reach their maximum in autumn.

By far the larger part of the 1,244 green flowers are pollinated through the agency of the wind. A very familiar illustration of wind-pollination is maize or Indian corn. No one who has walked through a field of newly spindled corn can have failed to notice that bright clouds of yellow pollen are borne away on the wings of every breeze. I place the wind-pollinated plants in the Northern States and Canada at about 1,048. They include the great company of grasses, sedges and rushes, and such homely weeds as the nettles, pigweeds, amaranths, spurges, plantains and ragweed. Among the shrubs and trees, which produce wind flowers, are the alders, the earliest plants to bloom in northern New England, and the birches, poplars, beeches and elms.

Years ago the willows were also fertilized by the wind, but to-day they depend upon insects to carry their pollen. These trees all blossom before or with the appearance of their leaves, and many people never know that they bloom at all. It is not difficult to understand why they flower so early, for the leaves later in the season would intercept the flight of the pollen.

Wind-pollinated plants have small and inconspicuous flowers which are green or dull-colored. Usually they flower and fruit entirely unnoticed. It would be of no advantage for them to produce bright colors or sweet odors, for the wind bloweth where it listeth regardless of all such attractions. The birches, however, have golden and greenish yellow aments and the blossoms of the elm are purplish. The glumes of grasses and the perianth of rushes are also often purplish or reddish. So conspicuous are the flowers of some rushes in Europe that they even attract a few insects. The sorrels sometimes have the entire plant red-colored, and in the Alps Muller saw a butterfly examining a plant for honey. The plantains are midway between wind-fertilization and insect-fertilization. Some odoriferous species display several hues and attract not a few inseets. But as a whole wind-pollinated plants have small greenish flowers.

Setting aside the great company of dull-colored wind flowers there remain in northeastern America 2,972 species, which are pollinated by insects or are self-pollinated. Of this number 223 have green, 955 white, 790 yellow, 257 red, 422 purple and 325 blue flowers. Most of these 223 green flowers are small or even minute, and many of them have no petals. They are attractive chiefly to flies and the smaller bees, as in the smilax and sumac families. But the green pendulous flowers of the garden asparagus are favorites of the honeybee. In the grape family the petals never expand, but fall away by separating at the base and coiling spirally upward. The fragrance which resembles that of mignonette can be perceived at a long distance. Kerner relates that in a journey up the Danube

he found the whole valley of the Wachan so filled with the scent of the vine flowers that it seemed impossible that they could be far off, yet the nearest vines were 300 yards from the boat. The honeybee and many beetles have been collected on the flowers. Various exotic species of the nightshade family and some Brazilian orchids possess large green flowers. They are strongly scented in the evening and are attractive to moths.

There are 790 yellow flowers in northeastern America, which vary greatly in size and form. Usually they are wheel-shaped as in the buttercups and five-fingers; but not infrequently they are very irregular in form, as in the pea and figwort families where the corolla bears a more or less fancied resemblance to butterflies and the heads of reptiles. As a whole, however, they are much less specialized than red or blue flowers. Highly modified yellow flowers usually exhibit great persistency of the primitive yellow, and little tendency to vary in color. In the goldenrods the individual flowers are very small and conspicuousness is gained by their aggregation in dense clusters. The bright yellow color of the flowers render them visible in the evening as well as by day, and as the temperature of the inflorescence at night is several degrees above the surrounding air they sometimes serve as a refuge for insects.

It was a few years ago believed that the drone flies especially admired yellow flowers. Because they were observed to hover over the bright blossoms of buttercups and marsh marigolds it was thought that they were admiring the shining yellow surface. But there is not a particle of evidence that this is so. Their behavior is rather due to their habit of flight, and Plateau has observed them poising on the wing before buds and sticks and even the human finger.

The yellow color of autumn leaves and of most flowers is caused by a pigment called carotin, familiar to everyone in the root of the carrot. It always occurs in solid granules called plastids, and is insoluble in water but

readily soluble in ether. It also occurs in all foliage leaves though its presence is usually masked by the green pigment of the leaf. In many plants, however, it is so abundant that it gives a yellowish hue to the leaves. In a few flowers and fruits, as in the yellow dahlia and the peel of the lemon, the color is due to a yellow pigment dissolved in the cell sap and not to solid grains of carotin. In plants with golden yellow foliage, as in many conifers and various shrubs, still another yellow pigment has been found.

White flowers are most common in our flora as well as in that of Europe. Many of the 955 white flowers in the territory under consideration belong to shrubs and trees. There is nothing more beautiful in the temperate zone than an apple orchard in bloom with its billowing banks of innumerable white blossoms, tinged with rose and flecked with the vivid green of the newly unfolding leaf buds. The cornels and viburnums are justly ranked among our handsomest shrubs. They produce large clusters of white flowers in such boundless profusion that the entire shrub is transformed into a huge bouquet. Small densely clustered white flowers are also common in the mustard, saxifrage and carrot families. Nocturnal flowers are also usually white.

White flowers contain no pigments. Like the snow and powdered glass they owe their color to their optical properties. To produce such vast numbers of blossoms must of course tax the energies of a plant, and the absence of pigments lessens this expenditure. Like white leaves I believe that white flowers are the result of retrogression or degeneration. Any bright colored flower may occasionally revert to white. Whatever impairs the vigor and vitality of the plant as cold, impoverished soil, injury to the roots, or continued self-fertilization will cause the floral hues to become paler or change to white. I once transplanted a scarlet poppy when in bud and the flowers became much smaller and changed to pure white. On the other hand whatever stimulates the growth of a plant as

bright sunlight, strong manures, or crossing increases the brilliancy of the flowers. From this point of view we can understand why white flowers are most common in Nature, and why they are truest to name under cultivation. Naturally florists find that they can develop any desired color variety from a white flower more easily than from one already containing pigments. Individual white flowers not infrequently change to yellow, as in *Lantana*, or to red, as in *Dianthus* and *Hibiscus mutabilis*.

There are only 257 red flowers in our northern flora. They are most abundant in the pink family, or Caryophyllaceæ, which contains 22 species. The pinks exhibit a wonderful variety of red shades varying through rose, pink and deep red to scarlet and crimson. The petals may be dotted or marbled with white, and they are often notched or fringed, and surmounted with a corona of scales. The scent is aromatic and the honey lies at the bottom of a long slender tube, where it is inaccessible to a great number of insects. The flowers are great favorites with butterflies, and, therefore, it has been thought that these insects prefer red coloring. But I am inclined to believe that it is largely the result of a coincidence that butterfly flowers are so often red-colored. For blue butterfly flowers do actually occur in Germany, while in the pink family there are no blue flowers. Moreover butterflies visit most frequently of all the flat-topped clustered flowers of the Compositæ, which afford them an excellent landing place, and I have found a much larger number of them on the dull white clusters of the common thoroughwort than on any other plant with which I am acquainted. Red flowers are also very common in the rose family, but there are no species which are adapted to butterflies. They are also numerous in the pea, mallow and heath families. Undoubtedly the two handsomest North American shrubs belong to the heath family. They are *Rhododendron maximum* and *Kalmia latifolia* or the mountain laurel. Asa Gray says that in North Carolina they adorn the valleys and mountains in immense abund-

ance and profuse blossoming of every hue from deep rose to white. In the brilliancy of its coloring the cardinal flower is unsurpassed by any other red flower.

The purple flowers number 422. This group contains both red-purple and blue-purple flowers, as well as a few brown, green and yellow-purple flowers. It presents evidently a much greater variety of hues than any one of the preceeding groups. Red-purple flowers are common in the orchid and geranium families, while blue-purple are numerous in the pea and mint families. The flowers of *Aristolochia*, or birthroot, are lurid purple. In the Dutchman's pipe of cultivation (*A. sipho*) the calyx is prolonged into a tube, with a contracted throat either straight or shaped like the letter S, which is set on the inside with reflexed hairs. Flies can creep inside easily, but the hairs prevent their escape. As soon as the anthers have ripened, the hairs wither and the imprisoned insects, now more or less covered with pollen, are set free. These flowers should be compared with the pither-like leaves of *Sarracenia* and the spathes of *Arum*, as all three serve as traps for small flies and are lurid purple, a color which is thought by some to be attractive to these insects.

The 325 northern blue flowers are most common in the pea, violet, gentian, mint and figwort families. They are often very irregular in form, with the honey deeply concealed and accessible only to the long-tongued bees. There are quite a number of flowers which are adapted to bumblebees alone. The range of the aconites (*Aconitum*), which are pollinated by bumblebees, is determined by the geographical distribution of this genus of bees. In the Alps the gentians are very numerous and display vivid masses of blue coloring. Huxley, while seeking health in the bracing air of these mountains, found great delight in the study of these plants. Blue flowers are derived frequently from red, yellow or white progenitors. Sometimes this color variation may be observed in individual flowers, as in *Myosotis versicolor*, which is at first yellow but later changes to blue.

The red and blue coloring found in the leaves, flowers and fruits of many plants is due to a soluble pigment called anthocyan. It does not occur in grains like the green and yellow pigments, but is dissolved in the cell sap. When its condition is acid the color of the flower is red, but when it is alkaline the color of the flower is blue. In the rose family there are no blue flowers because the cell sap is strongly acid. For the same reason there is but a single blue flowered species known among the orchids. On the other hand when the condition of the cell sap is nearly neutral the flower may readily change from one color to the other, or both colors may occur on the same flower-cluster, or even in the same flower, as has been observed in the hyacinths. Red coloration is much more common in foliage than blue, because the sap is usually acid. It is believed to aid the plant in the work of assimilation by converting light rays into heat. Blue leaves are rarer, but the upper foliage leaves of *Protea globosa* of Australia, surrounding the bright yellow flowers, offer a good example of blue leaves, while the lower leaves are dark green. Anthocyan is probably a compound of a tannic acid and a sugar for it occurs only in plants containing tannic acid, and it rapidly increases when such plants are fed with an invert sugar.

Readers desiring to pursue the subject further are referred to my papers in *The American Naturalist*, Vol. XXXIII, page 493; Vol. XXXV, page 197; Vol. XXXVI, page 203; Vol. XXXVII, page 365.

Waldoboro, Me.

THE EARLIEST SPRING BLOSSOMS.

BY WALTER ALBION SQUIRES.

WHAT flower shall be first to appear in spring seems to be determined largely by locality and exposure. A species which blossoms earliest in one locality may not be first in another. In rich woodlands the hepaticas (*Hepatica triloba* and *H. acutiloba*) seem to be among the earliest blossoms and I believe they are usually the first

to appear in such situations. In the deciduous forests which skirt the western shore of Lake Michigan I have dug through several inches of snow on New Year's day and found their nearly developed flowers already pushing up through the leaf mold. Closely wrapped in their warm gray furs, they were ready to burst into blossom the moment the warm spring sunshine should break through their snowy cover-lid. In boggy places the flowers of the skunk-cabbage (*Symplocarpus fœtidus*) are probably the earliest. They often appear before the end of February.

On the prairies of northern Kansas the beautiful little purple and white prairie anemones are usually the first flowers to be found in spring. I am inclined to think, however, that certain low-flowering, inconspicuous umbelliferæ are fully as early and in some places they probably precede the anemones. Farther south in the same state the white dog's-tooth violet is the earliest spring flower. It is there often called "Easter flower" and is usually found to be quite abundant by Easter Sunday. In eastern Kansas the "Dutchman's breeches," a delicate and beautiful plant despite its unfortunate name, is fully as early as the dog's-tooth violets which grow in the sunny spots of the praire and it is usually in full bloom before the *Erythroniums*, which are its neighbors in the shady woods, have begun to blossom.

Here among the mountains, prairies, and canyons of northern Idaho a small buttercup (*Ranunculus glaberrimus*) is our earliest spring flower. I have found it in Sawyer's Canyon as early as the sixteenth of February, the very day on which the last traces of a heavy snowfall, which had come a week before, vanished before the warm Chinook winds. As one stood at the foot of the canyon wall with flowers in bloom and the grass turning green all around, he could harbly believe that scarce ten days before the ground was covered with more than a foot of snow, with the thermometer so far below the zero mark and the air so full of frost that bright "sun dogs," great

pillars of light at right and left, below and overhead had accompanied the sun all day.

Though the buttercup is without doubt entitled to the honor of being called our earliest spring flower, here again a low member of the parsley family is a close second. It clings to the cliffs of crumbling basalt among the mosses and selaginellas. It blossoms soon after the first buttercups, and is followed closely by a small fritillary (*Fritillaria pudica*), the yellow dog's-tooth violet (*Erythronium grandiflorum*), and the bluebells (*Mertensia oblongifolia*).

We love instinctively the first flowers of spring. There is something in the first frail blossoms of the opening year which seems to touch somewhere deep down in the human heart an element of universal sympathy. The toiling farmer, the hurrying man of business, and the rough miner far away in the solitude of the hills will often pause and pluck the first spring blossom to gaze upon it for a moment in silent thought. Is it simply because they tell us that the cold and snow of winter are past and that spring has come again, or is there in them a far deeper meaning, a symbolism dimly grasped by every mind and shadowed forth in the literature of every land and tongue?

As we see them spring in beauty, fresh with renewed life and vigor, from the dead, cold earth of winter, is there not an unseen psychologic process which unconsciously associates them with those hallowed sentiments which gather round our Eastertide—the expectation of a resurrection and the hope of immortality.

Kooskia, Idaho.

STIRRINGS OF LIFE.

BY DR. WILLIAM WHITMAN BAILEY.

IF one were to put his ear to the ground at this season, like Fine-Ear in the fairy tale, he might, perchance, hear much commotion in the subterranean laboratories. A thousand tiny mechanics are preparing for the spring campaign. Night and day do they labor on their invisible anvils, welding armor for the fray.

What proof have we of this secret labor? The evidence of our senses. The flower-bed, even in early February, showed us various pale, sharp points aspiring to the light and piercing the overlying counterpane of rubbish. These plants, to be sure, are foreigners; crocuses, snowdrops, snow-flakes, squills, tulips, hyacinths, chisnodoxas. They know no better. Often they pay dearly for their precocity.

But, after all, they are not alone in vernal preparations. There comes a moving day for all plants. Go out into the swampy woodlands in March and you will see the quaint parti-colored hoods of skunk-cabbage (*Symplocarpus*). Often these protrude from the half-frozen ground. We always welcome these weird, gnome-like forms, wrapped in their vivid green or dark maroon mantles. Some holy order doubtless—but devoid of the odor of sanctity.

Upturn the earth anywhere and numerous bulbs, corms, and root-stocks will be found instinct with life and covered with vigorous buds. From them later will grow our adder's-tongues, bloodroots, dwarf ginsengs, Jack-in-the-pulpits and Solomon's-seals. The buds were formed last summer, so were new corms and buds, while root-stocks prepared to continue a foraging expedition across country, dying at one end while advancing at the other. So do they seek and attain new soil.

It is funny, but almost every year the writer has presented to him as a startling fact that the trailing arbutus (*Epigæa repens*) is a-bud in February. As a matter of fact, it formed its flower-bud last summer. In the same way the willows, alders, hazels, and other amentaceous shrubs and trees, also maples, elms, etc., perfect their buds in a previous season. They hang upon the branches all winter for everyone to see, but few take note of them. This fact may be published a thousand times. It is of no use; the next year one can safely repeat the same sermon undetected.

One of the earliest spring signs, noticeable in January

even in this very severe winter, is the dripping of the sap from wounds on maples and birches. It often spots the side walk in great wet blotches, which in March attract the *Vanessa antiopa* or mourning-cloak butterfly. When the ground is frozen hard, what should set the vital juices moving? My physiological friends have never explained this to my perfect satisfaction.

In March note the coloration of certain trees. The twigs of willows turn yellow or orange; the red-maple blushes rosy red, the sassafras becomes a lively green. Each tree has its characteristic hue. It seems full of hardly restrained life.

Along the brooks and about the springs grasses become green. The well itself may be clothed with water-star-wort (*Callitriche verna*). By and by a bluebird turns up here and there, or, better yet, a "windy congress" of wrangling black-birds, who vote and filibuster like other parliamentarians. Are they "pros" or "antis" we wonder, or divided into "ists," "ics" and "ans?" Who knows? Their convention, it may be a church congress or revival meeting, is never adjourned *sine die*. They appoint an early day to meet again.

Brown University, Providence, R. I.

A SPHAGNUM BOG.

BY FRANK DOBBIN.

A REGION of limited area which produces a distinct group of plants is always of special interest to a botanist. The sides and summits of high hills or mountains, the margin of lakes or rivers, swamps and particularly sphagnum bogs, each produce their own peculiar forms of plant life. Even if one fails to find the particular plant he may be searching for, the novelty of the situation and the interest of the search have a charm of their own which "bids dull care be gone."

I have, at different times of the year from March to November, examined several sphagnum bogs in my own and neighboring towns, and while my list of plants is not

so complete as it might be had I the time for more extended search, still a few notes concerning my trips to one bog in particular may not be without interest to readers of THE BOTANIST.

I usually intend to visit the place during the first week in July for then is to be found that most beautiful of our native orchids *Cypripedium spectabile;* some years in abundance and again only a few scattered plants. Always at the same time I find the common pogonia (*Pogonia ophioglossoides*) as well as the grass pink (*Calopogon pulchellus*). As yet I have failed to find the arethusa (*A. bulbosa*) although another bog, a few miles to the north, has a few plants. This bog would appear to be an ideal spot for the *Habenarias*, but only once have I found one of them here. That species was *Habenaria tridentata.* Of course many more are to be expected in such places and probably further search will be rewarded by new finds.

The swamp saxifrage (*Saxifraga Pennsylvanica*) is a conspicuous plant and the water arum (*Calla palustris*) is abundant in spots. That beautiful member of the gentian family the buckbean (*Menyanthes trifoliata*) and the common pitcher plant (*Sarracenia purpurea*) are present as they always are in such places.

The heath family furnishes a large number of species particularly of the low shrubs, among them being the marsh andromeda (*Andromeda polifolia*), the privet andromeda (*A. ligustrina*), the leather leaf (*Cassandra calyculata*), the sheep laurel (*Kalmia angustifolia*) and the swamp blue-berry (*Vaccinium corymbosum*). The small cranberry (*Vaccinium oxycoccus*) is present as is also the snowberry (*Chiogenes serpyllifolia*).

The white plumes of the cotton grass (*Eriophorum polystachyon*) dot the open places in this bog, while many other sedges particularly carices abound. In the pools of open water I found a green plant which bothered me to analyze for some time but which I finally found to be the water starwort (*Callitriche heterophylla*).

The surface of the bog is partially covered with a

growth of small trees among which the swamp spruce (*Picea brevifolia*) seems to predominate. Among the spruces are a few individuals of the mountain holly (*Nemopanthes fascicularis*) and a great many bushes of the poison sumach (*Rhus venenata*). It is well to handle the latter literally "with gloves."

In this bog I found for the first time the white moss (*Leucobryum glaucum*) is fruit and in the hollow made by the upturned roots of a fallen spruce I found the liverwort (*Marchantia polymorpha*) also abundantly in fruit. The trees are thickly covered with different species of lichens, among which *Usnea barbata* is conspicuous, and last autumn under the spruces I found the mushroom (*Cantharellus infudibuliformis*) a near relative of the *Cantharellus* illustrated in the December BOTANIST.

Here I have only attempted to name some of the more conspicuous and characteristic plants of sphagnum bogs. If one disregard wet feet and muddy clothing, an hour spent in such a place is apt to prove a very interesting one.

Shushan, New York.

LUMINOUS PLANTS.

There are many things in nature of which the average person is ignorant. Close observers, for instance, have noticed that our common tuberose lily (*Polyanthes tuberosa*) gives off sparks on a hot evening. We have noticed these sparkling from a bunch of tuberoses on a dark hot night, and they have seemed to us to partake of the nature of electric sparks. Of course, the light may have been phosphorescent, but it is not improbable that, under the influences of heat and electricity, combined with moisture, several tropical plants might exhibit a brilliant light. A writer in the *Journal of Horticulture* recalls an incident of some sixty years ago when there was exhibited before the Royal Asiatic Society, the roots of a singular plant, presumably a species of orchis, which grew amidst the jungle below the Madura Hills, in India. It was phosphorescent, and even if dried could be made to shine

with the brightness of a glow-worm when the surface had a wet cloth applied for a short time. The editor of the *Gardeners Chronicle* found that a small piece of this root retained its power of lighting up a good while, only the light got feebler. The Brahmins, it was said, knew its peculiarity, but all the plants did not possess this luminosity at their roots. They imagined the light of it drove away demons.

What is singular also, the sap of some trees in exotic regions appear luminous, as it flows from a wound. One shrub, indeed, has been named *Euphorbia phosphorea* from this fact, and there are other instances. We have it on the authority of the late Professor Henslow that the European dittany (*Dictamnus fraxinella*) evolves some inflammable gas in the evening, and, should the air be still, if a light is brought near, the plant will be enveloped in a transient flash, but receives no injury. Before his time the daughter of Linnæus had stated that a plant of *D. albus*, which she approached with a candle, became surrounded by a light blue flame. Dr. Hahn suggested the dittany might produce hydrogen or evolve an ethereal oil from the flowers; he made many experiments amongst species of *Dictamnus* unsuccessfully, but at last found a rather faded plant, from which, when he held a match, came a reddish crackling flame, having an incense-like smell. Then he ascertained this can only happen during the limited period of the flower's fading, and also that there are glands containing an aromatic oil. A Himalayan species of the genus has the reputation of making a brilliant display after dark, even when not approached by a light.

In 1843 Mr. Dowden described to the British Association a luminous appearance witnessed one August evening on the double variety of the common marigold. This was seen by four persons. During the twilight a golden flame appeared to play from petal to petal of some of the heads, making a sort of corona round the discs. This emanation grew less vivid as the light decreased, then vanished.

Most of the scientists considered this was a case of visual deception, but several years after Dr. Lankester established it as a fact, if one very exceptional. He noticed such a flame in the same species, and also in the hairy red poppy, the flashes of light occurring at the end of a hot dry day. Another gentleman stated that on a June evening, about nine, he saw flashes of light pass along three scarlet verbenas growing a foot apart in his garden. He called the attention of his gardener and several other persons to the spot, and the sight lasted quite a quarter of an hour. There was a smoky appearance in the air after the flashes, which reminded one of the summer lightning in miniature. Subsequently the same phenomenon was noticed amongst some red pelargoniums, and it was repeated many times during July and August, when the weather was sultry and electric. Friends are requested to watch their *Chrysanthemums* at dusk, since that flower is reported to be now and then luminous, presumably the white and yellow varieties. Other luminous plants are the white lily, the nasturtium, the sunflower, the evening primroses and some wall mosses.—*Indian Planting and Gardening.*

Note and Comment.

WANTED.—Short notes of interest to the general botanist are always in demand for this department. Our readers are invited to make this the place of publication for their botanical items.

PLANT PROTECTION.—One of the advantages of the movement for the protection of our wild flowers is that it has afforded an outlet for a lot of fine writing by sentimental individuals, who, to judge by their effusions stood in grave danger of bursting unless some way was devised for giving vent to their feelings. Particularly nonsensical is the suggestion that we "teach the child the merit of leaving the dainty little recluse to fulfill the law

of its being". Suppose the child leaves the flower he desires on its stalk; ten minutes later a ragged urchin untroubled by any law regarding "the dainty little recluse" calmly appropriates it. Exit all the effect of our moral discourse. The way to protect plants is to adopt measures that protect. With flowers as with people just laws well enforced are the best safe-guards. If every effort were bent upon securing laws to protect the wild flowers needing protection, they would soon be in a fair way to escape extermination. Without such laws, of what use is it that nine hundred and ninety-nine pass an attractive flower if the next comer picks it?

SCARLET-FRUITED HORSE-GENTIAN.—In Britton's "Manual of the Flora of the United States and Canada," page 873, there is described a new species of *Triosteum* by Mr. Bicknell, In 1900 a scarlet-fruited *Triosteum* was found at the Forest of Arden, Joliet, Ill. This was mentioned to several botanists, and considered merely a freak in coloring of the yellow-fruited *T. perfoliatum*. Finding the plants again this fall, 1904, I collected fruits for planting but made no herbarium specimens. I would like to ask if other readers of the BOTANIST have found this form, and under what conditions, and also what is the color of the fruit of *T. angustifolium*.—*H. C. Skeels, Joliet, Ill.*

COLOR AND INSECTS.—It often becomes a nice question to decide whether color is of use to the flower in pollination or not. At first thought we might be inclined to say that the colors of all flowers have been developed with regard to visiting insects, but when we consider the bright colors of some of the staminate and pistillate cones of pines, none of which are insect pollinated and none of whose ancestors ever have been, the use of the color is not apparent. The catkins of the wind-pollinated poplars are also often highly colored, especially in the cottonwoods. We seem forced to the conclusion that in many instances color is merely incidental, just as the sky is blue and the grass green.

How Flowers Attract Insects.—It is usually assumed that color, odor and nectar are produced by plants to attract insects to the blossoms, but that the shape of flowers has reference entirely to making the insect approach pollen and nectar in the proper way. The assumptions in regard to the attractions of flowers, however, have not gone unchallenged and a great many observations have yet to be made before the whole matter will be settled. Some observers have asserted that color is of no use whatever and that so long as flowers produce nectar they will attract insects whether the petals are removed or not. On the other hand, the fact that practically all showy flowers are insect pollinated indicates that color must be of some value to the plant. It is well known that many insect-pollinated flowers do not produce nectar. In such cases the insects visit the flowers for pollen. Many apparently odorless flowers attract numerous insects but the fact that human beings fail to find odors in them is no reason for asserting that they are odorless. There are light rays that we cannot see and sound waves that we cannot hear, yet insects perceive them. In all probability there is an immense number of scents perceived only by insects. Possibly every flower is fragrant to them. So odor is probably the chief means of attracting the attention of insects, nectar and pollen the objects that cause them to visit the flower, and color the assistant that directs the insect at close quarters. We must at this point take into consideration the difference in color-perception found in various insects. Bees seem to have the most acute sense and it is noticeable that the flowers showing the greatest degree of specialization and colored blue or violet are most often pollinated by bees. The experiments that can be made along the lines here indicated are endless, and anyone who has a flower garden need never lack for occupation. The results obtained, it need scarcely be added, will be of the very highest scientific importance.

Editorial.

During the summer of 1904 Professor Hugo DeVries of the University of Amsterdam, Holland, delivered a series of lectures at the University of California in elucidation of his now well-known mutation theory of the origin of species and the subsequent publication of these lectures by the Open Court Publishing Company of Chicago has given American students a much desired opportunity to carefully examine the evidence upon which his theory rests. Darwin's investigation of this subject left little doubt in the mind of students as to the general way in which the various forms of animate creation have been produced but there has always existed some question as to whether natural selection, as he defined it, accounts entirely for the great diversity of form in animal and plant life. DeVries thinks it does not and in the eight hundred pages of "Species and Varieties" which is essentially his earlier work "Die Mutationstheorie" with the statistics omitted, he attempts to show that species and varieties have arisen from one another by a series of leaps or mutations.

* * *

Every field botanist is familiar with the fact that the individuals of certain species differ among themselves very noticeably in such matters as hairiness, color, size, shape of parts, etc., but it has remained for DeVries to show by a great number of cultural experiments that these variations are constant and may be reproduced regularly from seed. In addition he has shown that many striking forms may originate directly from other species without the intergrading forms and the long periods of time that Darwin supposed necessary. Several species have been found to be constantly giving off such forms, most or all of which die for want of proper surroundings. Since these forms continue to reproduce themselves when cared for

they appear to have all the characteristics of recognized species. They are not, however, the same as systematic species, and DeVries accordingly calls them elementary species. Such elementary species among our wild plants will at once come to mind. The white form of the closed gentian, the red flowered form of the horse gentian, the green stemmed form of the common elder, the yellow berried holly and the many smooth forms of hairy species or the reverse may be cited as instances. Probably there is not a reader of these lines who has not at some time observed one or more of these elementary species. Several have been described in this magazine and when such forms become more familiar, elementary species hunting will become more fascinating than other plant collecting. One of the most astonishing facts brought out by the cultivation of various plants is that many of them will produce the same mutations again and again indicating that the characters of the elementary species are latent in the parent species. The closed gentian well illustrates this idea. In almost every locality where this plant grows some plants will be found bearing white flowers. These come true from seed and may also be produced by sowing seed of the blue form, each sowing being likely to produce a few white flowered plants which thereafter are easily reproduced from seed. The ability to produce white flowers, then, is a latent character in the closed gentian. Not all species are supposed to produce mutations—only the younger and unfixed types are thought to do so—but in some species the mutations are numerous, in the case of *Draba verna* amounting to more than two hundred distinct forms.

* * *

It will thus be seen that the systematic species is regarded by DeVries as a composite of elementary species. Ordinarily the characters of the latter may be blended in a single individual of the systematic species but by cultivation and selection each elementary species may be isolated. The reason we do not find many of these elemen-

tary species in nature is doubtless due to the inhospitable surroundings in which the seedlings find themselves; but that some do persist, is shown by the double flowers, dwarf plants, unusual colored fruits, etc., that are constantly being reported. As might be expected the annuals usually perish and leave no sign and it is from the perennials that the greatest number of uncultivated examples may be drawn.

* * *

Those who have persistently objected to the making of new species from single variant plants will doubtless hail the new theory with great delight. It will be easy now to show that many of these so-called "new species" are merely elementary species, and this fact alone will deter some of the hair splitting botanists from rushing into print with species that are almost certain to be shown to be unfounded later. Had this theory been announced earlier we feel sure we would have been spared the infliction of the multitudes of "new species" in *Antennaria*, *Cratægus*, *Viola*, *Aster* and *Sisyrinchium*. What to call these elementary species seems still undecided. It will only confuse matters to give them binomials. It would seem only proper that each should have the generic and specific names of the parent species and in addition a single name to distinguish it. This is practically the way conservative botanists have named such forms, but now that they have the weight of the mutation theory in their favor it is probable that many recent species will soon be reduced to their proper rank.

* * *

Not the least attractive point about "Species and Varieties" is the very lucid style in which it is written. The general reader will be able to understand it easily. Every botanist and botanizer would do well to read it and all who can should own it. The price is five dollars.

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Issued on the 15th of Each Month.

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Books Recommended

In this department we shall, from time to time, recommend books that to us seem of special value to readers of this journal.

III.—Fern Books.

It all depends upon what you want the book for. If a technical manual with descriptions of the North American species, get Underwood's "Our Native Ferns" ($1.08); if a popular handbook for Eastern America select either Parson's "How to Know the Ferns" ($1.63), Water's "Ferns" ($3.34) or Clute's "Our Ferns in Their Haunts" ($2.15). Parson's book is well written but the keys are difficult. Water's book has two technical keys and is illustrated with many photographs. Clute's book has more text than either, has illustrated keys, colored plates and the 225 other illustrations are by an artist of ability. The real fern lover needs all three. Eastman's "New England Ferns" ($1.25) is a new book that is useful but not so comprehemsive as the others, while Dodge's "Ferns and Fern Allies of New England" (50 cts.) is a complete little technical mannal. Clute's "Fern Collector's Guide" (50 cts.) tells where to find ferns and how to press, mount and identify them. Useful to take into the field.

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AZALEA.

THE AMERICAN BOTANIST.

VOL. VIII. BINGHAMTON, N. Y., APRIL, 1905. No. 4.

THE PINK AZALEA.

THE earliest spring flowers, heralding a milder season, attract more attention than would probably be their due were they to bloom later in the year when flowers are more abundant. When flowers are everywhere it requires an imposing blossom to make a special impression and yet throughout the summer certain flowers, either by their numbers, unusual size or brilliancy, stand out from among their fellows so decidedly as to mark a certain season for their own. We may speak thus of the dandelion season, the daisy season, the bluet season and so on for many more. None are more distinctly marked, however, than the one to which the subject of this sketch may well give a name—the pink azalea season. Until the plant begins to unfold its fragrant blossoms it is not at all a conspicuous, but in its favorite haunts the blooming season is something to be remembered. Those who have seen a few straggling specimens in bloom can form no adequate idea of its beauty when flowering in immense numbers along some chosen hillside. Although often called swamp azalea it does not appear especially restricted to swamps; in fact the dryish hillsides seem much more to its liking. But wherever it grows, its strong fragrance soon makes its presence known. At the height of its season the whole country-side is flooded with it and it is one of the few flowers that calls the non-botanical public to the woods. Many observers have testified to the fact that there is great variation in the intensity of the fragrance, and some have supposed that this is due to a confusion of two distinct species. These latter maintain that the common azalea (*Azalea nudiflora*) is but faintly fragrant and that another species, to which the name of

Azalea canescens has been given, is the really fragrant plant. More information upon this point is still desirable. In general appearance the second species is much like *A. nudiflora*, the principal difference being that its leaves are broader and canescent or densely white pubescent beneath and the corolla tube is glandular. The stamens also are said to be less exserted. It would be an excellent thing if observers would make a further study of the shrubs this year with a view to settling the question of fragrance.

STUDY OF OAK TREES NEAR CHICAGO.

BY MARY LEE VAN HOOK.

IN this region oak trees, undoubtedly, have the supremacy, though other trees are sufficiently numerous to attract some attention, especially in ravines and on the slopes. Even a few miles away from the Lake, where the soil is richer, elms, cottonwoods, and maples grow well; but here near the Lake oak trees control the uplands almost to the exclusion of other kinds.

White, swamp-white, red, black and bur-oaks are the varieties oftenest seen, though there are a few scarlet oaks as well. The white oak is the dominating species—rather a surprising fact when one considers the immense number of acorns eaten by squirrels and jay-birds. One squirrel can eat at one meal at least twenty acorns, often more, and he usually chooses the white oak or bur-oak variety. These acorns are large and the sweetest of any, with a decided chestnut flavor; no wonder they are chosen. There are two kinds of squirrels here, red and grey, many of each, and the groves are full of blue-jays, so that the consumption of acorns during autumn and winter months must make an appreciable difference in the number of young trees for the following spring. However, squirrels and jay-birds both have the trick of burying nuts, a habit which amounts to planting trees since they never find all that they bury; and so in celebrating every day as Arbor Day they perhaps make up for the number of acorns which they eat.

White oaks in this vicinity are from fifty to seventy-five feet in height, though the tree attains a growth of one hundred and fifty feet in the finest specimens I believe. The branches are oftenest at right angles and are fewer than in other species. The bark is grey, almost white sometimes, and is inclined to be scaly. The leaves, five to seven inches in length, have usually about nine entire lobes slanting somewhat from the midrib. On different trees the leaves vary in size and marginal cutting, the smaller leaf of the two distinct kinds having the deeper cutting. The acorn varies in size but is usually about an inch long, oblong, and set in a shallow, smooth cup; it is, as has been said, very good to eat.

The swamp-white oak resembles the white oak in the color of the bark and appearance of the acorn without the cup, which in the former species is fringed. The branches of the tree are gnarled and do not grow with the regularity of the white, their outline making more of an oval. The bark of the swamp-white oak is often so scaly that one could mistake it for a shelbark hickory until the other points are noticed. The leaves vary is size from five to eight inches and are obovate with wavy margins.

The red oak grows side by side with the other oaks but is oftenest in groves made up of its own kind. The tree can be distinguished by its bark which is smooth with black patches and streaks, especially on the lower part of the trunk. There are two kinds of leaves, the lobes of which terminate in spines; the smaller form is hard to distinguish from the leaves of the black oak, though it is less glossy and thicker in texture. The acorns, the largest of those of any oaks, are decidedly red and bitter.

The black oak has rough bark which is usually very black. The lobes of the leaves, about nine in number, like those of the red, terminate in spines. The acorns are small in flat cups; they are dark colored, sometimes striped.

Like the swamp-oak the limbs of the burr-oak are very much gnarled. The leaves are large, nine inches long,

often, and the entire lobes are cut almost to the midrib in one or more places. The acorn is an inch or more long and is set in a deep cup which resembles a burr, being covered with bristly scales. The acorn is rather sweet.

All of these species of oak have winter buds that are very small, seldom more than a quarter of an inch long. All are deciduous trees, yet most of the varieties mentioned, especially the white oak, retains many leaves during the winter months. Are the buds of the oak so much more delicate than those of other trees that they must be protected by the old leaves, or is it simply in keeping with the sturdy character of the whole tree that the petioles of oak leaves are tough and well attached to the branches? After all has been said about the identification of oak trees it yet remains a difficult and sometimes impossible task because of the tendency of different forms to approach each other in the intermingling of the species.

Lakeside, Ill.

OUR SUMMER'S DIVERSIONS.

BY H. A. SHIRLEY.

THE quaint old Moravian town of Salem in North Carolina possessed a little group of botanists in the early part of the last century, one of whom, von Schweinitz, is remembered the world over by botanists from his having discovered over twelve hundred new species of fungi and from the enormous personal collection of flora that he made. While residing in Salem from 1812 to 1825 he made a list of 1439 species of wild plants collected by himself in a radius of thirty miles, but last summer proved that there were still new things in this field to be found, even by a novice.

My friend and I had been walking occasionally, just for the pleasure of walking, taking interest in the mistletoe, umbrella-trees, the *Woodwardia angustifolia* ferns and things noticeably out of the common, when our attention was called especially to the orchid family. Who amongst amateur botanists has not felt the fascination

that this most interesting family has? As the summer went on nearly every week a new variety to us was found and carried home in great glee to have its name confirmed by the two older friends whose age prohibited the long tramps but whose interest in the finds was stimulating to the highest degree.

Once a week we took a walk, starting in the morning, carrying our lunch with us and going wherever fancy carried us. Generally it was nightfall which brought us back but sometimes it must be confessed that the lunch did not hold out and hunger brought us back in time for supper. What good times we did have. Sometimes the entire day would be spent investigating what some little glen had for us. There was one day when we feasted on wild black-caps—friends had to be shown the bushes to be convinced of their wildness—and the never-to-be-forgotten juicy yellow plums that were just at the stage when they melted in one's mouth. I can almost taste the delicious flavor now. Another day came the unexpected sight of a great blue heron and its beautiful pure-white young birds and we will surely not forget killing three copperhead snakes where we had just eaten our dinner. C— had just dipped his head in the branch when a minute after the first copperhead appeared from under a rock at the very spot, as if to see what had been disturbing his quiet. In fact, each day had some little adventure to distinguish it, to say nothing of the "treasures" which were found every week. In the line of mushrooms alone two hundred and seven varieties were identified during the season and we have often wondered if this is an unusual experience. Of the orchids found last summer the *Tipularia* was much the most abundant. Gray writes this down "very scarce," but we found it in every direction and decided that it must have changed its habits or that it was simply local. Usually the *Aplectrum* with its Adam-and-Eve corms was found nearby. When the solitary leaf, which these two orchids produce each year after blooming, appeared we were always bothered to remember which was which. The

Tipularia being veined, with rich purple coloring beneath, while the *Aplectrum*'s is simply green on both sides.

The *Corallorhiza odontorhiza* was another species which appeared in every dry woods towards autumn. Its near relative, the *Hexalectris*, was only found twice but it seemed to us the most beautiful of all of our orchids, while the circumstances of our first finding it will always be recalled with the astonished shouts of joy by which it was greeted.

The *Spiranthes cernua* and *S. gracilis* were both found. It was in November that we came across a meadow quite white with the blossoms of the "ladies' tresses" and a large handful was soon gathered. They possessed a delicate fragrance and everyone who saw them exclaimed at their beauty massed together, many taking them for lilies of the valley. The *Goodyera pubescens* was to be found in every woods, but the *Calapogon* and the delicate *Pogonia ophioglossoides* were only found in one locality although they grew plentifully in that one place. The *Pogonia verticillata* grew quite by itself and was only found on this one wooded bank. The modest *Orchis spectabilis* grew by a favorite stream, although one plant surprised us by making its appearance half way up an intensely steep hill. The *Cypripedium acaule* had not been found here for years but we discovered just one solitary specimen in a pine woods far from any habitation and the *Cypripedium pubescens* were found still later, farther yet from the haunts of men. The one twayblade was found so long after flowering that only another season can determine its name.

Then the *Habenarias;* the *H. tridentata* was found growing beside every branch where it was protected from high water. *H. virescens* was only occasional, but *H. clavellata* was more common and *H. lacera* was sometimes found. A most glorious sight was the little sphagnum bog covered with yellow fringed orchises which we found in July. *H. ciliaris* and *H. cristata* were growing side by side and the distinction between the two was plain

to any observer. They grew in such profusion that we gathered great bunches and then no one could have detected their absence. It was truly a sight to delight the heart of a flower-lover and one never-to-be-forgotten.

At the close of the summer we found we had exceeded the list of orchids found by von Schweinitz and best of all we actually found the *Schweinitzia odorata*, named for von Schweinitz. This is a member of the *Monotropa* genus. There was just one dried specimen of it left in town and as no plant had been found within the memory of anyone now living we felt that our summer had been successful indeed.

Salem, N. C.

VARIOUS LOOSE-STRIFES.

BY DR. WILLIAM WHITMAN BAILEY.

AMONG the plants most often sent to the writer for identification is the purple loose-strife (*Lythium Salicaria*). Here, in Rhode Island, the plant, though scattered over the state, is no where abundant. I have seen it in Little Compton, Apponaug and South Kingston. In the rich Hackensack Meadows and throughout Orange and Putman Counties, in New York, it grows superabundantly. Often blooming, as in the Hackensack Meadows, with *Hibiscus moscheutos*, it forms a gorgeous carpet.

It has had the rare good fortune to attract the attention of very noted students. Those who have at all considered cross-pollination, one of the most interesting lines of modern research, will recall what use Darwin, Muller, Kerner and others make of it.

This is owing to its showy flowers which are trimorphic; that is, they show three different lengths of stamens and styles in the neighboring flowers. The more diverse the reaction among these, the more potent and vigorous is the resultant offspring.

The plant usually has twelve stamens or twice the number of the petals, six of them longer than the others.

The plant is more or less downy, tall, with lanceolate leaves, opposite or whorled—or even scattered—and cordate at base.

Our swamp loose-strife (*Decodon verticillatus* or *Nesæa* of our younger days) is very common. It has willowy stems which bend over the water and expand at the end into a spongy, thickened mass of much physiological interest. These stems are four to six angled. The axillary, purple flowers are tri-morphic as in the nearly related *Lythium* and for the same reason.

It is thus interesting to note how plants, separated by wide oceans, have evolved the same habit. Relationship, however, would point to the fact that they were not always so geographically dissevered. It is almost inconceivable that plants of the same family should have been independently created at these wide intervals. If related, as there is no doubt, it is natural to look for the same or similar habits.

The other plants, popularly known as loose-strifes, have no relation to those described above. We find these recurring instances in one flower language of the duplication of names. Scientific apellations, in these latter days, are no more stable. We must expect incessant and often unjustifiable charge.

The yellow loose-strifes belong to the primrose family and are members of two closely related genera, *Lysimachia* and *Steironema*. To these, perhaps, may be added *Naumbergia*, the old *Lysimachin thyrsiflora*, which presents some peculiarities separating it from the others.

The four-leaved loose-strife is one of the flowers of our "lull-period," coming after the rush of May and early June. It is, from its abundance, the most familiar, unless we include the little "money"—*Lysimachia nummularia*, which escapes from gardens and spreads widely. The others, some with axillary, others with racemose flowers, and all pretty, we see throughout the summer. They add very much to the beauty of a summer bouquet.

Some of the species propogate, partly by bulblets

which formed in the axils of the leaves, drop off, sink in water, and next spring come forth as new plants.

Brown University, Providence, R. I.

BOTANY FOR BEGINNERS—XIX.

ORDER III—THE GRAMINALES.

The grasses and sedges which form the great order Graminales are at once so common and so characteristic in form, that they are readily recognized by even those who make no claim to botanical knowledge. To recognize a member of the order, however, is one thing and to identify the species is quite another as many a young botanist has learned after much time and labor. The flowering parts upon which identification chiefly depends are so little like ordinary flowers that the young student scarcely knows where to begin, and he usually rests with calling them simply grasses or sedges, as the case may be. Although grasses and sedges are much alike upon superficial examination, it is usually not difficult to distinguish between the two. The grasses generally have cylindrical hollow stems—or culms as they are called in this family—while the sedges have three cornered solid stems. Along with this difference in structure goes a curious difference in usefulness to man, the grasses being of the greatest value as food while the sedges are of no use whatever. Even grazing animals avoid them.

THE GRASSES (GRAMINEÆ).

The grasses form one of the largest of plant families. About three hundred genera and thirty-five hundred species are known. The group has a world-wide distribution, and while the Tropics contain the greater number of species, temperate regions more than overbalance this by the great development of individuals which there grow so thickly as to form a compact sod or turf over large areas. With the exception of a few species in the Tropics which, like the bamboos, take on a tree-like form the members of the group are herbaceous and mostly perennial. The immense importance of the grasses to man may be realized

when it is remembered that all the cereals, such as oats, barley, rye, wheat, rice and corn, are grasses as well as sugar cane, sorghum, broom corn, millet, timothy and the many forage species. Only one genus (*Lollium*) is known to contain poisonous species.

Although grasses as a rule have stems that are solid only at the joints, there are some exceptions to this as in Indian corn and sugar cane where the stems are solid throughout. The leaves are in two ranks and usually clearly divided into a sheath enclosing the base of the long internode and a narrow blade extending out from it. At the juncture of blade and sheath there is usually a scale-like out-growth parallel with the internode called the ligule. This is a very characteristic feature of grasses. The sheath is generally split down to the base on the side opposite the blade but occasionally it is entire and tubular.

In the flowers may be detected a general resemblance to the ordinary three-parted flower of the monocotyledons but some of the parts are reduced or wanting and this coupled with the presence of various chaffy scales and bracts make trouble for those who would identify the plants. The plan of the flower may be better understood if it is known that the spikelets of grass flowers are comparable to a raceme with its bracts. The empty scales, called glumes, at the base of the spikelets are in the nature of true bracts and the chaff-like scale called a palet immediately subtending the flower represents a bracteole. There is a perianth usually of two small members called lodicules, and occasionally a third member is present making the three-parted perianth. Within these are usually found three stamens though in the bamboos there are six. The pistil is a single carpel which ripens but one seed. This seed, closely invested by the ovary wall forms the fruit known as a caryopsis. Occasionally the ovary wall becomes succulent, forming a drupe-like fruit. In the genus *Melocanna* according to Rendle, it reaches a length of several inches and is edible. In some of the bamboos the walls of the ovary become hardened and nut-like.

The grasses are all wind pollinated and modified for this purpose by having the anthers lightly balanced on long slender filaments, while the pistil produces two styles with long feathery stigmas that easily catch any pollen floating by. Stamens and pistils are usually borne in the same flower, but cross-pollination is easily effected by one set of organs ripening before the other. In some species, as Indian corn, stamens and pistils are borne on different parts of the plant. Corn-silk is made up of the numerous styles and stigmas. A few species produce cleistogamous flowers. In *Amphicarpum* the fertile spikelets are borne on slender runners at the base of the stems.

The grasses spread rapidly by runners which push out from the base of the plant and after burrowing in the soil for some distance turn upwards and become erect stems. In this way a compact mat-like turf is soon formed. A few lay up stores of starch in tuber-like under-ground stems. The stems themselves are often rich in silica which makes them exceeding hard.

RABBITS AND POTATO BEETLES AS BOTANISTS.

BY MARIA L. OWEN.

LET Miss Gertrude Jekyll speak first. In her "Wall and Water Gardens" she says, "Rabbits seem to favour the *Cruciferæ*. When I first grew the *Æthionemas*, forgetting their relationship to *Iberis* (candytuft) I put them in a place accessible to rabbits; the rabbit being the better botanist, recognized them at once, much to my loss." Now my own experience.

One summer day walking round my little flower beds I saw a potato beetle on a trumpet-tongue (*Salpiglossis*) plant. It passed through my mind that he had got lost, for there was no tomato, potato or any other plant of that family near, and after humanely and effectively stopping his mischief for all time, I thought no more of the matter. But the next day I saw another of the little striped pests on the same plant; then I roused up and said "This means something," so after treating him like

his predecessor I came into the house, consulted my "Field, Forest and Garden Botany," and found that the *Salpiglossis*, although in the figwort family, is in a section of that order intermediate between the figworts and the nightshades. This was news to me, but the little *Doryphoras* and their ancestors had known it, I doubt not, since potato beetles and trumpet-tongues were first evolved upon earth. They knew their tribes and sub-tribes so much better than I did, that I felt almost sorry I had put such botanists out of life.

Springfield, Mass.

CHLOROPHYLL.

At this lovely season of the year, when foliage of infinite shades, and verdure in all its vernal freshness, clothe the landscape, with an indescribable charm, it probably seldom occurs to the beholder that this universal greenness represents the first and most vital essential of his own existence, it being practically the one and only vehicle for the transformation of solar activity into potential life. All life is dependent, directly or indirectly, upon vegetation, and the old saying that "all flesh is grass" is absolutely and literally true if we accept grass as the symbol of vegetation generally. The meat-eaters are always dependent upon vegetable-feeding animals, as a moments' consideration of our own case will clearly show, and hence we are easily led to the conclusion that the entire realm of organic life is based on the capacity of plants to grow.

We next find that all plants, except those which are practically parasitic ones, or fungi, which feed upon plant tissues dead or alive, and thus none the less exist at the expense of the green ones, can only form their foliage under the influences of sunlight, direct or diffused. Growth under the influence of electric or other artificial light forms no exception to this rule, for we have only to investigate their source to find the sunlight as its origin since one and all kinds are obtained by the consumption, of coal, oils, &c., which are merely the stored-up products through the

vegetation of past ages, of the sunshine of their time. Directly or indirectly, therefore, we always come at last to the sun as the impelling vital force, and in connection therewith we equally invariably find that this force can only find vital expression through the vegetation which clothes the world with verdure; naturally, therefore, we find a certain synchronism to exist between cause and effect; that is, between vital vegetative activity, and solar influence, especially as solar light and solar heat are so intimately associated, and the heat is also a factor in leaf development.

The next thing to consider is how the sunshine is enabled to do its vital work within the leaves, and although it is impossible for us to define the actual "how" we absolutely know that the work is entirely done by the green coloring matter itself, the so-called chlorophyll, which is really the simple Greek of leaf color. Within the partially transparent cells which form the fabric of all leaves this coloring matter exists as an infinite number of tiny green grains, which, under the influence of light are enabled not only to multiply, but in some subtle way to break up or decompose the carbonic acid gas of the air which is absorbed by the leaves through their pores, and such salts as may be contributed from the soil through the roots; and also to recombine their elements in infinite ways to form woody and leafy tissue, and, in short, build up the plant on wider and wider lines.

If we pause a moment to consider the infinite variety of flavors, odors, and chemical products which exist in the plant world, and remember that all of these, nutritious, noxious, or even deadly poisonous, are fashioned by these little green grains, and that every leaf in the fair prospect we may be enjoying is an actual and busy laboratory engaged in this varied work, our conception of the wonders of Nature, and especially of the wonders of chlorophyll, cannot fail to be immensely widened. There is, indeed, absolutely nothing else in creation, nothing so pervasive and so essential to life, which can be compared

to it; and the more we investigate, the greater becomes our wonder and sense of reverence at the creative power which underlies it.

From the more microscopic forms of plant life to the giant Sequoia, it is the tiny green grains which, in conjunction with the formative cell, the twin wonders of creation, enable them to exist and reproduce themselves; and, as we have already indicated, in those lowly forms of plant life, the fungi, which manage to exist without their actual presence within their substance, they can only do so by feeding, as carnivorous animals do, on organic matter previously shaped by chlorophyll, and consequently charged with nutritive elements. The green leaf, in short, forms the link 'twixt solar force and life itself, and in viewing the wide expanse of verdure of hill and dale and field and forest in their spring and summer garb, we are the actual witnesses of the wondrous process of transformation upon which our very existence and that of life in every other form, is absolutely dependent.—*Charles T. Druery in Journal of Horticulture.*

Note and Comment.

WANTED.—Short notes of interest to the general botanist are always in demand for this department. Our readers are invited to make this the place of publication for their botanical items.

NITROGEN FIXING BACTERIA.—Examine the roots of the nearest thrifty clover plant and they will be found to bear numerous small, rounded nodules not much larger than pin heads. These are the homes of bacteria, species of fungi so small that notwithstanding the minuteness of the nodules, each one may contain a million or more individuals. The bacteria seem to have set up a sort of partnership with clovers and other leguminous plants and

in return for a habitation on their roots provide them with nitrogen which they are able to obtain from the air. Although all ordinary plants require nitrogen, they are unable to secure it from the air without the aid of bacteria and the partnerships which clovers have formed are very much to their advantage. Until a comparatively recent period little attention has been paid to these minute plants, but renewed study indicates that possibly a majority of the leguminous plants have their own species of bacteria and will not thrive with any other. It has long been known that in some of the States of the Middle West the red clover ordinarily will not grow in certain soils and it is only lately that it has been ascertained that this is because its favorite bacteria are missing. Knowing this, all the farmer has to do to get a good crop is to obtain some soil from an old clover field and inoculate his soil with it. Thereafter he may raise clover as long as he pleases, but should he raise other crops on the land for half a dozen years in succession, the bacteria will die out and the field must be inoculated again before he can raise another clover crop. Other legumes are not so particular and in most cases either have sufficient bacteria attached to their seeds to enable them to get a start or they find the right bacteria in the soil, possibly the kind that affects some native plant. The alfalfa is another of the species that is a bit particular about its bacteria and so will not grow in every soil. It is interesting to know, however, that the common sweet clover is partial to the same species of bacteria, and that wherever sweet clover grows there will alfalfa grow, also. Fields in which sweet clover is not found may be inoculated with soil from a sweet clover patch and then will produce abundant crops of alfalfa. In this case both the clover and alfalfa are imported plants and the bacteria seems to have been imported with them but while the sweet clover is able to look out for itself and spreads rapidly, alfalfa is slower to take possession of new soil. Possibly the clover seed offers a better opportunity for the lodgement of bacteria.

COMMON NAMES AND GENERA.—It has often been pointed out that nearly all the common names of plants refer to the genus rather than to the species. Familiar instances are found in such words as violet, buttercup, rose, willow, clover and hawthorne. All this indicates that the common names of plants were given at a time when the genus and not the species was the unit of classification.

MARSH PLANTS IN DRY PLACES,—Prof. Isaac Bayley Balfour told the Botanical Society of America at a recent meeting that many supposedly marsh plants are really drouth plants, because, though rooted in water, the location is physiologically dry to them. Because of some substance in the water, the roots are unable to take up the moisture that is all around them. "It sounds paradoxical," he said, "that a soaking peat soil is to plants in respect to water like a desert sand, a salt strand, a tufa, a half frozen loam or a tree bark. Yet all are physiologically dry to the plant." This explains why marsh plants can thrive in dry, sandy garden soil. They are able to get as much moisture there as in the swamps.

CLEISTOGAMOUS FLOWERS.—The editor of *Nature Notes*, commenting on a note in our journal regarding cleistogamous flowers in the sundew, points out that while the term cleistogene commonly connotes a reduction of parts a cleistogamous flower is not necessarily a flower with reduced parts for cleistogene means simply "produced closed." Any flower that does not open, therefore, may be termed cleistogamous. A remarkable transition between showy and cleistogamous flowers may usually be noted in the Canada violet (*Viola Canadensis*) which early in the season produces showy flowers only, but as the weather becomes warmer the showy petals decrease in size until the flowers are scarcely noticeable. The plant continues blooming, however, and when the cool days of autumn come begins to produce petals again. It would seem that all the cleistogamous violet flowers have originated in this way.

MIDWINTER VIOLETS.—*Viola odorata* the original form of the species, single, blue and fragrant, makes an extremely interesting winter plant indoors if given suitable quarters. The plants are quite hardy but can not endure the high temperature of living rooms. On the other hand they delight in a comparatively low temperature. Unheated rooms, having windows with a southern exposure, where sunlight is ample and the night temperature does not go below the freezing point, offer ideal winter conditions for these fair little plants. In such places they will flourish and reward one with a wealth of bloom and fragrance for the little caretaking they require. —*J. Ford Sempers, Aikin, Md.*

PLANTS WITH NODDING TIPS.—In the plant kingdom are to be found many peculiar adaptations. One of the most interesting is the habit which some species have of keeping the growing tip curved downward during the period of development or until the stem has attained its growth for the season. This curving of the tip of the stem appears much like the arch commonly developed in sprouting seedlings but must be for a different purpose. The nodding of the growing tip is strikingly seen in such plants as *Solidgo canadensis* and *Asimina triloba*. Some species of a genus may nod while others show no sign of a curve in the stem tip. Thus *Gaura parviflora* nods very strongly while *Gaura biennis*, it appears, does not nod at all. In most cases the curve is quite rigid but in some the nodding is merely the result of the flexibility of the stem. A few species have the tips nod at night but become nearly straight in the daytime. Whatever the cause or factor which induces plants to nod, there is probably no doubt but that the habit is a means of protection to the delicate terminal bud.—*Ohio Naturalist.*

Editorial.

Sooner or later there usually comes to the student of botany, unless he possesses an ample fortune, the question whether or not botany can be made to pay. It is not that he is inclined to measure the delights of botany by the single standard of dollars and cents but that he discovers that dollars and cents must be taken into account. He finds that to give more of his time to botany will encroach upon the hours devoted to business and it is but natural that he should query whether botany and business cannot be combined to the material advantage of both. The answer to the question, however, will doubtless read different ways to different people and in no case can it be an unreserved yes or no. It rather depends upon individual circumstances and what one means by making botany pay.

* * *

Practically there is no money in botany in the sense of a considerable income over and above expenses. The amount of good hard "digging" that is required to make a successful botanist if applied to the study of law, medicine, civil engineering or similar studies would yield an income many times as great as the average botanist enjoys. The best paid man of this class in the United States receives a salary of less than six thousand dollars while botanists with salaries of three thousand dollars annually are so rare as to be curiosities. Such salaries are seldom paid to those outside of the larger Universities, a thousand dollar salary being usually considered a good one, elsewhere. A large number of teaching botanists probably receive less. These figures, therefore, need only to be compared with those for other professions to show that botany does not pay in the pecuniary sense of the word. Any skilled mechanic can do as well or better than the average botanist and at the same time be under less expense for clothes and other necessaries of life.

There are, however, other compensations in the life of a botanist. To those who care for the approbation of their fellows the honor of being connected with some great University or Botanical Garden, or a position in some department of the Government counts for much; while to those who delight in botany for its own sake the prospect of doing exactly what one likes best to do and being paid for doing it, is particularly pleasant. Moreover, while the botanist is usually a very busy individual, it is his avocations rather than his vocation that makes him so. His duties generally leave him considerable leisure for other things while his situation among books and specimens allows him to employ his time to the greatest advantage. It is this last feature that makes the life of a botanist so fascinating to the plodding beginner who, perhaps, is obliged to snatch the few minutes a day he gives to botany from hours that should be devoted to other things. He may have the greatest inclination for further study, but lacking the botanist's leisure he must forego it.

* * *

Commercially, therefore, botany can scarcely be said to pay, but measured by any other standard it does pay and it pays well. After all, the commercial standard is not a true standard. Are any of the really desirable things of life measured by it? Can we place a money value on friendship, or religion, or health, or youth, or the capacity to enjoy good books, music and fine scenery? No one would exchange these things for money though many with money would willingly purchase them if they could. These things and many others pay us a vast interest annually, but not in mere coin and it is in this latter sense that botany pays us best and most acceptably. A holiday spent in field or wood gives pleasure in proportion as the flowers have a significance. The unbotanical are constantly deterred from the examination of attractive blossoms through dread of being poisoned, or because of superstitions connected with the flowers, while the botanizer sees new beauties at every step.

Indeed, from the very nature of the subject, botany is likely to pay back better returns for the time spent upon it than most other studies. There are few pursuits, the objects of which combine fragrance, delicate hues, marvelous forms and graceful habits, and in the study of these one may profitably and pleasantly spend the spare hours of a lifetime.

* * *

The botanist may be described as a person interested in plants for the sake of the science, while the botanizer may be said to be interested in the science for the sake of the plants. Nor does the latter title carry anything of reproach with it, rather the reverse. Certainly the one who gets the most genuine pleasure out of botany is the botanizer. He has no special problems to bother him, but in his leisure moments—holidays, Sunday afternoons and during vacations—saunters countryward to botanize. He knows the names of the showy flowers, at least, and he knows when they bloom and where to find them. He it is that brings in the first arbutus, and later can lead you by the most direct path to the haunts of the orchids and wild lilies. He knows when the first young wintergreens are up and when the mandrakes are ripe. For him the woods hold many a toothsome morsel from the berries on vine and brier to treasures underground—crinkle-root, ginseng, ground-nut, sweet cicely and cucumber root. His aim is to know more of the secrets of wood and meadow and he has use for the botanist's labors only as they add to his available store of knowledge. The botanist desires to accumulate exact knowledge about plant structures, plant relations and plant processes; the botanizer prefers a knowledge of the colors, fragrance and forms of flowers, where they grow when they bloom and what they are good for.

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Books Recommended

In this department we shall, from time to time, recommend books that to us seem of special value to readers of this journal.

III.—Fern Books.

It all depends upon what you want the book for. If a technical manual with descriptions of the North American species, get Underwood's "Our Native Ferns" ($1.08); if a popular handbook for Eastern America select either Parson's "How to Know the Ferns" ($1.63). Water's "Ferns" ($3.34) or Clute's "Our Ferns in Their Haunts" ($2.15). Parson's book is well written but the keys are difficult, Water's book has two technical keys and is illustrated with many photographs, Clute's book has more text than either, has illustrated keys, colored plates and the 225 other illustrations are by an artist of ability. The real fern lover needs all three. Eastman's "New England Ferns" ($1.25) is a new book that is useful but not so comprehemsive as the others, while Dodge's "Ferns and Fern Allies of New England" (50 cts.) is a complete little technical mannal. Clute's "Fern Collector's Guide" (50 cts.) tells where to find ferns and how to press, mount and identify them, Useful to take into the field.

For the above books, or any others, address,

WILLARD N. CLUTE & CO., Binghamton, N. Y.

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THE AMERICAN BOTANIST.

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PEA-FLOWERS IN SUMMER.

BY DR. WILLIAM WHITMAN BAILEY.

THERE is always a something clean-cut and handsome about any one of the Leguminosæ. They, indeed, furnish quite a number of our showy wild-flowers. This is even more evident as one goes west or south. I purpose here to speak merely of our New England species, the earliest of which, as it is one of the loveliest, is the lupine.

If one arises early enough on a summer morning, he may still find a fire-opal balanced in the center of the palmate leaf. These compound leaves, by the way, of seven oblanceolate, silvery leaflets, are extremely pretty and contrast well with the violet-blue or, occasionally, white, racemes of papilionaceous flowers.

Next with us among the summer peas comes the wild indigo with its yellow flowers. It is a custom in New England to tie great bunches of this plant to the heads of horses, with the belief that they keep off annoying flies. The bushy plants, when growing, have a somewhat weedy, untidy look, unless one views them in mass, when they have something of the effect of the European gorse or broom. They rather like sandy districts or dry meadows and pastures.

Two extremely dainty plants which at first one hardly suspects to be of the pulse affiliation occur in sandy districts, especially near the railroads. These are the wild sensitive plants (*Cassia chamæcrista* and *C. nictitans*). The nearly regular flowers are yellow, and in the first, are tinged near the center with a rich red-brown. The pinnate leaves of numerous small leaflets respond more or less promptly to a touch, closing upon themselves in pairs. The plants are very graceful in habit and love the sunlight.

I have noticed that they so dispose their leaves as to face the sun, especially in the afternoon, the upper side always being turned towards it. It is odd to see plants all facing one way in this manner and suggests the familiar action of *Silphium laciniatum* and *Lactuca scariola*, both known as "compass-plants." I have never seen the trick recorded of *Cassia*. Another feature of the leaves has struck me, viz:—their very close imitation, when closed, of the loment-like pods. Is this a protective disguise for some reason? The pods are not actual loments as they split their whole length, but they are deeply indented by each seed.

Another plant, very common on arid plains and along our sea-beaches, is *Strophostylis* or wild bean. The flowers, though small, are pretty and of a peculiar shell-like pink. The idea of the shell is still further suggested by the peculiar twist of wings and keel. Gray gives this curious account of their cross-pollination by insects, "The keel, inclosing the stamens and pistils, is prolonged into a narrow snout which is spirally twisted; the stigma is oblique on the tip of the style, and the beard on the style is mainly on the same side that the stigma is; the wing-petals stand forward and turn downward, forming a convenient landing-place for bees. The anthers early discharge their pollen, much of which adheres lightly to the base of the style. In the untouched flower all, from first to last, is concealed in the coiled keel. Press down the wing-petals, and first the stigma and then the pollen-laden tip of the style projects from the orifice; remove the pressure and they withdraw within. When this pressure is made by a bee resting on the wing-petals, while searching for nectar within the base of the blossom between the keel and the standard, the same movement occurs." Of course the insect is then dusted by the pollen which he bears away to another flower.

Apios tuberosa, the well-known "ground-nut," has also an extraordinary contrivance for cross-pollination which may be found described in Vol. I of Gray's "Structural Botany." The flowers are of a peculiar mingling of

purple and flesh-color, and are deliciously, though intermittently fragrant with the odor of violets. The very large sweet-potato-like tubers of this plant were much used by the Indians for food.

One of our daintiest Leguminous plants is the hog-nut (*Amphicarpæa monoica*). It is found along woody roads, on rocky slopes, or among low bushes in various situations—usually shaded. It scrambles over shrubbery, has tri-foliolate leaves and very delicate pink flowers. Much prettier are some of the tick-trefoils of the troublesome genus *Desmodium*. Our adjective used meant to convey the idea of their difficult study, but they are troublesome in another sense; the jointed pods from whence they derive their name, from *desmos* a chain, easily break up and being amply provided with hooks affix themselves to one's clothing. Thus do they make man an unwilling agent in their distribution. However, the flowers of some species are extremely lovely, and those of *D. Canadensis* really showy. The bush-clovers or Lespedezas are near relatives of the Desmodiums, but never as showy.

We might go on to speak of the white and yellow melilots, sweet when drying with the odor of vanilla; of the lucerne and alfalfa, and of the rattle-pod or *Crotolaria*. Our article, however, is already protracted and it has served its purpose if in any way it has produced an interest in some at least of our wild pea-flowers.

Brown University, Providence, R. I.

SOME FAMILIAR POT-HERBS.

BY WILLARD N. CLUTE.

EACH year, almost before we have begun to think of spring, we are apprised of the fact that a milder season is approaching by the familiar sight of women and children roaming about the fields and pastures in search of dandelions. In localities where there are many of foreign birth the gathering of dandelions assumes the rank of a thriving industry for some weeks in spring. Dandelion digging, however, is not confined to foreigners;

in early spring a taste for "greens" is developed in most of us. The foreigner is most noticeable in collecting dandelions because he, or rather she, has not learned to use our other available plants. One who has lived longer in the country could name many plants as useful and possibly more palatable than the dandelion. To such the wild things of the ordinary farm-yard fence-corners may be made to yield numerous attractive additions to his fare while almost any woodland or pasture will produce others.

About the time that the dandelion is in its prime, the tender leaves of the cowslip (*Caltha palustris*) are much in demand by those who know their qualities. Only the persistent gatherer, however, is likely to return with these as his prize, for they delight to grow in mud and water quite out of reach unless one is especially equipped for the work of gathering them. It is a matter for wonder that this plant should be edible since it is one of the Ranunculaceæ, a family noted for its possession of nauseous or poisonous plant juices. The cowslip is own cousin to the larkspur, aconite and hellebore.

Another early pot-herb is called the winter cress (*Barbarea vulgaris*) though the resemblance to the true cress is not very striking. It is most abundant in old fields and is so frequently used as to be dubbed "poor man's cabbage." It is a member of the great crucifer family from which man has derived so many other edible plants and it is therefore not surprising that this, too, may be eaten. Possibly many other crucifers might prove palatable if we were to try them. The list of those we now use, though not as pot-herbs, is a long one and includes cabbage, cauliflower, kale, brussels sprouts, radish, turnip, cress, pepper-grass, horse-radish, mustard and various others. The tops of horse-radish, turnip and mustard are often used for "greens," and in some places both mustard and turnips are cultivated for this purpose.

The standard wild pot-herb in most of the region in which it grows is the milkweed. There are many herbs

with a milky juice called milkweeds but the plant used for the table is the one that bears the fat pods of brown-coated, silky-plumed seeds in late autumn and is to be found along most dusty waysides. Its scientific name is *Asclepias Cornuti.* It is a bulky plant and the tops remain tender until the plant is a foot or more high. Associated with the milkweed and not unlike it in general appearance is the poke (*Phytolacca decandra*). Certain venturesome individuals annually gather it for food but the majority avoid it because of its dangerous character. The root is known to be deadly poisonous, but the tops appear to be harmless. The plant is even more lusty and succulent than the milkweed and in many places can be gathered by the bushel.

Although the pigweed (*Chenopodium album*) is edible, this fact does not appear to detract from its weedy qualities nor does it serve to greatly reduce its numbers. Possibly the name, pigweed, is enough to preserve it from being eaten by man. When gathered for food it is usually called red-root or lamb's-quarters. Pigweed is a near relative of our best-known pot-herb, the spinach, and both belong to the Chenopodiaceæ of which the beet is also a member.

Such unpromising things as the nettle and purslane are also said to be good for the table. Certainly both are common enough in some places to become the mainstay of the community. The purslane (*Portulaca oleracea*) is a near relative of the spring beauty whose tubers the Indians are said to eat.

The asparagus vies with the spinach for first place at the table, and while it is well known to be a harmless and palatable plant it comes of a family that is not above suspicion. To this family, the Liliaceæ, belongs the poisonous white hellebore, lily-of-the-valley, squills and many others. Curiously enough, one of the plants of this family that closely resembles the asparagus when young, the Solomon's-seal (*Polygonatum*) is occasionally used exactly like its better known relative. It is picked just

after it has appeared above the ground and is said to be much like asparagus in taste.

So few of the flowerless plants are used for food that it is something of a surprise to find, at least, three kinds of ferns edible. These are collected just as the fronds are unrolling and boiled. The species most commonly used is the cinnamon fern (*Osmunda*) though it has rather too much mucilage in its make-up to suit the ordinary palate. The young fronds of the Ostrich fern (*Struthiopteris*) are also used, though it ought to be considered little less than sacrilege to destroy such magnificent plants to gratify a taste for green things. The bracken (*Pteris*) crosiers are occasionally eaten but they lack the tenderness of the others.

The plants mentioned above are doubtless but a small proportion of the wild species used for the table. All parts of the country have their own peculiar plants. The knowledge that they are edible has in many cases been derived from the Indians; in others it has come by way of experiment in times of a scarcity of better food. It would be interesting to know how many more can be added to this list, especially in the South and West.

Joliet, Ill.

BOTANY FOR BEGINNERS—XX.

THE SEDGES (CYPERACEÆ).

Although the sedges are of small importance to man the immense number of species seem to warrant the conclusion that they are of considerable use in Nature's economy. There are nearly three thousand species. Like their allies, the grasses, these plants are distributed throughout the world being most common, doubtless, in the swamps and wet meadows of temperate regions. Some few species are found on dry land, just as some grasses are nearly aquatic, but as a general thing the sedges keep to the moist places and the grasses to the drier ones. Although the sedges of the tropics are tall and luxuriant, this branch of the order Graminales seems not

to have developed an arborescent or tree-like group similar to the bamboos. The family likeness is plainly stamped on most of the species which are thus made easily distinguishable from grasses; but in some cases the young student is likely to vote the likenesses altogether too close as in the genus *Cyperus* with four hundred species or the genus *Carex* which contains about seven hundred!

As a whole the Cyperaceæ seem to be a bit easier to identify than the grasses. The flower approaches more closely the typical monocotyledon flower, having in some cases a whorl of six perianth segments, six stamens and a pistil composed of three carpels. There are seldom more than three stamens, however. The perianth segments may be slender and bristle-like or short and broad. In *Eriophorum* the many cottony hairs are regarded as parts of a perianth. Other members of the group have flowers quite devoid of a perianth as in *Carex*. In this latter genus the staminate and pistillate flowers are in separate heads and the pistillate are surrounded by a bottle-shaped sheath called a perigynium. Some regard this as the equivalent of a perianth but the modern view makes it a bract such as subtends the flower in other members of the Cyperaceæ.

The flowers are small, green, inconspicuous and as may be assumed pollinated by the wind. The majority, as in the grasses, avoid self-pollination by ripening pistils and stamens at different times when the two organs occur in the same flower. In others, as *Carex*, the two kinds of essential organs are in separate heads and often on separate plants, thus necessitating cross-pollination. The stigmas are seldom feathery as in the grasses, though the flowers are wind-pollinated. The fruit is a triangular or lens-shaped achene or utricle, depending entirely upon whether the pericarp closely surrounds the seed or is inflated. In structure the Cyperaceæ may be distinguished from the Gramineæ by their solid, usually triangular, stems, their long, narrow, three ranked leaves springing

from a sheathing base but without a ligule where the two join. Like the grasses, the sedges spread by underground runners but the former tend to form mat-like growths while the latter incline to tufts and tussocks. The sedges are also remarkable for usually having the internode bearing the flower many times longer than the others.

From the fact that very careful work is necessary to identify the various species of grasses and sedges, the group is one to attract discriminating botanists and has always been a favorite with close students. The identification of the species is a most excellent drill in observation and accuracy and is likely to prove interesting even to the beginner who will attempt it.

THE ROUND-LEAVED MAIDEN HAIR.

Adiantum reniforme.

There is probably no genus in the world more distinctly marked than *Adiantum*, to which the maiden-hair ferns belong. The peculiar one-sided pinnules with the main rib running along the lower margins, and the oblong sori concealed under overlapping lobes of the opposite margins are so characteristic that the merest novice has no trouble to refer all ordinary forms to their proper places. More difficulty would be experienced, however, if all the ferns of the world were examined, for then it would be seen that all maiden-hair ferns do not have pinnules of the one-sided type and we should have to fall back on the characters of the sorus and indusium to be sure of our plants. The species that we have chosen for illustration is one of the latter kind. From a casual glance at its fronds we would scarcely take it for a fern at all, much less a maiden-hair fern, but the characteristic form of the fruit dots settles the question beyond doubt. It may be added, however, that maiden-hair ferns with simple entire fronds are exceedingly rare, there being only one other species with this peculiarity in the world. Both are natives of the Old World, *Adiantum reniforme* being found in Madeira and Teneriffe, and *A. Parishii* growing in the Malay Peninsula.

Our illustration of *A. reniforme* is nearly life size. *A. Parishii* has much shorter stipes.

The genus which *Adiantum* is nearest like is the Tropical one called *Lindsaya*. The latter has one-sided pinnules as in the maiden-hair family and its sori are mar-

ADIANTUM RENIFORME.

ginal. The indusium, however, is slightly different, having an inner membraneous indusium and an outer thicker one formed by the reflexed part of the frond. The

sporangia, moreover, are situated on the frond at a slight distance from the margin in *Lindsaya*, while in *Adiantum* the sporangia grow from the reflexed lobes that form the indusium. Some tropical forms of maiden-hair have elongated sori that might incline one to think them members of the *Pteris* genus, but in this latter the sporangia are in a continuous marginal sorus and covered by the reflexed edge of the frond.—*Willard N. Clute in The Fern Bulletin.*

A NEW YARROW?

BY MRS. C. E. PEASE.

LAST August (1904) I went with a party of friends from Portland, Me., on an excursion through the White Mountains, stopping at the Fabyan House about half an hour for lunch. Most of the excursionists hurried off the train to the hotel, while I, and a few others, strolled about to enjoy the views and to investigate the growing things to see what we might find unlike what we were familiar with at home.

Immediately I noticed across the track, spreading up over the sloping bank, an abundance of white bloom clothing the ground as thickly as daisies in a neglected field or the golden buttercups in a meadow. "What is that looking so much like yarrow?" I exclaimed, hurrying over for a closer inspection. It proved to be yarrow, but so different in general appearance as to seem not to be when viewed at a slight distance. It was more robust throughout the entire plant than the common *Archillea millefolium*. The stalks were somewhat stouter, the cymes broader and heavier in character, the little white outer ray-flowers larger and the leaves seemed coarser. My sister, more of a botanist than myself, noticed that the receptacles were sharply conical and remarked that she never before saw a yarrow with other than a flat receptacle. I could not recall ever seeing yarrow growing in such an extended patch—thickly covering quite a hillside. I usually find it common enough, but only a limited

number of plants in one spot, more scattering in growth—here and there a plant.

Upon reaching home we referred to our botanies but could not find any description of our white mountain yarrow. I have not had the opportunity to make many inquiries about yarrows, but thought that some reader of THE AMERICAN BOTANIST might be able to throw some light upon the subject. Is there another species, and has it been introduced by means of the railroad, as have so many of our weeds?

We were also much interested and pleased to find upon the rocks, forming a wall restricting the river to a narrow channel as it passed beneath the railroad bridge, the first beech ferns (*Phegopteris polypodioides*) we had ever seen growing. They were much more lovely rooted in the rocks, with their dainty green fronds gracefully swaying over the water, then when dried and mounted on herbarium sheets.

These two finds added much to the enjoyment of the trip, and will remain in our minds with the memory pictures of the beautiful mountain scenery.

Malden, Mass.

[Possibly the plant was the northern yarrow (*Archillea borealis*). Since the last edition of Gray's Manual was printed, several forms of yarrow from America have been distinguished some of which appear to be good species.—ED.]

COLOR.

Now that we are on the brink of the brilliant annual display of spring flowers which herald the approach of the general flowering season, a little consideration of what color really is may not be out of place, especially if coupled with some indications of those laws which govern that harmony which best and most pleasurably appeals to our sense of beauty.

Color is undoubtedly one of the most subtle features of plant life among many, since, although popularly we

may impute it to the presence of certain pigmentary substances within the cells of the leaves or the petals or the fruit as the case may be, this merely begs the question of the how and why these substances influence our eyes in such wonderfully different ways. We perceive color in fact in a somewhat topsy-turvy manner, as we shall presently see. White light, as most of us know, is produced by a combination of all the colors of the rainbow, that wonderful phenomenon, indeed, resulting from the breaking up of the sun's rays by the prismatic raindrops into their various components in such a way that they are arranged side by side instead of being mixed up, and, as we know, a glass prism does the same thing. The difference in color in the various rays is due entirely to different wave lengths of the light rays, and with the color-producing rays are intermingled others which are invisible—heat rays, which are also sorted out but cannot be seen, but only felt.

With these rays we have for the present nothing to do, so we will proceed to explain our expression of topsy-turvy by stating that when the rays of light fall upon leaves, etc., of plants, certain series of them are absorbed, and others rejected, and it is by virtue of those colored rays with which the plants, so to speak, will have nothing to do, that we perceive the colors we impute to them. Thus, to put it roughly, the green leaves absorb all the red rays, while the "red, red rose" appropriates the green ones, and the snowy white lily rejects them all.

How the great diversity in floral color has been brought about by evolution is, to a great extent, a mystery. Presumably primæval flowers were green, seeing that in all cases they are merely modified leaves, and we still see survivals of green flowers, as, for instance, in some of the euphorbias (our common milkweed, to wit), and occasionally we see reversions as in the green roses and dahlias. Undoubtedly, the tastes of the insect world have played a large part herein, since the fertilizing insects are certainly guided mainly by color, and in this way

conspicuousness and distinctness of tints has been encouraged and developed, as well as divergence of form, size, and arrangement evolved to the same end, viz., greater attractiveness. Man himself came in at a much later period as a selective factor, and has enormously increased the brilliancy of many flowers; but it is abundantly obvious that a host of magnificently colored blooms of purely natural origin have been independent of his aid, when we consider some of the tropical passion flowers, *Gloriosa superba*, Tacsonias, and so on.—*From an article by Charles T. Druery in Indian Planting and Gardening.*

Note and Comment.

WANTED.—Short notes of interest to the general botanist are always in demand for this department. Our readers are invited to make this the place of publication for their botanical items.

PLANTS OF THE NORTHWEST.—Last summer a party of botanists visited the Selkirk and Rocky Mountains in British America for the purpose of collecting the plants of that region. Herbarium specimens of these are now for sale and may be obtained of Edw. B. Heacock, Wyncote, Pa.

PEDICULARIS SPECIES WANTED.—A French botanist, Mr. G. Bonati, of Lure, Department of Haute-Saone, is desirous of obtaining good specimens of American Pedicularis, being at work on a monograph of the genus. He offers to send in exchange plants from France and Switzerland of which he has an extensive collection. Mr. Henry Dantun, of Cherry Hill, New Jersey, will be glad to receive offers and requests for exchanges, which he will duly transmit to Mr. Bonati. Readers of this journal will doubtless be glad of the opportunity to assist in the enterprise. The species of the far North, West and South are most desired.

Relation of Plants to the Soil.—The botanist is often able to judge the nature of the soil by the plant growing upon it. Some plants seem made for sterile soils and rarely grow elsewhere. The old story of the blind man who went to buy a farm well illustrates this point. Dismounting from his horse he ordered it tied to a mullein stalk, but after a search none could be found. He then decided that a stalk of dock would do. Upon being told that there were plenty of docks about he at once concluded the bargain, saying that docks are always found in fertile land and mulleins never.

Fernworts as Weeds.—In a recent number of *The Fern Bulletin* Prof. C. E. Bessey notes that one of the fern allies, *Marsilia vestita*, has been sent him with the information that it is becoming troublesome in certain wet meadows. In another number of the same journal Prof. R. S. Cocks writes that the little water fern (*Azolla Caroliniana*), which is individually so small that a whole plant may be covered by a silver dime, grows in such abundance on a pond in Audubon Park, New Orleans, that no less than fourteen cartloads, weighing nearly seven tons, were removed during the summer. The lake is only about a quarter of an acre in extent.

Extermination of Rhododendrons.—The common rhododendron (*Rhododendron maximum*) grows in immense quantities along the southern Alleghanies and it will be many years before it is threatened with extinction, but further north the plant is rarer and when the commercial instinct stirs in the owners of these outlying clumps the fact is to be deplored. An instance of this kind has just come to notice. An individual near Kingston, R. I., is offering rhododendrons from that region at a rate that seems to threaten the very existence of the plant. In this case, however, the dealer is beyond the influence of the plant protection societies, because, owning the land, he can do as he pleases with the plants. When plants are sufficiently valuable to tempt the cupidity of man, sentiment is of no effect in protecting them.

Wilting of Flowers.—In any company of flower-gatherers it will be noted that all are not able to preserve their bouquets in similar condition. Though all gather the same flowers at the same time, it will soon be found that the flowers gathered by some wilt much more quickly than those gathered by others. This peculiarity appears not easily explained, though most botanizers can doubtless recall instances of it.

Locality and Common Names.—The common names often change with the locality and are then no better than the scientific names of the "new" nomenclature. For instance: the sycamore of Scripture is a fig, the sycamore of England is a maple and that of America is the button-wood (*Platanus occidentalis*). It is necessary to give the scientific name of the button-wood, because in some parts of our own country the same name is given to a small bush (*Cephalanthus occidentalis*). A more familiar case of the confusion of common names is found in the application of the word mayflower. In England this is applied to the hawthorn (*Cratægus*), in Massachusetts to the trailing arbutus (*Epigæa repens*), in New York and Pennsylvania to the azalia (*A. nudiflora*), in various places to the mandrake (*Podophyllum peltatum*) or the hepatica (*H. triloba*).

Locality and the Color of Flowers.—Sometimes one finds a most remarkable difference in the colors of flowers of the same species from different localities. In the Eastern States, *Trillium erectum* is so constantly dull red in color as to be called commonly the red trillium. In the vicinity of Joliet, Ill., the flowers are pure white and one might collect for years without seeing a red one. It would be interesting to know whether the white flowered form is confined to the middle west and whether the two colors intergrade where the eastern and western forms meet. Evidently the flowers indicate two so-called "elementary species." Readers are requested to report on the forms found in their own locality, not forgetting to mention the yellowish green form of the flower when it occurs. It

would be interesting to know also whether soil, climate or longitude have any effect on the color of the flowers. Another similar difference in the flowers of *Lilium Canadense* has come to the editor's notice. When this lily was first encountered in southern New York many years ago, he was surprised to learn that its common name was wild *yellow* lily for all the plants he could find were bright orange red, quite as red, in fact, as the wood lily (*Lilium Philadelphicum*). This coloration seems to prevail across the southern part of the State, though yellow blossoms are occasionally found. As one travels east, however, the colors gradually change places until in Southern New England the flowers are nearly all yellow and the plant is rightly named the yellow lily. Is this another case of an elementary species? Additional notes are much desired. Cases of such coloration are not peculiar to flowers, it would seem, for the little screech owl (*Megascops asio*) is sometimes gray and at others bright reddish brown.

Various Teas.—It is probable that the real tea will never be supplanted in the regard of civilized man by an infusion of some other plant, but it is interesting to note that aside from the familiar "herb tea" of former times taken for its medicinal qualities, mankind has, under stress of circumstances, evolved several tolerable substitutes. During the Civil War, tea made from sassafras roots is said to have been frequently used in the South as a beverage. Its use as a blood purifier is common in some sections at present. If we are to believe the historians, tea made from the leaves of raspberry and *Ceanothus Americanus* was frequently used during the Revolutionary War. Indeed, the latter plant is said to have received its name of New Jersey tea on this account. The name of teaberry applied to the wintergreen (*Gaultheria procumbens*) hints at its use as a beverage. An infusion was made of the leaves and was often known as mountain or salvador tea. A near relative of the wintergreen—*Ledum latifolium*—is known as Labrador tea from the use of its leaves for tea. Its taste is said to be between tansy and chamomile

—not a very appetizing article, one would think. In the same category might be placed the tea made from a species of goldenrod (*Solidago odora*). Those who have tried it will willingly testify to its tansy-like taste. The plant is often known as Pennsylvania mountain tea. A fragrant tea is reported to have been made from spice-bush (*Benzoin*). A better-known tea is that from the sweet fern (*Myrica asplenifolia*) which has the virtue of being medicinal as well as palatable. The infusion of the berries of several sumacs (*Rhus glabra*, *R. typhina* and *R. copallina*) as well as of the barberry can scarcely be called teas and yet they belong to the beverages derived from wild plants. No doubt there are many others. As for medicinal teas, used solely for their curative properties, they are too numerous to mention were they entitled to a place among the beverages.

Elementary Species.—It seems probable that there are more of DeVries' elementary species about than one would at first surmise. When the collector discovers a plant that differs from the normal, instead of pulling it up for an herbarium specimen he would do well to transplant it to a safe place in his garden for further observation; or, if he cannot do this, he should by all means collect the seeds that others may experiment with them. When satisfied that it is really an elementary species, he should carefully describe it and give it a name. Other students may do good work in cultivating species thought to be varieties of others. The blue violets are excellent subjects for investigation. No one doubts that most of the violet species described are different from the others, but that they are systematic species may be very seriously questioned. Only cultural experiments seem likely to settle the matter, but it is pretty certain that many of these can be proved to be elementary species. Any two forms that differ merely in the quantity of pubescence, color of the flowers, number of petals or shape of the fruits are desirable subjects for experiment.

Editorial.

It is the intention of the publishers of this magazine to send extra copies of each number to all writers of articles and notes appearing therein. If by any chance a writer is overlooked we shall be glad to have our attention called to the fact. If your contribution is only a short note, we shall be glad to send you extras for your friends if you want them.

* * *

It cannot be denied that there is a pleasure in collecting plants and making an herbarium that can be obtained in no other way. The plants of the greater part of the United States are now fairly well known and the large herbariums are so well supplied with our common species that no more are desired, and yet we continue to collect these common plants and to enjoy the labor. Most of us have a more or less sharply developed instinct for collecting something and if we must collect, what appeals more to us than the flowers? It is probable that every nature lover is better off for the making of an herbarium if he does not become a slave to the collecting habit. There are some private herbariums that are of great value to their owners but to many others the plants they amass are scarcely more valuable than so much hay. It all depends upon whether one makes such a collection for use or to satisfy the collecting instinct. Unless you are a systematic botanist, interested in a comparison of the differences between species, we maintain that every plant added to your herbarium by exchange is in some measure a loss. Every specimen accumulated by the true collector should be collected by himself; to allow someone else to collect it for him is to deprive himself of that much pleasure. To be sure such a collection will not grow as fast as others but the pleasure of making it will last longer while the species not yet included in it will stand as so many reasons for further excursions into new regions which bring with them all the delights of discovery.

It is much harder to pay for anything after we have used it than to pay in advance. If we pay at the beginning, we appreciate the value of the article each time it is used; if we pay at the end we are wont to think the article is dearly purchased. This applies to magazines as well as to other things. We expect subscribers ultimately to pay for what they get, and we have no hesitancy in extending credit to all who desire it, and yet we know that all will enjoy the magazine more if it is paid for when received and therefore suggest to those in arrears that it is a good thing to pay up and to pay in advance.

* * *

Having had occasion, recently, to look carefully through the first dozen volumes of one of the older American botanical journals, that is still being published, we were impressed with the utter lack of interest which most of the numbers display. This is not to be considered as a criticism of the magazine for at the time these numbers were published it is probable that the editor selected the matter for publication most suited to the demands of his readers. The contents consist in great part of localities for more or less common species, lists of plants found in flower on botanizing expeditions, and other items of no greater general interest that make exceedingly dry browsing for readers of the present day. As we made our way through these unattractive pages, we began to query whether the makers of current botanical literature might not here obtain a hint that would save their own writings from a similar fate. Notes on distribution are very desirable especially from regions not fully explored, but as soon as a region becomes well known these records lose a great part of their interest. Descriptions of species, still more necessary, are seldom read except by the systematist. Notes regarding plant habits or plant adaptations, however, have a perennial interest as do articles about plants from any fresh or striking view-point. Not only do such items hold their interest longest, but the source from which they are drawn is practically inexhaustible. The

living botanical literature of the future, therefore, it seems to us, is likely to be concerned more with the activities and structure of plants, than with any records of their distribution and abundance.

BOOKS AND WRITERS.

The days of species-making in the best sense of that term seem to have forever passed. The plants of most parts of the world are now fairly well known and while we shall continue to discover occasional species new to science, we may begin to sum up the relationships of those already in hand. It is astonishing how rapidly our ideas of such relationships have changed in the past two decades. Less than a score of years ago it was the custom in books devoted to systematic botany to sandwich the pines and their allies in somewhere between the oaks and palms, but no author of the present day would think of doing so. Our ideas of classification have steadily gained in clearness and have made possible such a work as that of Alfred B. Rendle's on "The Classification of Flowering Plants." The first volume of this work, recently issued, discusses the classification of the Gymnosperms and Monocotyledons and will prove of interest to all students of plants whose interest in the subject extends beyond that sort of classification of plants that consists merely in pulling the flowers to pieces in order to learn their names. Beginning with an historical introduction the book proceeds to discuss the Gymnosperms, both living and fossil, each group coming in for an adequate review of their salient characteristics. Tables of the orders, families and genera with their distribution are given. Following this the Monocotyledons are treated in the same thorough manner. Especial attention is given to such subjects as methods of pollination, habit, habitat and distribution. It may be noted that the author uses Order in the sense that American writers use Family. Nearly two hundred excellent illustrations add to the interest of the four hundred pages of text. (New York, The MacMillan Co., 1904.)

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WILLARD N. CLUTE, - - - EDITOR.

SPECIAL NOTICE.

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A Trip to Mount Katahdin.

All persons desiring to visit Mount Katahdin this coming summer for the purpose of collecting the rare plants and other forms of life found there are requested to write to the undersigned for particulars and price of trip.

Parties desiring to purchase sets of Maine plants at reasonable prices write for particulars.

O. W. KNIGHT,
State Assayer, 84 Forest Ave., Bangor, Maine.

Books Recommended

In this department we shall, from time to time, recommend books that to us seem of special value to readers of this journal.

III.—Fern Books.

It all depends upon what you want the book for. If a technical manual with descriptions of the North American species, get Underwood's "Our Native Ferns" ($1.08); if a popular handbook for Eastern America select either Parson's "How to Know the Ferns" ($1.63). Water's "Ferns" ($3.34) or Clute's "Our Ferns in Their Haunts" ($2.15). Parson's book is well written but the keys are difficult, Water's book has two technical keys and is illustrated with many photographs, Clute's book has more text than either, has illustrated keys, colored plates and the 225 other illustrations are by an artist of ability. The real fern lover needs all three. Eastman's "New England Ferns" ($1.25) is a new book that is useful but not so comprehemsive as the others, while Dodge's "Ferns and Fern Allies of New England" (50 cts.) is a complete little technical mannal. Clute's "Fern Collector's Guide" (50 cts.) tells where to find ferns and how to press, mount and identify them, Useful to take into the field.

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FLOWERING BRANCH OF THE PAPAW.

(Asimina triloba.)

THE AMERICAN BOTANIST.

VOL. VIII. BINGHAMTON, N. Y., JUNE, 1905. No. 6.

THE PAPAW.

Asimina triloba.

BARK gray, smooth; young shoots dark pubescent; leaves obovate, acute, cuneate at base; petioles short; flowers appearing with the leaves; sepals three; petals six, dull red, the outer set larger; stamens many, in a globose mass; pistils several, distinct, but few ripening; fruit a fleshy pod-like structure, containing several large flattish seeds—A shrub or small tree in rich moist soil ranging from western New York, Michigan and Nebraska southward to the Gulf.

Although the papaw extends northward in the Mississippi Valley nearly to the Canadian border, and spreads eastward under the salubrious influence of the Great Lakes until it crosses this border into Ontario, it is essentially a southern species and is at its best nearer the Gulf. The Northern botanist coming upon a papaw thicket for the first time is likely to be impressed with the tropical appearance of the plant and is not surprised upon being told that this is the most northern member of the great custard-apple family which in the tropics numbers nearly five hundred species. The large leaves, for the most part borne near the extremities of the slender branches, give our tree an individuality that prevents its ever being confused with any of the other plants that affect the same habitat.

In other ways the tree shows its southern kinship. The leaf-buds are not encased in scales during the winter as they are in strictly northern plants, but hang from the bare branches, naked save for their coating of dark brown hairs. In appearance they strongly suggest the leaf-buds of the witch-hazel. Nor do they develop with the first warm days of spring as the naked buds might lead one to expect. On the contrary the leaves are not fully spread in the States north of the Ohio river until the last week in

May—near the end of the season for the early spring flowers, and some time after the other trees have donned their summer foliage.

The flower-buds appear to be formed in autumn and to pass the winter in wrappings similar to those of the leaf-buds. The flowers are as deliberate in opening as are the leaves and when they do bloom present a singular appearance strung along the nearly naked branches as represented in our illustration. At a little distance, a papaw thicket at flowering time looks like a thicket through which a forest fire has recently passed.

The flowers approach globose in form and hang downward from the axils of the leaves. The sepals are rather short, but the six petals are quite large, often twice as large as those in the illustration, and increase in size for some time after the flower has opened. Although the flower is constructed upon what appears to be the plan of three, it is really a dicotyledon. As floral relationships go, however, it is not very high in development and it is noticeable that it belongs to the group which includes the barberry, magnolia, mandrake, water-lily, calycanthus and other plants whose flowers have not yet settled down into the usual five-parted type of the dicotyledons. The color of the petals may be described as dull red, though Gray calls them dull purple and others describe them as brown. Careful observation will show that red and brown colors predominate. The flowers are apparently adapted for cross-pollination for the stigmas, though ripening at about the same time as the stamens, project beyond them and so are not easily self-pollinated. The two sets of thick, veiny petals alternate with each other and enclose the essential organs except for a triangular opening which resembles the entrance to the flower of Canada ginger. The smaller inner petals secrete an abundance of nectar on the inner side near the base, and here the color is paler, serving as an efficient "honey-guide." The flowers have a heavy, yeasty, rather disagreeable odor with just a hint of the smell of the ripe fruit

in it. The flowers are overrun with ants and small beetles that should prove most effective agents in pollination if the pistils could be affected by the pollen in the same flower. The plant, however, rarely produces much fruit in the northern parts of its range, though the flowers are usually abundant and each contains several pistils. The larvæ of an interesting butterfly, the zebra swallowtail (*Iphiclides ajax*) feeds upon the papaw and it is suggested that the adult insect is the species likeliest to affect cross-pollination. This insect, like the tree itself, is rather southern in its distribution, and its rarity may account for the scarcity of fruits in the Northern States. It may be queried in passing how the ants discover so quickly that the papaws are in bloom. In flowers nearer the ground their presence is not so surprising, but in papaw flowers twenty feet or more in the air one might expect to find them absent.

Late in Autumn the banana-like fruit ripens. At maturity it is four inches or more long, a third as broad, and reddish yellow with a thick rind that encloses a soft fragrant pulp in which are embedded a half a dozen or more large smooth seeds. The pulp is edible and has a flavor that at once brings to mind the flavor of the tropical fruits of this family if one has ever eaten them. To many palates the flavor is too strong to be agreeable, but there is enough demand for the fruit in some sections to to cause it to be sent to market in some quantity. The leaves remain on the tree until late in the Autumn and before falling turn to a rich clear yellow that lights up the thickets for some days.

ABOUT MILKWEEDS.

BY DR. WILLIAM WHITMAN BAILEY.

NOTHING can be more singular than the structure of milkweed flowers. If one compares them with the morphologic ideal of a flower, or with one which actually approaches the unit, we fail utterly to refer some of the parts. They are aberrant and almost bizarre.

The five portions of the persistent calyx are spreading; the five divisions of the corolla reflexed and deciduous. Within the floral envelopes is the "crown" of five hood-like bodies, the "nectaries" of Linnæus. Each one of these contain an incurved horn. The stamens are five in number, united by their filaments into a tube, within which, finally, is the pistil. The anthers are adherent to the stigma and have two vertical cells, each cell or compartment containing a pear-shaped pollinium or pollen-mass. "The two contiguous pollen-masses of adjacent anthers form pairs which hang by a slender prolongation of their summits from five cloven glands that grow on the angles of the stigma." The pollen-masses are removed by butterflies or other insects, often adhering to their heads and appearing like extra antennæ.

Every one knows the pods of the milkweed. In some species, like *Asclepias verticillata*, these are smooth, long, and tapering; in others, like *A. cornuti*, they are more ellipsoidal in shape and thickly beset with pointed tubercles. These are never resistant enough to be called actual prickles, though epidermic in origin. Given a range of species and the pods differ extremely as to size, and even position. Thus, while in *A. cornuti* they are "erect on deflexed pedicels," in others, like *A. verticillata*, they are strictly erect.

In all cases the contained seeds are flat, brown in color, wing-margined or rimmed, and beautifully imbricated over each other, each seed held down like one of Blue Beard's wives—by its hair. This silky hair with which each seed is furnished arises from its top, forming an exquisite fairy parachute to transport it through the air. This tuft of hairs or "coma" absolutely and neatly balances the seed. To the writer it was always a mystery that there should never be a mistake in the length of the hairs. The seed never wobbles in the air; it is plumb and true always. One never tires of setting these little balloons afloat.

It is surprising how Nature will vary a type in the

production of species; indeed it is these variations that cause us to recognize species. Each species of milkweed, for instance, has its own special color. The tall, common *A. cornuti* is flesh colored; the poke-leaved milkweed (*A. phytolaccoides*) a paler, more delicate shade of the same hue; *A. quadrifolia*, a charming little woodland species, nearly white; *A. purpurascens* a glorious purple; *A. incarnata*, a swamp species, red; finally and most glorious of all is *A. tuberosa*, the butterfly weed, which is a flaming transcendent orange. All these plants are, in New England, a feature of the summer landscape, the *incarnata* especially so from its situation in swamps or meadows. From car windows one catches a flash of the superb *tuberosa*. This species is well worth a place in the flower garden. Entomologists have, of course, long known that milkweeds furnish good collecting grounds for lepidoptera and coleoptera. They swarm with butterflies and beetles. One rarely fails to find, hovering over their flowers, the milkweed butterfly *par excellence*, the *Danais Archippus*, beautiful as larva, chrysalis, or imago. The chrysalis, indeed, is one of the most exquisite objects in nature—a pure apple-green casket beset with a ring of dazzling gold beads. When one finds it, he may well exclaim, what an ear-drop for Titania! The perfect butterfly is a deep sienna color, striped with black and spotted here and there with white. It is well worth while to feed the larvæ and watch their transformations.

The dogbanes (*Apocynum*) are near relatives of milkweeds, and like them exude a milky juice when the stem or leaves or pods are abraded. Kerner maintains that this sticky exudation serves as a partial protection against ants and other marauders whose sharp claws penetrate the epidermis of the stem. The escaping milk soon hardens and mires the feet of the intruder. The dogbanes, one of which has lovely pink bell-like flowers, are visited by a very handsome beetle, green and gold, known as the "gilded dandy."

Of course man has attempted to utilize so fine a

product as the silk of these Asclepiads. The hairs are, however, too smooth to felt. If one looks at a cotton-fibre under a microscope he will find it to be a flattened ribbon-like band, more or less twisted on its own axis. This quality permits each hair to stick to its neighbor and greatly aids in weaving and such like processes. The milk-weed hair, on the contrary, is a simple cylindrical, smooth thread. If a method is ever found for using these fibres, it seems as if any amount of plants could be grown. But value would probably soon produce unexpected enemies. Let a plant become of service to man, and at once it is attacked by ten thousand enemies, incentives to make us work and perhaps swear.

Some milkweeds are expert fly-catchers, or rather butterfly-catchers. We have often seen insect visitors caught by the proboscis and hanging helpless as examples to their kind. Cruelty is not confined, it seems, to cats or small boys; even plants are not above it.

Brown University, Providence, R. I.

BOTANY FOR BEGINNERS--XXI.

ORDER IV.—PRINCIPES.

The order Principes has scarcely more than a foot-hold in North America, but so large and characteristic a group is it in other parts of the world that we can scarcely omit some notice of it in passing. The single family Palmaceæ, the palms, of which there are more than a thousand species make up this order. They are found most abundantly in the warmer parts of the world and the individual species are often very local in their distribution.

The Palmaceæ is the characteristic tree group of the Monocotyledons. While a few species are nearly stemless, the great majority assume the proportions of trees and no really herbaceous species exist. There is also a vine-like group, the rattan-palms, which scramble over other vegetation by means of hooks on the stems and are said to sometimes reach a length of three hundred feet. The aspect of the arborescent species is so well known that the

term palm-like is a common expression needing no explanation. Though belonging to the Monocotyledons it may not be amiss to again call attention to the fact that these trees have no bark, and though often reaching a height of seventy-five feet or more, the stems do not increase in thickness by annual layers of wood. For some time after a young plant appears from the seed the stem is quite short but grows steadily in circumference. When it has reached a proper size the bud begins to carry the stem upward and as the species seldom put out branches, a tall slender stem of uniform diameter is the result. The bud continues to give off the great palmate or pinnate leaves which form a green rosette at the summit. There seems to be no definite time for shedding the leaves, but each one as death overtakes it droops downward on its petiole and ultimately becomes loosened and falls to the ground. The stems of many species are shaggy with the remains of the petioles and often very thorny as well, the thorns being produced from the petioles or from the trunk itself.

The flowers are usually quite small, but are rather better developed than those of preceding orders, there being usually a six-parted perianth easily distinguishable into three sepals and a like number of petals, six stamens and three carpels or a three-parted pistil. The perianth, however, is quite inconspicuous, dull in color, leathery or fleshy in texture and not much like petals and sepals in appearance. The flowers are borne in a simple or compound much branched spike which springs from the axil of an enormous spathe. The flowers are rarely perfect, the stamens and pistils occurring in separate flowers though usually in the same inflorescence. The flowers are mostly wind pollinated though a few are said to produce a perfume and are therefore likely to attract insects. In the species with perfect flowers self-pollination is prevented by the stigmas ripening before the stamens.

The fruit is a berry, drupe or nut often of much commercial importance. Familiar examples are the cocoanut and date. The date is the fruit of the date-palm (*Phœnix*

dactylifera) but the cocoanut is really a seed, the husk of the fruit, corresponding to the edible part of the date, being stripped from it in the tropics before shipment. A multitude of uses is found for other species by the inhabitants of the Tropics and in such regions the order is of far more importance than that containing the grasses which people of temperate climes find so useful. From the Palmaceæ are obtained lumber, thatch, sugar, sago, oil, starch, fibre, and many edible fruits. It is interesting to know that although the palms are found around the world in warm regions, the species of the Old World are almost without exception different from those found in the Western Hemisphere.

ORDER V.—SYNANTHÆ.

This order consists of the single family Cyclanthaceæ containing about fifty palm-like plants, natives of Tropical America. None are found in our territory and none are remarkable for either beauty or use.

PLANTS WITH EXTRA-FLORAL NECTARIES.

The United States National Museum has recently issued a most interesting volume on "The Useful Plants of the Island of Guam" by W. E. Safford who was for a long time resident of the island. From his account of the vegetation, we select the following on extra-floral nectaries:

There are perhaps few localities which offer better facilities for the observation of extra-floral nectaries. Here, within a small area, growing not in conservatories, but in a state of nature, may be observed a remarkably large number of plants having glands on the midribs, veins, petioles, or rachis of their leaves, or on the peduncles, pedicels or sepals of their flowers. Among them are species of *Cassia*, *Erythrina* and *Acacia* with stalked disc or cup-like glands, and, belonging to the Euphorbiaceæ, the candle-nut and the well-known castor bean with well marked nectaries at the junction of the blade and petiole of the leaf.

Many of the Euphorbiaceæ are provided with extra-floral nectar glands which have been noticed by systematists as well as physiological botanists. They are found on the stipules of *Jatropa multifida* and on the petiole at the base of the leaf-blade of *Aleurites molluccana*. In a paper by Percy Groom on the extra-floral nectaries of the allied *Aleurites cordata* these petiolar nectaries are described as follows:

"Each nectary is a green-stalked, shallow basin, the concavity of which is tinted red. The secreting cells which line the basin form a single layer of palisade-like cells. The general culticle is preserved over these and the secretion emerges through splits in it. The secreting cells contain proteids, sugar, a red coloring matter (a compound of tannin?), tannin but no starch. In the ground parenchyma starch tannin and crystals of calcic oxalate occur. The conducting parenchyma contains sugar but no starch or crystals. Darkening the nectaries of leaves on the plant, or of excised leaves, or darkening the whole leaves, caused a gradual disappearance of the starch, but the nectaries continued to excrete for some time." Among the Malvaceæ growing in Guam several are provided with nectar-glands on the underside of the midrib. These are most conspicuous in *Urena sinuata* occurring not only on the midrib but sometimes on the main lateral ribs of the palmate leaves. They also occur on all leaves of cotton (*Gossypium* sp.) and on the midrib of *Pariti tiliaceum* in the form of vaginate glands.

The sweet fluid secreted by these glands is eagerly sought by sugar-loving insects and a number of authors maintain that the power of secreting it has been specially gained by plants for the sake of attracting ants and wasps which will serve as defenders against caterpillars, leaf-cutting insects or other enemies; but Darwin, after a series of observations, could not see any reason to believe this to be so with the species observed by him, although the fact that these glands are visited by insects for the sake of their nectar can be verified at any time of day

when the sun is shining and these insects must serve as a protection for them. It is interesting to note that these glands may occur in one species and be absent from another closely allied to it, of the same genus. Indeed, there are species in which the glands are present on some leaves and absent from others and of their variability we have already spoken in connection with *Ricinus* and *Urena*. On this account Delpino argues that these glands ought not to be regarded as excretory, since if they were so, they would be more constant and would occur in every species. Their variability is especially noticeable in the genus *Cassia* where the tiny cup-shaped nectaries may be found on the petioles of some species and on the rachis of others, but are absent from both in others. If they perform some necessary function it is hard to believe that they would not occur in all species. One thing is certain, they are more highly developed and more active in the young and tender leaves and about opening leaf-buds than on the older and tougher leaves which are less tempting to herbivorous animals, and more able to resist their attacks; and whatever may be the truth regarding the presence of these glands in general, Belt has shown conclusively that the bull's-horn acacia (*Acacia sphærocephala*) of Central America not only attracts stinging ants by its nectaries, but offers them as an additional attraction, dainty food, rich in oil and protoplasm in the form of small bodies at the end of the divisions of the compound leaflets, which the ants gather when ripe and carry to their homes in the stout hollow thorns of the plant itself. The fruit-like bodies do not ripen all at once, but successively, so that the ants are kept about the young leaves for some time after they are unfolded and Belt arrives at the conclusion that ants are really kept by the acacia as a standing army to protect its leaves from herbivorous mammals and insects. In the same way there is a succession of active nectaries about the tender young leaf-buds and flower cluster of *Ricinus* which are constantly visited by wasps and ants; and the important part played by the

nectar glands in the petioles of the cotton leaf as an attraction to ants which serve to protect the plant from the boll weevil and other injurious insects has recently awakened great interest and has been turned to economic account.

POLLEN.

If we examine the flowers of any plant, it matters not of what description, provided it be a true flowering plant, we shall find associated with them, either as a powder or, as in the orchids, in a somewhat viscous mass, an immense number of small grains which represent the pollen, *i. e.*, the male or fertilizing element. In some cases, however, where the male and female flowers are separate, we must, of course, only look to the former for this powder, while the latter we shall find, as a rule, to be comparatively inconspicuous. Thus in many of the Nut tribe we find the male flowers associated in conspicuous catkins, accompanied by an abundance of pollen, this abundance being necessary in order to secure the fertilization of the distant female flowers by the aid of the wind, insect agency being largely debarred owing to the absence of sufficiently obvious flowers fitted to attract them.

These grains, despite their minuteness, are very beautiful objects under the microscope, and will repay examination, as they will be found to vary very greatly in size, shape, make, and color, every species of flower having its own distinguishing type. Their size would appear to be correlated with the length of the stigma, or stalk, of the female flower, so that in the lilies and evening primroses, to take familiar examples, we shall find them of comparatively large size, while in short-stigmated flowers they are much smaller. The brilliant carmine or orange-tinted pollen grains of the lilies are especially beautiful objects, even under an ordinary lens.

The reason of this correlation is a very simple one. When the pollen grain is conveyed either by wind, insect, or other agency to the stigma of the female flower, or

portion of a flower, for in the majority of cases the flower bears both kinds of organs, it becomes attached thereto by virtue of a viscous or gummy secretion which holds it fast. This done the pollen grain bursts, and a slender tube issues from it which lengthens and traverses fine channels between the cells of the stigma until it reaches one of the embryo seeds at its base, which it at once fertilizes, and thus renders it capable of perfecting and producing a plant. Hence, it is clear that the longer the required tube the more material there must exist in the pollen grain, and the correlation is explained.

We also see in this arrangement a bar to cross fertilization between unfitted plants, but another and less obvious bar exists in the fact that there is undoubtedly some sympathetic action upon the proper pollen grain by the viscous matter on the stigma which is lacking with alien pollen of the wrong species. Some extremely interesting experiments have been made in this direction by immersing pollen grains in solutions of this stigmatic gum, with, to some extent, very unexpected results, pollen grains sometimes reponding freely by bursting in quite foreign solutions, and yet failing in far more likely ones, though not of their own exact species.

Such experiments are, of course, of great value to the hybridists, but have the drawback that the necessary length of tube formation is left out of the question, so that a pollen grain might quite well be induced, as it were, instantly to start form in its tube by misplaced stimulus, and yet be quite unable to penetrate the full length of the stigma, to say nothing of subsequent incompatibility as regards the intricate process of fertilizing the seed. Each embryo-sac or embryo-seed is only capable of being fertilized by one pollen grain, and when we see such a seed-vessel as that of the poppy, with its thousands of seeds, each individually and separately attached to the walls or compartment walls of the seed-vessel, and consider that at least an equal number of pollen grains, and probably a far greater number, become attached to the broad ribbed

stigmatic disc which we see in the centre of the flower, and that yet, after some preliminary struggle for precedence, only an equal number of tubes must have traveled downwards and found their way unerringly to perhaps every seed in the capsule, we cannot fail to be struck with wonder and admiration at the arrangement which can admit of all this without a shadow of confusion.

This, however, is a minor wonder as compared with the pollen grain itself. Their number, as we have seen, is simply enormous in many instances, and very large in all, and yet in every one, tiny as they may be, there is bound up not merely the potencies of the entire parental plant, but also of its ancestors, and if, as well may be, that plant has been cross bred at any time, two or more sets of ancestral potencies will be lying latent, and be capable of asserting themselves when fertilization is completed. Notwithstanding this innate complexity, the bulk of the grain is, as we have seen, devoted merely to tube formation, and hence, at the time of fertilization, nothing is left but a single microscopic cell, which it has been the function of the tube to convey.

This cell, the biologist will tell us, is really only half a cell as regards the normal cell contents, and the embryo cell in the seed-vessel is similarly halved. It is this preliminary halving which renders fertilization necessary, and the act of fertilization consists in the union of the two halves into one complete cell, which is thus rendered capable of growing, dividing, and multiplying, and building up first a seed and then a plant. Inasmuch as the half cells of the embryo seed are equally endowed with parental and ancestral potencies, the perfected seed contains both sets, and its subsequent development into a plant is deter- by some sort of subtle adjustment, which in the case of cross-bred plants, leads to immense variety, and yields our selective cultivators many of their richest prizes.—*Indian Planting and Gardening.*

Note and Comment.

WANTED.—Short notes of interest to the general botanist are always in demand for this department. Our readers are invited to make this the place of publication for their botanical items.

A BEE-PLANT FOR STERILE SOILS.—When the Chicago drainage channel was dug, the material excavated formed a ridge nearly forty miles long and from fifty to a hundred feet high. Few plants grow upon these great piles of rock, but the sweet clover seems to find some parts a congenial home and thrives in spite of the dryness. An enterprising individual has recently begun fostering the spread of this plant for the honey it affords his bees. In the vicinity of the drainage channel there are hundreds of acres of sterile soil which may ultimately be turned into pasturage for bees and thus be made to yield a return not inferior to that from better land planted to field crops.

SEX OF INDIAN TURNIP.—Readers of this magazine need hardly be told that the inflorescence of the Indian turnip or Jack-in-the-pulpit (*Arisæma triphyllum*) is not a single flower, but a number of flowers clustered at the base of a thick spadix and surrounded by a colored bract or spathe, but possibly some do not know that these small and inconspicuous flowers are likely to be of two sorts—staminate and pistillate—and that while some flower clusters may have both pistillate and staminate blossoms, the majority are usually of one sex. It has often been stated that the sex of the plants can be determined by the color of the spathe, those with the deepest color being pistillate and the others staminate. An examination of a series of plants, however, will show that this rule has many exceptions. The real distinction seems to be due to the general rule among plants that in species of two sexes, the more robust specimens are likely to be pistillate or female, and the weaklings to be staminate or male.

CHRYSANTHEMUM SMOKING. — The chrysanthemum now has something else to do besides look pretty. According to *The Gardening World* the petals have been recently recommended as a harmless substitute for smoking-tobacco. A medical journal goes still further and asserts that the smoking of chrysanthemum petals is very beneficial in dyspepsia and cites a case in which an epileptic patient has been nearly cured by this treatment. This news ought to strengthen the chrysanthemum market. A flower that may be worn till it wilts and still be worth the original price as smoking material is indeed unique.

CORRELATION OF COLOR.—We commonly think of the color of flowers, only, but the color of stems, leaves, fruits and seeds are usually so closely correlated with that of the flower that one may usually select the plants that will bear pale or deeply colored flowers from a batch of seedlings as soon as they begin to grow; indeed, they may often be selected before the seeds are sown. In bulbous plants the bulbs with colored scales will produce the flowers of deepest color. By keeping this in mind when setting out plants that bear flowers of more than one color, such as phlox, one may avoid getting all the flowers of the same color together.

THE MARKINGS OF FLOWERS. — In a letter to the editor, Mr. John H. Lovell observes that actinomorphic, or regular flowers, are rarely lined or spotted. The regular flowers are visited by a great variety of insects and apparently can dispense with honey-guides. The zygomorphic or irregular flowers are patronized by fewer insects and these are nearly always directed to the nectar by lines or spots or both. Some regular flowers, however, are lined and Mr. Lovell instances the wood sorrel (*Oxalis acetosella*) and various members of the saxifrage family. An additional instance can be cited in the spring beauty. Green flowers are generally without markings but the white hellebore (*Veratrun viride*) is marked if our remembrance of the flowers is correct. Who can supply other instances?

Odor of Hound's-tongue.—It may be questioned whether all flowers have not an appreciable odor to the insects that visit them. We are inclined to assume that because certain flowers have no odors that are perceptible to us, they have no odors perceptible to other members of creation. It frequently happens, however, that flowers we have set down as odorless are really not so, our mistake arising from the fact that perfume from single flowers is too faint to be perceived by our senses. In such cases, one may often detect the odor by picking a bunch and smelling of them in the mass. The hound's-tongue (*Cynoglossum officinale*) well illustrates this. There are few individuals with senses keen enough to notice the odor of single blossoms, but in a bunch the flowers have a strong, musky, mouse-like odor. This is apparently well liked by the bees for during the season of bloom it attracts great numbers of these insects.

Change of Color in Flowers.—The changes in color which many flowers undergo during the time they are in bloom are so striking as to be well known. Among these may be mentioned the change of the white wake-robin (*Trillium grandiflorum*) from white to pink, the change of the blue-bell (*Mertensia Virginica*) from pink buds to deep blue flowers and the honeysuckle from white to yellow. Many less conspicuous changes in flowers are fully as interesting if we take the trouble to look them up. Many of these changes are concerned with the honey guides and are doubtless of service to visiting insects by indicating to them the age of the flower. A striking example of this is found in the horse-chestnut which Gray says—incorrectly—has a white corolla spotted with yellow and purple. As a matter of fact the petals each have a single spot at the base. The flower opens with these spots pale lemon-yellow, but they change rapidly to orange, then brick red, and end by being of a deep purple, not the purple of grapes and lilacs, but the purple in which there is a blood-red tint. Another instance may be found in so common a plant as the toad flax (*Linaria vulgaris*) in which the pale

yellow flowers have, when young, a palate of a deeper shade of yellow, this changing later to the deepest shade of orange. It would be interesting to make a list of the flowers in which the whole flower changes color, and another in which the spots and lines of the flower do so. The first list may be started by the hound's-tongue which changes from dull red to purplish, and the bush honeysuckle (*Diervilla trifida*) which changes from yellow to orange. Who can add others?

Ferns for Orchids.—The Ames Botanical Laboratory, North Easton, Mass., has duplicates of some rare Florida ferns which are offered in exchange for orchids. Further particulars may be obtained by addressing the Laboratory stating what species can be furnished.

Poisonous Honey from Poppies.—According to a writer in a bee-keepers' journal, bees that have free access to a large number of poppies may be destroyed by the narcotic principle of the plants. In one instance eight colonies were destroyed in this way. The question whether or not certain flowers secrete poisonous nectar has often come up for discussion without being certainly settled. The mountain laurel and various other heaths have been suspicioned. If the bass-wood, clover and buckwheat can each add an unmistakable flavor to the nectar it produces, it seems possible for poisonous plants to add more or less of their noxious elements.

Polypodium Fibre.—Growers of orchids often make use of a potting material made from the rootstocks of the bracken (*Pteris*) or the cinnamon ferns (*Osmunda*) and now according to an advertisement in *The Gardening World* an enterprising inhabitant of Germany is offering polypodium fibre made from the rootstocks of the common polypody (*Polypodium vulgare*) for the same purpose. The bracken and cinnamon ferns often grow in such quantity that the use of their rootstocks as potting material is scarcely likely to cause them to be exterminated, but if polypody fibre ever becomes the fashion in this country we may soon expect to place the *common* polypody among the rarities.

Editorial.

After trying for a year the experiment of issuing colored plates in every other number of this magazine, we have decided to change this by substituting a black and white plate in every number. The first of these plates appears in this issue and is one of a series made especially for us. They will, in so far as possible, illustrate the less familiar aspects of our wild flowers and should thus prove of interest to every reader whether he be botanist or botanizer. In the forth-coming volume we shall also begin a series of illustrated articles on the pollination of flowers which will contribute some new facts on this interesting subject. The articles on plant families in the "Botany for Beginners" series will be continued, and with these things in view, not to mention the other valuable contributions that will appear, we feel that we are warranted in asking not only the continued support of our present readers but an active interest in making the magazine known to others. It now needs but a few more subscribers to cause another increase in the size of the magazine. Your aid in bringing this about will be greatly appreciated.

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We are indebted to the Open Court Publishing Company, of Chicago, for a framing portrait of Professor DeVries whose book on the origin of species and varieties by mutation is attracting so much attention. The portrait is platino finish 10 by 12 inches in size and sells for $1.00. It will be a desirable addition to school-room or study.

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Messrs. Williams, Brown and Earle, whose advertisement appears in every issue of this magazine, have lately brought out a Reflecting Lantern by the use of which illustrations from books, plain or colored sketches, mechanical models, etc., may be shown upon a screen

exactly as is done with lantern slides. Colored plates from books are shown in their natural colors. This attachment will fit any lantern and seems destined to work a revolution in the illustration of lectures, etc., since prints, photographs and plates from any source can be used.

BOOKS AND WRITERS.

The editorial and publication offices of *Floral Life* have been recently moved from Philadelphia to Springfield, Ohio.

Houghton, Mifflin & Co. announce the publication of Dr. C. S. Sargent's "Manual of the Trees of North America" with 644 illustrations, and of the first fascicle of Oakes Ames' "Orchidaceæ."

The Fern Bulletin has recently issued a very complete index to the first ten volumes, compiled by B. D. Gilbert. The great activity in fern study that was manifested during the ten years covered by the index is shown by the fact that more than five hundred signed articles are listed. In the index to species two thousand references are given, notwithstanding the fact that no reference is made to species mentioned in the magazine unless something definite is said of them. The index covers thirty-two pages and costs 25 cents.

The Wellington Field Naturalist Club, of Guelph, Ontario, formerly conducted a department in the *Guelph Herald*. This has now been abandoned, for an annual publication called *The Ontario Natural Science Bulletin*. The first issue (for 1905) contains 48 pages of well printed information upon the fauna and flora of Ontario. The biology of this region is still imperfectly known and the articles are therefore mainly lists of species and notes on distribution. Mr. A. B. Klugh, an occasional contributor to our columns is the editor. The price of the number is 25 cents.

There is an individuality about the trees not possessed by lesser forms of vegetation and this doubtless accounts for the large number of books about trees that have appeared within the past few years. A handy volume on the British arborescent flora for comparison with these is Step's "Wayside and Woodland Trees." This appears to have had a great vogue on the other side having already reached a second impression. The plan of the book is the same as that followed in previous books by this author, there being 185 illustrations of the trees with their leaves and fruit. In most instances views of the trunk at close quarters, as well as the tree as a whole, are shown, the leaves and fruit being given in separate illustrations. The text is of a popular nature. The points by which the trees may be known are dwelt upon, but for the most part the things that make the trees attractive to the rambler have first place. (New York, Frederick Warne & Co., $1.75 net.)

The Iris has justly been called "the poor man's orchid." No other flower is at once so orchid-like and so varied in showy coloring. A majority of the species are quite hardy and when once planted will grow and increase in beauty for years. The cultural features of these flowers are discussed at great length in "The Book of the Iris" by Irwin Lynch, which is the twenty-first volume in John Lane's "Handbooks of Practical Gardening." Beginning with the structure and Natural history of the iris flower, the author takes up the iris garden, and the general cultivation of the various divisions of the genus. There is also chapters on hybrids and diseases of the plants. The greater part of the book, however, is devoted to a description of all the species, varieties and hybrids with directions for cultivating each. A series of excellent keys will enable the cultivator to identify his specimens. There are upwards of two hundred pages in the book and thirty-six illustrations. (New York, John Lane, 1904, $1.00.)