THE AMERICAN BOTANIST

DEVOTED TO ECONOMIC
AND ECOLOGICAL BOTANY

EDITED BY WILLARD N. CLUTE

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CONTENTS

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THE AMERICAN BOTANIST.

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THE OLD FASHIONED GARDEN.

BY DR. W. WHITMAN BAILEY.

THERE is scarcely need to describe an old-fashioned garden, for nearly every one knows it at sight. It is still to be found in out of the way villages, and even some old cities of New England. Phlox is generally in it, and stocks and gilly-flowers; yellow marigolds sun themselves through the summer days, and coreopses stray out of their borders while the weeds leap in. There are great tall hollyhocks standing like grenadiers on duty, and there is a sweet-pea that has been loved by generations of old maids. Bless those maiden aunts, from Betsy Trotwood down! How delicious are their apples and cream, how crisp their doughnuts, and how quaintly orthodox their advice!

But we have, after the example of our first parents, strayed from the garden. Let us return to the humble flowers. Shakspeare himself has been before us, for here is "a bank on which the wild thyme grows," and here is "sweet marjoram," the pass-word of Lear, and Ophelias' pansies, and rosemary and columbine. Here are "cowslips tall" and "eglantine," and all the good old English names. We have read that Shakspeare, who was no botanist, makes mention of about one hundred and fifty plants; a goodly number for a mediæval herbarium. That the weeds and wild flowers had a place deep down in that human heart of his, who can doubt?

The china asters take us back to the time when we were no taller than they, and quite as care-free. The camomile makes us squirm with its pungent odor, just as it used. We never liked the double dahlias; they are so very

precise, but here they are not withstanding. It is fortunate that no flower nor man either, for that matter, is outside the pale of human sympathy. Sunflowers flourish in an old-time garden, and upon them we find the dainty yellow-birds pecking at the nourishing seeds. We wonder if these flowers do turn to the sun, or whether that is a love-sick fable of Tom Moore's. We do not despise the sunflower, although he is a somewhat shabby fellow, and swells into premature magnificence. Did not Captain Cuttle deem it worthy to present to Mr. Dombey?

Mint, lavender, horehound, lemon verbena are here, all sweet smelling and pleasant. In the afternoon the four-o'clocks open their red and white or yellow blossoms, the "marvel of Peru" furnishing at one time, maybe, a nosegay for the Incas.

Vervain and larkspur, monkshood and fox-gloves, are usually found together with lovage and spurge. Of roses, we need not speak; every old garden is full of them; red, white and yellow. Even those well beloved plants are subject to capricious mutations. What can surpass the old familiar blush rose that used to grow by the arbor in our garden? We can see it after this lapse of years, and it's pretty neighbor, the sweet-brier, with a breath like that of a sleeping babe.

If in our list we have failed to mention anybody's favorite flower, it is an unintentional omission. We would grieve no plant lover; if we cannot meet on any other common ground, we can harmonize in the garden.

There are few plants in which the effects of cultivation are so marked as in the common pansy, the *Viola tricolor*. In it's wild state, and, indeed, as we find it in old gardens, it is a small, parti-colored violet, not always particularly pretty. Careful treatment as to soil and judicious eradication of the smaller and less beautiful forms, year after year, selecting seed from the most vigorous specimens, have worked wonders, until now we have the innumerable varieties which gladden the hearts alike of rich and poor.

One can hardly go anywhere now-a-days where he

will not see the heart's-ease or pansy. The latter name is a corruption of the French "pense'e," thought, though why, in the language of flowers this modest violet should come to have such significance, is past finding out. It has, however, been attributed to the nodding or drooping attitude of the flowers suggesting contemplation. The sentiments attaching to flowers often seem quite forced and fanciful even to the riotously imaginative; it is impossible even to guess their origin.

Speaking of old gardens, some years ago we visited Salem in midsummer. Next the quaint old house in which we sojourned was an abandoned garden of a rich estate. Wholly neglected in the absence of the owner, all sorts of plants, both weeds and exotics, had sprung up simultaneously. Here could be seen the golden stars of coreopsis, the white and crimson tints of hollyhocks with errant bees encamped therein, the tropical bloom of yucca, misty sprays of red and white spiræas, blue columbine, larkspurs, monkshood, and no end of pansies.

Perhaps in the long ago, Alice Pyncheon herself gathered pansies in this garden. Nothing is young in Salem. Who knows? We mused long and deep as we wandered through the tangle, thinking of gable-roofed houses, witch craft, the famous White murder, and many local incidents. The plants grew with a rich luxuriousness, which, under cultivation they might not have attained. For us the confusion was more charming that the set beds of foliage plants one now sees everywhere, very prim, very harmonious, but certainly not natural. We are so pre-Raphælite as to admire Nature. She weaves her mats much as do the Persians, without much apparent thought of the result. She does not ask whether such and such colors will blend or contrast, but simply puts them together. Should we attempt to imitate either the oriental or the Good Mother, the chances are that we might have to chronicle a conspicuous failure. There is perhaps a subtle design under a kaleidoscopic effect.

The colors exhibited by pansies are most extraordin-

ary. Some are as near black as flowers can be. The richest purples are common, with clear yellow, intense violets, lavenders, tender dove-colors, rich maroons and browns. On the lower petal which in the violets is hollowed behind into a nectar-bearing spur, they can be usually seen, when the ground tint is not too dark to obscure them, the so-called "guiding lines" to which old Sprengel first called attention. He claimed for them a significance which science has of late re-affirmed, maintaining that they serve as so many clues or lines of direction to assist insects in finding the nectar.

Providence, R. I.

THE CASTOR OIL PLANT.

BY M. F. BRADSHAW.

WHEN I lived at the North Pole—which I can easily point out to explorers should any really care to find it—I had a hobby for gardening, and had a very fine garden during the short summer time, for you know there are many plants that adapt themselves to great extremes of climate and to very short seasons of work. I grew everything that *would* grow there, and tried vast numbers of plants that would not. Now one of my strongest desires was for a sub-tropical corner, and my experiences in that line would fill a book—a pathetic, not an amusing book to me.

Among the things I tried was *Ricinus communis* and my success was not at all bad. The seeds always came up and some seasons the plants grew a foot or two high, and one never-to-be-forgotten summer they got away above my head. I was a proud gardener then. Now I live in the sub-tropics where almost anything can be cultivated. I still admire my old love the *Ricinus* though I do not cultivate him any more as he seems better adapted to roadsides and creeksides than a garden; besides his size would unfit him for refined plant society.

Botanists give only one species, but I must say then it has two very different suits of clothes. One is green all

over, stem, leaf and seed pods; the other is mostly a dull, dark red, stems, young growth, and underside of leaves, while the racemose clusters of seed pods are of the richest crimson.

Ricinus is more than beautiful; it is grand. The great leaves are shaped like a star, rich, dark green and glossy on the upper surface and red or purplish underneath in the red species. The racemes of pistillate blossoms are as thick as a man's wrist, with the small, scarlet flower set on the apex of the big seed pods, the small, cream-colored staminate flowers on the same stem just below.

The stamens are in great clusters and bear a quantity of fine, dry pollen, but are avoided by insects. I have heard it said that a *Ricinus* plant by a window will keep all flies away from a room, but I am rather skeptical on this point. The plants are pollinated by the help of the wind, however, and are anything but the feeble, delicate things I used to nurse in the cold climate; they grow sturdy and strong and wax tall and broad, keeping on year after year, till they are veritable trees.

It is said to be a native of Africa and so must have been introduced here, but I never saw anything with a more at-home air and a wider grasp of territory. It is never weedy looking, as how could it be with those magnificent leaves? and is always quite the aristocrat in whatever neighborhood it is pleased to locate.

Besides looking grand, those leaves have some odd characteristics: the edges are sharply serrate, and each tooth has a minute cup, and on the base of the ribs and along the leaf stems are little warts. These serve to supply the leaf with water, instead of the usual hairs.

A wilted leaf will become perfectly fresh if the serrate margin is put into water, without the petiole.

Even the seeds are exquisite. They are the size of white beans, a glossy, dark gray, dotted all over with white, and I have seen long chains of them, made by the children, that anybody might covet.

Some day I am going to have a *Ricinus* tree just out-

side my kitchen window so that maybe the smooth prose of everyday work will be broken up now and then by a ripple of poetry.

Orange, Cal.

BOTANY FOR BEGINNERS—IV.

POLLENATION.

Notwithstanding the many curious and beautiful patterns of petals and sepals that plants have evolved, it is certain that for the purpose of producing seed these are unnecessary. All any species seems to need is a set of pistils to contain and nourish the young seeds, and a set of stamens to furnish the pollen that quickens them into life. The transference of the pollen from the stamen to pistil is called *pollenation*, and plants have many nice adjustments of parts for this purpose.

At first glance it would seem a very simple matter for a flower to become pollenated when there are plenty of stamens surrounding the pistils and close to them; and so it would be if flowers were always pollenated by the nearest stamens. But it turns out that many flowers are prevented in one way or another from using their own pollen. For instance, there are many flowers in which the stamens and pistils mature at different times; that is, when the stamens are shedding their pollen, the pistils in the same flower have not grown sufficiently to make use of it, or *vice versa*. In such cases pollen must come from another flower. Examples of this may be found in the hollyhock, some mallows, figwort (*Scrophularia*), and many common flowers. Still others like the willow-herb (*Epilobium*), evening primrose, (*Oenothera*) and bellwort (*Campanula*) all of which have united ovaries but separate stigmas, have the stigmas when young folded together face to face so that no near-by pollen can reach them. Later they spread out ready to receive the pollen from other flowers. In the bellwort, illustrated in Fig. 11, the essential organs of the young flower are shown at *a* with stamens ripe but pistils

immature At *b* is shown the same parts, but with stamens withering and stigmas ready to receive pollen.

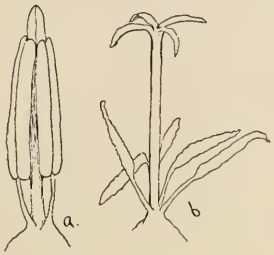


Fig. 11.

The great composite family to which the asters, sunflowers, goldenrods and their allies belong, make use of this method, but with the following unique modification: In this family the stamens are joined into a tube by their anthers which open within so that at maturity the pollen falls into this tube. Now at the bottom of the tube lies the pistil but it escapes pollenation because its two stigmas are folded face to face. As the pollen is shed, however, the style begins to lengthen, carrying the folded stigmas up through the tube and brushing all the pollen out at the top (Fig. 12 *a*.) Then, the stigmas spread out, (Fig. 12 *b*.) the stamens are withdrawn into the carolla and the pistils are ready for their share of pollen which comes, of course, from some adjacent flower. This process may be seen very clearly in the common garden sunflower.

The fact that many flowers find it necessary to obtain their pollen from others has given gardeners a hint which they have been quick to improve upon in the production of numerous hybrids. All that is necessary is to carefully pick out the stamens of desirable flowers and then pollenate them with pollen from the blossoms with which it is wished to cross them. It is to be understood, of course, that crossing is possible only with closely related plants. Petunias, for example, could not be crossed with geraniums, or lilies with roses, otherwise there would be no distinct types of flowers. Nature has set her ban on such mixing

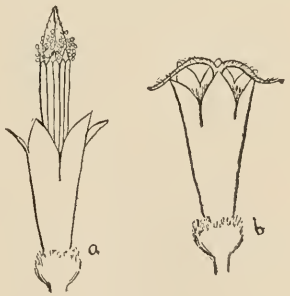


Fig. 12.

and if pollen from a flower of a different order happens to fall on the stigma it has no effect. But in plants of the same genus, or in varieties of the same species it is often easy to make crosses, and the closer the plants are related the easier it is.

Still more striking instances of the necessity for cross-pollenation are found in plants that bear their stamens and pistils in different flowers. In such cases it is absolutely necessary that pollen be brought from some other flower. A corn-field, at this season, is an excellent place to study this subject. First there is the corn whose staminate flowers (the "tassel") are borne high above the pistillate ones (the ear) whose long styles are well known by the name of corn "silk." Down on the ground sprawl the pumpkin vines whose pistillate flowers are easy to distinguish from the staminate from the fact that they each have a tiny pumpkin below them. The whole gourd family has this peculiarity, and one may see it in the cucumber, musk melon, and squash. The corn and pumpkin also stand for two distinct methods of pollenation, for while the corn trusts its pollen to the wind, the pumpkin relies upon insects, mostly honey-bees in our latitude.

Other well known plants with flowers in which the sexes are separate are the alders, oaks, birches, chestnuts, sweet-fern, begonias and some of the nettles. There are still other species with stamens and pistils on different plants, and of these the willows, poplars, meadow rue (*Thalictrum*), hop and hemp are familiar instances. In such cases we have entire plants whose only use to the species is to furnish pollen for others, since they can never set seed themselves.

Under these circumstances it is very evident that some agency is needed for transferring the pollen from one flower to another. The wind serves the pines, aspens, grasses, sedges, oaks and others. Most wind pollenated plants are remarkable for producing immense quantities of pollen, for when this is sown on the wind there must be an abundance if no stigma is to be missed. The stig-

mas also are often broad or feathery to give them the best chance to catch the pollen. When the great pine forests of the Southern States bloom, the pollen is so abundant that it often falls in showers, completely covering the surface of small pools, etc.

In the case of the eel-grass (*Valisneria*) water assists in pollenation. The pistillate flowers grow on long stems and reach the surface of the water, but the staminate have short stems and are often found several feet under water, At maturity, however, the latter break loose from the plant, rise to the surface, shed their pollen and so pollenate the pistillate flowers. In tropical countries birds sometimes cross-pollenate the flowers, and in our own latitude the humming birds occasionally perform the same office. Insects, however, are the principal carriers for showy flowers. Lured to the blossoms by attractive colors, pleasing odors and abundant nectar, they may imagine they are being entertained free, but as they sip the honey they become well covered with pollen, and upon a subsequent visit to another flower some of the pollen is sure to be rubbed off against the stigmas while the insect is being covered with fresh pollen for another trip. In insect pollenation the sepals and petals play an important part, and in consequence this part of the subject will be dealt with further after we have discussed these additional features.

THE WALKING FERN.

BY FRANCES C. HAESELBARTH.

MY experience with the walking fern, *Camptosorus rhizophyllus*, always reminds me of the legend of the man who searched far and wide for the coveted four-leaf clover, and then returned to find it growing at his own door. After a trip to the Berkshire Hills, made for the express purpose of seeing the plant in its native haunts, I returned to find it growing within thirty miles of New York City—nay, even within the limits of my own town.

A little brook, starting deep and calm among the hemlocks, flows out across the open over a bed of solid gray rock, gradually increasing in force as it flows, until it suddenly precipitates itself over a steep cliff forming a beautiful waterfall some twenty-five feet in height. Here, reaching its curious fronds out into the dancing spray, grows the walking fern. Carefully hugging the sheer wall of rock, minutely scanning every inch of the glen, we at length discovered eight small colonies of the fern.

In close proximity were found the graceful rosettes of the maidenhair spleenwort, while sheltered beneath a huge overhanging ledge of rock, so beautifully covered with mosses and lichens as to seem a part of the very wall itself, was a phoebe's nest.

Early this season, while hunting for hepaticas, my heart was rejoiced by finding a goodly sized new group of the queer, spidery little plants. And while the plants I have found near my own home are neither so numerous nor so beautiful as those of the far famed Berkshires, yet somehow my heart warms toward them with something of the pride of a Columbus approaching the shores of a newly discovered continent, for, are they not my own, did I not discover them?

Nyack, New York.

THE PASSING OF PORT MORRIS.

BY PAULINE KAUFMAN.

THIS, one of our Ballast grounds, situated at the foot of East One Hundred and Thirty-eighth Street, New York City, takes toll from every passing vessel and train, so that for years, the number of foreign plants which have here become naturalized citizens, has made it a Mecca for the botanist. Particularly was this so for several members of the Gray Botanical Association, who passed its merits on to interested acquaintances. Mr. Buchheister was the discoverer of *Zygophyllum fabago*, a caper from the Cape of Good Hope; and also of a rare thistle bearing yellow flowers.

The flagman near this place, through his interest, became acquainted with everyone seeking treasure, there, and in lieu of a policeman, we told our botanical troubles to him. He it was, who, two years ago, said to me, that after Mr. Buchheister had passed along with his yellow thistle, a man seeing it, said, "I'd give five dollars to have found that."

Every one of my trips was gladdened by the fact, that although any number of ragged little boys bathed there, and all sorts and conditions of people came for a breath of air, our capers at the water's edge still throve, undisturbed. Last week, while taking Miss Ryon (of New London) to this ballast ground, I told her of all we might naturally expect to find. To our great dismay, there was no sign of the caper, the yellow thistle, another valuable thistle with purple flowers, the patch of poppies, a tiny fumaria and many other good things from both continents. The disappearance of many of these plants is not due to *improvement*, the usual apology for wholesale botanical extermination, but to one who *knew* what he was about. It seems a pity that these plants could not have been left to gladden the hearts of future collectors, who would have been satisfied with a couple of flowers. thus carrying out the precept of our late secretary, Wm. MacDonald, "Of a little, take a little, leave a little."

Among a bunch of flowers, buttercups, daisies and clovers, evidently dropped by a child, were several spikes of a bearded grass as fine as silk. It was new to both of us, and we hunted vainly for the parent plant. I have since come across one similar specimen in an herbarium collection from the west, but could not learn the name. However, my swan will doubtless prove a goose as has heretofore happened.

Plants found within a few years, in the ballast region from Port Morris to Hunt's Point include *Sisymbrium sophia*, *Thlaspi arvense*, (mithridate mustard) rarely naturalized, *Ballota nigra* (black horehound), *Marrubium vulgare*, (common horehound), *Papaver argemone* (prick-

ly poppy), *Fumaria officinalis*, *Tussilago farfara* (colt's foot—in quantity at Port Morris; I have never seen it elsewhere), *Lactuca scariola* (prickly lettuce), *Crepis tectorum*, *Matricaria chamomilla*, *Anthemis nobilis*, *A. cotula* and *A. arvensis* (corn chamomile, rare), *Asperugo procumbens*—still at Oak Point,—*Lithospermum arvense*, *Viola arvense*, *Agrostema githago*, *Lychius diurna*, *L. flos cuculi*, *Zygophyllum fabago*, *Potentilla anserina*, *Reseda lutea* and great numbers of more common species.

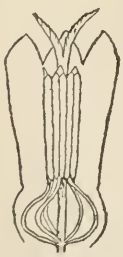
New York City, N. Y.

POLLENATION OF THE SUNFLOWER.

BY WILLARD N. CLUTE.

BOTANICAL works that mention the subject at all say that the sunflower's method of cross-pollenation consists in a tube formed by the stamens into which the pollen is shed, to be later pushed out at the top by the lengthening style, after which the stigmas spread out to receive pollen from other flowers. But this is only the least interesting part of the truth.

Happening to examine a sunflower recently, I was struck by the fact that the blooming florets were much taller than any of the others, not forgetting those that had finished blooming. It is not unusual for flowers to increase in length at the blooming period, but how the sunflower florets were able to shorten up later was what puzzled me. A short examination of a floret, however, solved the mystery and revealed a very pretty piece of plant mechanism by which the shortening is brought about.



It seems that the new florets are taller than the others because the stamen-ring projects above the corolla and the stigmas project above the ring. In older florets the stigmas are scarcely longer than the corolla, and it turns out that after the pollen is shed both the stamens and the stigmas are retracted into the corolla

tube; the stamens by means of the filaments which curve outward in a half circle, and the stigmas by means of an elastic region at the base of the style. The style, therefore, shortens by shrinking, but the stamens cannot do this and the filaments must bend outward, nature having formed a spherical bulge at the base of the corolla to permit this. The illustration shows the corolla laid open, with the stamen ring withdrawn into it.

THE BOTANIST AND THE PUBLIC.

There is, perhaps, no science which seems to the average man so futile. The name "Botanist" is to those who know least about it, almost synonymous with that of a "mild and harmless visionary." He does no harm to anybody, they would say, and, under their breath, add that he does no good either. Yet this same average man eats vegetable food daily; he drinks beverages of vegetable origin, solaces himself with vegetable narcotics, depends upon vegetable textiles for many of his clothes, uses wooden articles for all manner of purposes; he is liable to fall a victim to diseases of vegetable origin which he will try to cure by the help of vegetable drugs. Why, if this be so, (and the average man can hardly be ignorant of it), does he take so unfavorable a view of the student of those organisms which are the very mainspring of his life? I cannot help thinking that the botatists are in a measure to blame. In the past, perhaps, more than now, they have entrenched themselves behind a barrier of terminology and make little endeavor to show that many of the terms are in themselves an evil. Accordingly the conclusion is that the botanist sets store by repulsive trifles and is, therefore, worthy of contempt.—*Professor Bower in Journal of the Pharmaceutical Society.*

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.

Squash Varieties.—*Country Life in America* for July gives an illustration of a pile of squashes containing 110 distinguishable varieties, all the product of a single cross-bred squash. When nature can make so many varieties in a single generation it would seem well for the describers of "new species" to go slow—they may only be varieties, after all.

Another Mosquito Plant.—British nurserymen are advertising *Ocimum viride*, one of the basils, as a plant that will drive away mosquitos, and thus prevent malarial fevers. It is described as unquestionably a blessing to mankind and seeds are offered at about $1.25 per packet. If this plant will really drive away mosquitos, there are many people who would consider immunity cheap at the price asked, though it may seem to the majority that this particular blessing comes rather high.

Water Pores.—The number of facts in botany that even the student is content to accept on hearsay is surprising. Take the stomata for instance. We all know what stomata are, and the offices they perform in the economy of the plant, but who, except those who have taken a course in physiological botany, have ever seen them? Even less familiar are those curious modifications of the stomata called water pores. These latter are usually situated on the border of the leaves at the termination of the veins, and under certain circumstances exude drops of clear water. Water pores are very plainly to be seen in the leaves of the garden nasturtium (*Tropæolum*) and if one will examine them early in the day, before the sun has drunk up the moisture, he may see the tiny glob-

ules of water on the edges of the leaves where the veins terminate. The same phenomenon may be seen in the primrose, fuchsia, Canterbury bell and many others. A simple lens is all that is necessary ts see the water pores, but a compound microscope will be needed to make out their structure.

NAMES OF THE ELEPHANT'S EAR.—That plant which in cultivation is usually called elephant's ear (*Caladium esculentum* or *Colocasia esculenta*) has many other names in various parts of the world. In Porto Rico it is called bleeding heart; in Jamaica, coco; in Barbados, eddo and in the French West Indies, taya. It may be added that in Polynesia it is the well known taro and forms a staple article of food.

THE ERRATIC EVENING PRIMROSE.—It was a species of evening primrose that gave DeVries his most abundant data regarding the origin of new species, and the same versatile trait appears to be present in other species of the genus. The common evening primrose (*Oenothera biennis*), for instance, has provided the editor with a puzzle that is still unsolved. The specific name was given the plant under the impression that it requires two years to round out its life, but there is a mistake, somewhere, for a large number of plants have been noticed this year, that have sprung up from the seed and produced flowers and fruit like any other annual. Other more provident specimens in the same ground instead of blooming have been laying up plant food all summer in a thick root ready for next year. There is a great difference in the two strains when they bloom, for the annual kind has short stems and few blossoms, quite noticable in contrast to the strong stems of the biennials, often ten feet high. The annuals, too, do not usually develop the red color in the stems. The plants are undoubtedly of the same species and will continue to be until some disciple of De Vries gets hold of them, but the question as to why they differ in the amount of time necessary to fruit remains unanswered.

FOR EXCHANGE.—Dr. Rensselaer J. Smith, of Metoma, San Bernardino County, California, wishes to exchange seeds, bulbs and herbarium specimens of the plants of his region for others.

GROWTH OF THE FORGET-ME-NOT.—A friend took a root of the forget-me-not (*Myosotis*) and put between two of the stones that curbed the farm spring. E'er the season was half gone, it festooned the sides to the very water's edge, and the blooms were twice the size of those growing in the garden.—*Mrs. A. E. Goetting, Cincinnatti, Ohio.*

WILLOW BARK FOR SMOKING.—According to the *Atlantic Slope Naturalist* the Indians of the north-western United States used the dried bark of the red willow for smoking, either alone or mixed with tobacco. Unfortunately the magazine does not state the species of willow from which the bark is obtained. It is commonly supposed that the bark of the silky cornel (*Cornus sericea*) was smoked by the Indians under the name of kinnikinnik, but this does not seem well anthenticated. More data is desirable.

DEVICES FOR CHECKING TRANPIRATION.—The summer along the coast of the Bay of Naples is long and dry, and the plants of the region have been obliged to develop various means of checking the evaporation of water from their tissues in order to exist there. A writer in the *Botanical Gazette* in discussing the flora, lists thirty-six of the common species with their means for hindering transpiration. From this it appears that one of the principal factors is the absence of stomata from the upper surface of the leaves. A large number have leaves of this nature while a still larger number have leathery leaves or leaves that are hairy or downy. Among other devices in this line may be mentioned minute leaves, or leaves that fall off in summer, leaves that are more or less vertical, leaves with glossy epidermis, or with stomata sunk in pits, or containing aromatic substances. Many of the plants mentioned possess several of these characteristics. The

root systems of most of these plants are extensive. In some cases the roots weighed nearly twenty times as much as the trunk and branches and were evidently used for storing water.

TELEGRAPH POLES IN FRUIT.—Over 1,000 miles of telegraph poles in full fruit may be seen in Uganda. The wires are strung from a species of fig tree which has extraordinary powers of vitality even when detached from its own roots.—*Gardening World.*

PERFUME OF FLOWERS.—Recent investigations have shown that the perfume of flowers is often increased by growing under colored glass, that some plants are fragrant only at night and others only in hot sunshine, that the seasons affect odors, and that temperate climates are more favorable than tropical ones.—*Gardening World.*

NOT ANY FOR US.—The *Gardening World*, commenting upon a recent article regarding poison ivy in THE AMERICAN BOTANIST says, "It is astonishing to what extent this shrub is grown in America, for it grows rankly upon walls and fences bordering the country roads for miles. The article does not state whether these have been planted or have grown there naturally but we should imagine they have been planted for covering the walls and fences." To this we hasten to reply that the poison ivy, like the crow and house sparrow, thrives in America in spite of the efforts of farmers to exterminate it. Our walls in country districts are made of rough stone loosely put together, and the ivy runs riot over them as well as spreading into the grass on their borders. It is one of the commonest plants of eastern America, being found from Canada to the Gulf of Mexico. The foliage is brilliant in autumn, and the fact that the plant is not poisonous to most people, or at least that few people are annually poisoned by it, probably accounts for the lack of more determined efforts toward eradicating it.

Editorial.

Along with the remittance of a new subscriber, received recently, was this comment: "Your little journal is fraught with interest from cover to cover and you don't need a dictionary to look up every word." This moves us to observe that botanical publications are like living things in that they pass through periods of youth, maturity and old age. If one looks through the files of any journal of this kind, he will be impressed with the fact that as it increases with age it becomes more and more technical; indeed, until it does begin to be technical it is often thought to be immature and there is a considerable number of readers who will have nothing to do with it. THE AMERICAN BOTANIST, however, is issued for those of any age who retain a youthful spirit and it is our intention to always keep it free from technical matters—to make it a journal for those who love flowers, rather than for the dry-as-dust sort of scientist who studies but does not love them. We shall endeavor to present items that are new and interesting, but whatever age the magazine attains, a dictionary will not be necessary in order to comprehend it.

* * *

If anyone has the idea that publishers of botanical journals are getting rich, he may ponder the statement of *The Plant World*, which after an existence of nearly six years announces in the July number that it is giving more than it can afford, and adds that it is unreasonable to expect the supporters of the journal to maintain it at a loss.

* * *

Although two-thirds of the subscriptions of THE AMERICAN BOTANIST expired in June, we have since received just two orders to discontinue. This we consider a remarkable showing for any journal, much less one still in its infancy, for there are always a few discontinuances to

be expected in subscription lists. It is probably unnecessary to add that we shall try to justify this kind of encouragement.

* * *

It is pleasing to note the increasing number of botanists who decline to upset well established plant names in deference to the much lauded rule of priority. Thus Dr. Grout in his recently issued "Mosses with Hand-lens and Microscope" says, "The principle of priority has been allowed great weight, but usage also has its claims and a name long in common use has not been discarded unless convenience and clearness seemed to demand it," and in the "Algæ of Northwestern America" by Professors Setchell and Gardner the authors hold that "A name which has been recognized for a quarter of a century or thereabouts is to be considered fixed and not to be unsettled simply because another may have been proposed earlier, but hitherto neglected for good or even for no real reasons." The strong common sense in such utterances will commend itself to all botanists who have the good of the science at heart, though the changing of names will probably continue to appeal to a certain class who have all to gain (in the matter of personal prominence) and nothing to lose, by such word tinkering.

* * *

Botany does not consist entirely of dry facts as some novices seem to think. There is considerable fun to be got out of it if one only knows how, as may be shown by the new and highly diverting pastime that has originated in connection with the genus *Cratægus*. In any other genus one would not think of founding species upon such trivialities as the color of the anthers or minor differences in the pubescence or rotundity of the fruit, but assuming that these *individual* peculiarities are of *specific* importance, it gives a waggish species-maker a chance to tickle the vanity of every acquaintance who ever cut a shillalah from a hawthorn thicket by naming a species after him. As soon as the news goes out that the hawthorns of any particular

region are being studied, we feel that now we shall soon know for certain who are the botanical worthies in the vicinity; for there are always enough new species found to allow one for each and leave a few over. It is the height of the young collector's ambition to have a species named in his honor and it must be exceedingly pleasing to him to know that the hawthorn genus has been found to be elastic enough to make this possible. In time to come one will only have to take down his botany and turn to the volumes on *Cratægus* to find a complete botanical directory, but we must insist that this scheme will never be complete until some method is found for adding the address of each person who figures in this botanical diptych.

BOOKS AND WRITERS.

Mr. J. Horace McFarland, well known for his excellent photographs of botanical subjects has prepared a "Book of Trees" which is to be issued in the fall by the Outlook Company. It will be, of course, profusely illustrated.

In June Dr. A. J. Grout published the first part of what is intended to be a fairly comprehensive hand-book of the mosses of the Eastern United States. It is entitled "Mosses with a Hand-lens and Microscope" and is practically an elaboration of his earlier "Mosses with a Hand-lens." The new work has the advantage of more and better illustrations, a large number of plates having been reproduced from "The Bryologia Europea" Sullivant's "Icones" and other sources. The first part, in addition to treating of several families of the mosses, is concerned with such preliminary matters as classification, nomenclature and the study of mosses. The life history and structure of the moss is thoroughly described and there is a full and well illustrated glossary. In the description of the mosses, their distinguishing characters are printed in italic, a very helpful feature to the beginner. (New York City, published by the author, $1.00.)

Special Notice.

Several vexatious and unavoidable delays, after most of this number was in type have made it impossible to issue earlier. The August number will follow shortly, and we hope to have the September number on time.

THE PUBLISHERS.

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CONTENTS.

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THE AMERICAN BOTANIST.

VOL. V. BINGHAMTON, N. Y., AUGUST, 1903. No. 2.

FERN-HUNTING IN LITTLE FALLS, N. Y.

BY MRS. H. A. DECOSTER.

IT seems rather strange, now, as I look back, that my interest in ferns was first aroused by a curious-looking plant which I did not know was a fern at the time, but which had, on the underside of its leaves, heavy brown lines of what I had always heard called "fern-seed." Of course I had seen and known ferns, or thought I knew them, for years. Their delicate beauty meeting me "when e'er I took my walks abroad" had been part of the pleasure of my woods rambles; but the depth of my ignorance will be apparent when I admit that I divided them all into three classes: brakes—ornamental and often quite picturesque in autumn, but coarse, and not desirable for carrying home; maiden-hair—dainty and beautiful always whether in the woods or in the house; and ferns. Under this last head was included everything else fern-like that I found in woods, swamps or meadows.

Every autumn I filled several plant jars and a dish for the dining-room with native ferns, learning by the slow but sure method of experience that certain ones, most feathery and attractive in October, were sure to be gone before Christmas; while others, less dainty in appearance, kept their freshness almost unchanged until spring.

Then, one day in late February, I took a walk through the woods on the North Hill and seeing several clumps of bright green rubbery leaves I went back the next day to dig up a few to replace such of mine as had succumbed to the combined influences of coal gas and furnace heat. It was while looking for these ferns that I made a discovery. Several huge rocks were almost completely hidden under

mats of fresh green. Long, narrow, dark-green leaves grew in a sort of rossette from the very rock itself, so it seemed, for when I took hold of a plant and gave a little tug it all came up in my hand and there was the rock, bare but for a sprinkling of leaf-mold. One curious thing that I couldn't make out at first was the way those leaves tapered. They narrowed very gradually from the base until they reached a point where it seemed the most natural thing in the world that they should stop. But they didn't stop. They went right on tapering until they could get no narrower and then they curved over toward the rock, making tiny green arches all bending outward from the center of the plant.

When you see a plant doing anything unusual you can always find a reason for it if you look long enough. I looked and looked and finally found a leaf which had gone down into the moss and from its point sprang a little baby plant which "favored" the parent sufficiently to remove my last doubt. Perhaps I had felt it in my bones at the time for I was more delighted than surprised and further search brought to light several other plants still fastened securely to the parent leaf.

I took one of the best specimens home with me and showed it to every one who came in. No one knew what it was or had ever seen its like before. I had no book on ferns to consult, but finally bethought me of two volumes of Torrey's "New York State Botany" banished to the peaceful seclusion of the garret because the terms used therein were as Greek to me. Once these books had saved themselves from a banishment even more remote than my attic by showing a fine plate of "giant St. John'swort" (*Hypericum pyramidatum*) when every other flower-book that I knew had been looked through in vain So to the attic I went, lugged the two heavy volumes down-stairs and began my search. Of course I found my plant, luckily, as in the previous case, there was a plate and it WAS a fern, a walking-leaf fern, or as the book further asserted, *Asplenium rhizophyllum*.

I found too that the description of those ferns marked "rare" tallied very closely with specimens I had found in the woods about home; even the walking-leaf was raised above its neighbors by the mark "not common."

Right in the nick o' time, the very next week in fact, I received a notice of the publication of Mrs. Parsons' "How to Know the Ferns." I have the harmless habit of writing in my books the date when they became my property; and I noticed in "How to Know the Ferns" the date is writted March, 1899. Since the date at the bottom of Mrs. Parsons' prefatory remarks is March 6, 1899 I could not have lost much time in availing myself to the opportunity to "know the ferns." I could hardly wait for April and May to bring them back. Before the weather was sufficiently warm to warrant any tender baby fern in pushing up through the ground I had found and named several of the hardiest sorts by the clumps of last year's fronds lying flattened against the earth, but still fresh and green. In May and June I thought I lived in a fern-lover's Paradise. In a sphagnum swamp lying back of the Wintergreen Woods I found the interrupted fern (*Osmunda Claytoniana*), the sensitive fern (*Onoclea sensibilis*) and the ostrich fern (*Struthiopteris Germanica*). In some what less swampy situations in the same woods I found the crested shield fern (*Nephrodum cristatum*) and Goldie's fern (*N. Goldieanum*). Other ferns of the commoner sorts grew there but I mention these as growing in greater perfection there than elsewhere.

On the North Hill where I found my first walking-leaf fern I found also the ebony spleenwort (*Asplenium ebeneum*) and maiden-hair spleenwort (*Asplenium trichomanes*). But my best fern-region in point of variety, was Cogoman Woods and the gulf below. In the deep, rich woods I found the narrow-leaved spleenwort (*Asplenium angustifolium*), silvery spleenwort (*Athyrium thleypteroides*) and maiden-hair (*Adiantum pedatum*) growing in greater profusion than I have seen them anywhere else. Here, too, were fine specimens of rattle-snake fern (*Botry-*

chium Virginianum) and ternate grape fern (*B. ternatum*). The evergreen wood fern (*Nephrodum marginale*) and spinulose wood fern (*N. spinulosum* var. *intermedium*) grew to great size here in the rich leaf-mold and the only specimen of Clinton's wood fern (*N. cristatum* var. *Clintonianum*) which I have found grew in these woods. In the gulf the bulblet bladder fern (*Cystopteris bulbifera*) fairly covered the rocks in some places, reaching out its long feathery fronds toward the little water-fall that almost disappears in midsummer. The fragile bladder fern (*C. fragilis*) grows on the rocks above the falls but is less common than *C. bulbifera*. On the opposite side of the gulf, just within the border of the woods, is a small patch of broad beech fern (*Phegopteris hexagonoptera*). Between woods and pasture the hay-scented fern (*Dicksonia pilosiuscula*) and the New York fern (*Nephrodum noveboracense*) make great beds of soft gray-green. The brake fern (*Pteris aquilina*) grows on the open slopes of the pasture and the lady fern (*Athyrium filixfœmina*) borders the woods and grows among the stones of the tumble down wall.

Most of these ferns were found in my first summer's fern-hunting. On the top of the Roll Way, an almost perpendicular wall of rock which shuts in the valley on the south, I found my first little oak fern (*Phegopteris dryopteris*) covering the shady knolls under the silver birches, and, lower down, where the rock formation is like that of the North Hill, were similar patches of walking fern.

Down along the River Road, in the swamps, the marsh fern (*Nephrodium Thelypteris*) grows abundantly, and east of the city, on the long stretch of barren rock called the Burnt Rocks, my first specimen of rusty woodsia (*Woodsia Ilvensis*) were discovered, growing side by side with saxifrage in crevices of the rock.

I had looked in the Wintergreen Woods and in several other likely places for royal fern (*Osmunda regalis*) but I never saw it growing until a bird-watching expedition led me far over the Burnt Rocks and into a marsh beyond.

Here I stumbled upon a few clumps with the fertile fronds in fruit and marked the spot as holding the only royal ferns in the vicinity. The next summer, however, in a cedar swamp on the Lansing Farm, a little below the city, I found *O. regalis* almost as common as *O. cinnamomea* and *O. Claytoniana*. The common polypody (*Polypodium vulgare*) is less common than its name would imply; it grows in profusion where it grows at all but I find it in very few places as compared with the other common ferns. The Christmas fern (*Polystichum acrostichoides*) grows in the woods everywhere.

My next find was a small station of slender cliff brake (*Pellæa gracilis*). It was June when I discovered them and both fertile and sterile fronds were at their loviest. I was one of a picnic party, but I happened to be alone walking along the edge of a creek and looking for ferns on the shelving rocks above my head. Suddenly I spied something new, a bed of ferns unlike anything I had seen before. They were so exactly like their picture even to the background they had chosen that I knew them at once. The last fern on my list was added last year, the little grape fern (*Botrychium simplex*). I found it in three quite widely separated localities but always in the same soil and with the same general surroundings.

Little Falls, N. Y.

TENDERFOOT NOTES FROM SOUTHERN CALIFORNIA.

BY CHARLES FRANCIS SAUNDERS.

THE world is so accustomed to hear of California's big fruits and vegetables that perhaps the botanical tourist from the modest East should not be surprised to find plant families which at home he knows only as herbs, represented in the Land of Sunshine by shrubs, and shrubs correspondingly by trees.

The evidences of this fact have contributed entertainment to many of our outings in southern California. The

first to attract our attention was a small tree of Santa Catalina Island which we noticed in January covered with a profusion of white blossoms. At the same time it was fruiting, and its bunched carpels numbering from three to six or eight or more and resembling the fruit of small peonies, betrayed its family position. It proved to be *Crossosoma Californicum*, a woody cousin of our eastern buttercups and anemones. In the canons of the San Jacinto Mountains we found in March another species of the same ranunculaceous shrub, *C. Bigelovii*, with smaller purplish blossoms and purplish fruit.

The little New Jersey Tea of the east that hugs the ground by the wood's edge, is represented in California by dozens of species, many of which are shrubs as high as a man's head and several are even arboreal in their proportions. The poppy family which is associated in eastern minds with its herbaceous members, the garden poppy, the celandine and the bloodroot, developes in California a stout shrubby genus—the tree-poppy (*Dendronecon rigida*) whose compact bushes, sometimes six or eight feet high, and starred over with large golden flowers, are conspicuous sights on the hillsides of their choice. The heath tribe which in the Middle and New England States are a lowly race, or at most, as in the rhododendrons, shrubby growths, include trees on the Pacific Slope—such as the exquisite madrons which Bret Harte has enshrined in worthy verse, and at least one species of the manzanita, own cousin to the creeping bearberries of the New Jersey Pine Barrens and the alpine tops of northern mountains.

Another of these arboreal daughters of Hesperus, for which our eastern education had not prepared us, was the elder. The Southern California species is *Sambucus glauca*—so named probably from the frosty bloom on its dark blue fruit—and although it is frequently only a large shrub, it is quite as often a strikingly beautiful tree, assuming many varied and picturesque attitudes of growth, so that a grove of it reminds one of an old apple orchard. The monkey flower, too, had a surprise for us, in a shrub-

by species three to six feet high. So, too, penstemon, the familiar beard-tongue of numerous species in the east and middle west is sometimes a shrub in southern California—notably a species with fat yellow blooms that adds beauty to some of the desert regions. The California branch of the waterleaf family, also, tends to shrubbiness, and includes one of the most famous of Pacific Coast medicinal plants, the Yerba Santa, or holy plant (*Eriodyctyon glutinosum*). Its bitter, aromatic leaves are highly esteemed in the domestic pharmacopœia as the basis of a home-made cold cure.

Pasadena, California.

BOTANY FOR BEGINNERS—V.

THE PETALS.

The petals are really the wrappings of the essential organs and when present are always found in a circle around the stamens and pistils. From the fact that the blossoms of many successful species are without petals, we know that they are not necessary to the plants' existence. They are therefore of secondary importance. They may serve to protect the delicate essential organs from cold and wet; they are helpful in obliging visiting insects to approach these organs in a way that will most surely effect cross pollination, while their bright colors are of service in attracting insects to the flowers in the first place.

Not only do the petals protect the essential organs in the bud, but even after the flower has expanded it is not uncommon for them to close again upon the approach of cold or threatening weather as does the adder's-tongue (*Erythronium Americanum*) the purslane and the scarlet pinpernel (*Anagallis arvensis*). A great number like the poppy, dandelion, bloodroot and hepatica close at night, while others close for a certain time in each twenty-four hours, though not always in the evening. Of these the morning-glory, four-o'clock, evening primrose, goat's-beard (*Tragopogon*) and catch-fly (*Silene*) are examples.

The petals are usually the most noticable parts of the

flowers being in shape like small leaves though far more delicate in texture and usually of some other color than green. Of all the organs they are least likely to vary from the radical number. In five parted flowers the stamens may be several times five and the pistils less than five, but the petals are nearly always of the proper number.

Taking a single petal it is not difficult to understand how petals may have originated from leaves. There is an expanded portion which corresponds to the leaf blade and is called the *lamina*, and a more or less stalk-like base which corresponds to the stem but which in petals is called the *claw*. Like the filament of the stamen and the style of the pistil this claw is often absent. Petals have many forms but possibly a majority have a shape that may be described as roughly heart-shaped. Such are found in the buttercup, geranium, violet, cinquefoil (fig. 13 *b*) apple and rose. In the buttercup the outer margin lacks the notch of the heart, in the mallow the notch is very evident, while in certain chickweeds and the pink family in general (fig 13 *c*) the notch is so deep that the petal is nearly cut in two, and the beginner often imagines he has found a plant with ten petals. Other petals may be linear, as in the witch hazel; in fact Nature has about as many patterns for petals as she has for leaves. In some flowers an added beauty is given the petals by their being beautifully fringed. The fringed gentian owes nearly all its popularity to this, and the starry campion and mitrewort though less known are equally well ornamented.

FIG. 13. Forms of Petals *a* Nasturtium, *b* Cinquefoil, *c* Catchfly.

Petals may increase by "doubling" as it is called until we have such flowers as the cultivated rose, buttercup, anemone and hollyhock. In such cases it is usually not a real addition of more petals by the flower, but a transformation of organs already existing, usually the stamens. In completely double flowers both pistils and stamens are absent, but in their places are petaloid objects

which show by many signs that they are the transformed and deformed essential organs. It is perhaps for this reason that the botanist has no special fondness for double flowers.

Most wild plants occasionally show examples of partial doubling, and it was from such sources that the gardener obtained his first hint of double flowers. The water lily is a noteworthy illustration of this showing in every blossom a complete gradation from petals through organs that are half petal and half stamen to the true stamens. The hepatica and rue anemone sometimes have one or more whorls of extra petals while the yellow pond lily (*Nuphar*) and the purple clematis (*Atragene*) usually have several rows of short petal-like scales at the base of the stamens. From facts such as these Grant Allen formulated the theory that all petals were originally derived from stamens, though the more natural inference would be that they were derived directly from leaves.

Nearly every color known finds its counterpart in the petals of flowers. The most common are yellow and white, while red, blue and violet are less plentiful in the order named. While this is true for plants as a whole, there are also seasonal variations. In the North Temperate Zone, at least, early spring and late autumn have the greatest proportion of blues, while mid-summer is given over to yellow, orange and red. It has been attempted, with considerable success, to show that there has been an evolution of color. The more primitive forms of flowers are nearly always yellow or white and the most specialized, blue and violet with orange and red flowers between. Some striking instances which are taken to indicate this evolution are found in white flowers which fade toward the next higher color (pink) as in the white trillium and certain evening primroses; while the flower buds of white flowers are often pink tinged as in the apple and the windflower. Again, blue flowers often have pink buds as the lungwort (*Mertensia*). It is found, too, that in all flowers having more than one color, the more primitive color is

nearest the center. Thus the morning glory has a blue or pink border but a white center; the bluet is blue on the margin, white within and yellow in the center. A large number of other examples may be found by anyone who will look for them among our common blossoms.

THE EARLY DAYS OF BOTANY.

BY DR. WILLIAM WHITMAN BAILEY.

IT was in seeking for simples to cure or palliate the wounds of war or ravages of disease; in groping among the plants of forest, field or mountain that the early physicians became acquainted with such crude facts as originally constituted botanical science. Toxicology, too, cherished a much too intimate relation to botany and to medicine. A knowledge of poisons often carried with it a great, though perhaps secret, political power. It was sometimes the part of prudence to decline invitations to the afternoon teas or evening banquets of the olden time. This, however, was not an unmixed evil. The experience gained from the experiments in diplomacy, these subtle acts of the ancient bosses, was, it is true, a terrible experience; the elimination of undesirable citizens or ambitous opponents, was a terrible power to exert; still, it served to add to the sum of human knowledge. What were found to be deadly drugs in large doses, might, in small ones, prove to be potential cures.

The so-called herbalists tried almost every plant as a remedy. It was nothing to experiment upon a slave; vivisection was not confined to guinea-pigs and rabbits. These early students formed into decoctions, tinctures, elixirs and liniments the plants or parts thereof, that they considered beneficial. Incidentally they learned much about vegetable structure, physiology and relationship. They were compelled to systematize—and hence gave us our first ideas of taxonomy. They, of course, saw that some families or genera of plants contained more potent members than others and were, in consequence, naturally led to look for properties in newly discovered individuals

of such groups. Thus to-day we look for useful plants among the nightshades, the crowfoots and the great groups of Rosaceæ and Leguminosæ.

These old writers published elaborate works, often, it is true, disfigured by gross analogies but at times showing close and patient observation and even profound erudition. Their drawings are still our marvel and envy, despite the fact that imagination often played with them most extraordinary pranks. The evolution of geese from barnacles was not the least marvelous of these deductions.

We must not forget the impulse given to research by the attempt to find an "elixir of life." In the chase after this will-o'-the-wisp, many philosophers spent their lives. However, they did not live in vain. As astrology was to the true science of astronomy; as alchemy was to chemistry; so was this search to botanic medicine. The elixir was elusive and still remains unfound, but by the roadside on which it was sought, were discovered facts that have enriched mankind, relieved uncounted woes, and added infinitely to the resources of science.

The pursuits of savage tribes of our own day throw light upon the advance of the race. We still see them seeking simples and ascribing virtues to inert weeds. Probably at the very dawn of human knowledge there began to be an acquaintance with the properties of plants. A few unhappy experiments would serve to indicate a poison; a chance cure to exalt a specimen into a panacea. Even fetish worship must not be disregarded in this consideration. We can easily see how such a plant as the poppy, relieving pain, or inducing sleep might come to be indued with sacred functions.

A seer, a necromancer, a practiser of physic, priest, prophet or even rain-doctor became among these tribes a "medicine-man." Such is the fore-runner of the physician. As knowledge was, for ages, reposed in the priesthood, we find ritual and incantation associated even with legitimate practice. It was but a step from such ceremonies to the claim of miracle. Often, no doubt, such foolery ex-

erted a certain hypnotic influence for good. The practitioners soon learned to play upon the credulous. Have they ever now ceased to do so? Consult any city newspaper for advertisements of quack-medicines, clairvoyance etc. A curious survival of ancient and later medieval study, remains in the so-called "doctrine of signatures." If a plant had kidney-shaped leaves it was good for reinic disorders. Pulmonary complaints would be cured by a plant of which the leaves were tubercular; hemorrhages by a red-juiced plant like blood-root. It is queer to find this notion abiding even now in certain rural districts.

Providence, R. I.

HOW THE NASTURTIUM IS POLLINATED.

BY WILLARD N. CLUTE.

IT is not necessary for the botanist to go to distant countries in search of things strange and new in his line; there are plenty still to be found here at home. Take the garden nasturtium (*Tropæolum*), for instance. This showy member of the geranium tribe, is so common in cultivation as to be known to everyone at sight and yet, how many could tell whether the blossom is designed for cross-pollination or the reverse, and if the first, how it is brought about?

In certain families of plants, such as the orchids, mints, figworts, etc., the specialized and irregular blossoms indicate at a glance that they have been modified to secure cross-pollination by insects. But it is not every insect that can reach the nectar such flowers secrete. They cater only to those insects that they can use to advantage and so get their pollen properly transferred with the minimum amount of waste. But the nasturtium blossom is more nearly regular than

these and at first sight seems to be one of those flowers like the buttercup or rose that is run wide open, offering its favors to any bee, bug or butterfly that may chance to pass, and notparticular about the way in which its pollen is transferred.

This, however, is not really the case. The blossom bears unmistakable indications that, in its tropical home, at least, it has certain good friends among the insects, whose visits it desires and whose services are promptly paid for. The long tube formed by the sepals on the upper side of the stem and containing nectar at the bottom could only be designed for the use of some insect with a proboscis long enough to sound its depths; and we may be sure that any insect for which these sweets are reserved is of value to the plant in the transferrence of its pollen.

The flower has also set up guides to this well of nectar, printed so plainly that even the greatest blunderer among its desirable winged visitors ought to be able to read and understand. On the two upper petals are fan-shaped streaks of darker color which point downward to the spur, and the inside of the sepals also have lines trending in the same direction.

Nor has the flower overlooked the machinery necessary to give and receive the pollen, for the eight stamens project forward about in line with the claws of the three lower petals and as they ripen, one after another rises up in front of the entrance ready to dust with pollen all who enter. After the stamens have shed their pollen, the style and stigmas, which up to this time have lain unnoticed in the depths of the flower, grow forward and take the position occupied by the stamens in turn. They are thus adjusted for brushing the pollen-covered insects that come from other flowers and so cross-pollination is effected.

But there are other smaller insects with a taste for sweets or even for pollen that, lacking the means to reach the depths of the spur, would not visit the flower in the right way and so only waste the pollen. These the flower has apparently tried to fence out by the line of erect

bristles across the inner sides of the three lower petals, and has also tried to throw them off the trail by three false honey-guides one on each petal that lead nowhere. The nasturtium evidently desires the visits of insects large enough and strong enough to disregard these bristling petals and who will enter the flower directly from the front. That it is successful in this, a few minutes observation in the flower garden will show.

In this part of the world the principal visitors are the bumble-bee and the humming-bird, both of which approach the flower in the proper way and doubtless are the chief agents in the transfer of the pollen. Butterflies, although equipped for getting the nectar, apparently seldom attempt to do so. Various small insects, however, have a liking for the pollen, but they seem never to find out the direct way to it. They always alight on one of the lower petals and wander about trying to get through the fence. Many give it up to try elsewhere, but others, crossing over to one of the two upper petals find themselves close to the feast. These clamber over the stamens and may be seen to literally scoop the pollen out of the anthers and stuff it into the pockets with which some of their legs are fitted. In this way they probably often help to dust the pistil with pollen and while wasting some and carrying away more may be of some benefit to the flower, though in less degree than the nectar loving bee who does not stop to eat pollen.

DEHISCENCE OF THE ANTHERS IN THE WITCH HAZEL.

BY ROSCOE J. WEBB.

EARLY in October, during one of my rambles, I noticed that the witch hazel (*Hamamelis Virginiana*) had begun to blossom and picked some flowering branches to carry home. Most of the flowers had just opened and many of the anthers had not yet dehisced. It is well known that the anthers of this plant open by means of lids, which, differing from those of many plants whose

stamens have them, open forward, that is, inward towards the center of the flower.

Cutting off one of the stamens for closer inspection under a magnifier, I was interested to observe that, caused by the warmth or dryness of the air in the room, in a short time the anther cells began to dehisce. First one lid slowly raised itself and began to swing forward on its hinge, then the other, until in a few minutes both lids had opened widely and stood back to back, each having completed a half-circle of revolution. There would have been nothing particularly noteworthy about this had it not been for the fact that it was not the lid alone that moved, but that *the pollen* contained in each cell *came out on the lid of the cell*, leaving the cell itself, perfectly empty.

This was true with all the anthers I examined, both those which had opened naturally and those which I caused to open. Sometimes both lids would rise together and swing rythmically forward, sometimes one would be more or less in advance of the other. This is doubtless a device for aiding in the pollination of the flowers. The pollen is thus moved forwards and placed in a very exposed position, so that any insect which comes to the blossom can hardly help getting some of it on its legs or proboscis and thus, if it visits another flower, effect the cross-fertilization that the plant desires.

Garrettsville, Ohio.

THE WANDERING MILKWEED.

BY E. S. GILBERT.

IT is a midsummer morning just at sunrise and the southern side of this thick grove of basswood, ash, maple, etc. lies in deep shadow, wet with dew. Between the beaten path and the tall trees the ground is overgrown with masses of strong plants two feet or more high and the air is filled with a pleasant smell which might be called a fragrance though close at hand it is less agreeable and has a suggestion of a potent bitterness. It is the Indian physic or wandering milkweed (*Apocynum androsæmifo-*

lium) of the dogbane family to which the European "myrtle" or periwinkle (*Vinca minor*) with its trailing vine, evergreen leaves and violet flowers belongs.

The oleander is another but the order is mostly tropical. There are rubber yielding trees and many a splendid flower among its species though it is a suspected tribe often or generally poisonous. If you are not familiar with the "fire on the mountain" (*Euphorbia heterophylla*) you do not know what Nature can do in the line of rich greenery but these leaves in many opposite pairs on long red tinted branches are noticeably fine in this way, smooth and deeply colored. The clustering flowers of thick substance remaining a long time without change have a deep five parted cup of purest white lined and stained with a beautiful tint of red; many a worse plant is carefully cultivated. It is a strong perennial but is not aggressive. Its long slender round red pods growing in pairs full of winged seeds are often seen above the snow in winter and the seeds must fly with the winter wind year after year but it does not spread. Its long running roots send up stems here and there but on the whole its narrow habitat here is the same as that of forty years ago.

Arkport, N. Y.

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 JAPANESE FERN NATURALIZED.—Mrs. A. P. Taylor has recently found the Japanese climbing fern (*Lygodium Japonicum*) often erroneously called *Lygodium scandens*, growing wild along a ditch in southern Georgia.

DROUGHT AND THE COLOR OF CLOVER.—In the spring we had a period of drought which seemed to effect the common white clover by making much of it (indeed nearly

all in this locality) show very *pink* blossoms. Has that point been noticed in other localities?—*E. W., Morristown, N. J.*

Color of Closed Gentian.—Probably there is no plant in the American flora with flowers of a deeper, darker more glowing blue than those of the closed gentian (*Gentiana Andrewsii*). We see only the outside of the corolla, for it never opens, but the color is so rich that it is very conspicuous among the green leaves.

Buds from Underground Parts.—A subscriber in Riverton, N. J. asks how plants like the pleurisy root (*Asclepias tuberosa*) are able to send up new shoots from any small portion that happens to be left in the soil. The explanation is, that plants under stress of circumstances are often able to produce buds on any part. Thus the roots of the *Asclepias* being still in full vigor, may send up new stems when the original ones are removed. There are several plants that regularly produce buds on their leaves, as the walking fern and the *Bryophyllum*, while most trees and shrubs may send out new shoots from latent buds under the bark. There are also underground portions of plants that must be considered in the nature of stems, such as the artichoke, potato and ground-nut (*Apios*), and these, of course, may send branches up into the air. Cases are not wanting, also, in which roots upon coming to the surface take on all the functions of stems. An instance of this will be found on page 115 Vol. III, of this magazine.

Crossing Orchid Genera.—The orchids are usually regarded as a very ancient family of plants and one rather on the decline at present. The different species are very distinct and do not intergrade in endless variations as certain other plants do. This fact has been cited as further evidence of the antiquity of the orchids on the supposition that all intergrading forms have had time to die out. Under these circumstances it is remarkable that species of *different genera* may be crossed with ease. According to the *Journal of Horticulture* various species of *Epidendrum*

have proved fertile when crossed with species of *Cattleya*, *Sophronitis*, *Lælia*, *Schomburgkia* and *Zygopetalum*. Other genera that have produced fertile crosses with the genera above mentioned are *Brasoavola*, *Bletia*, *Oncidium*, *Colax* and *Batemannia*. Still more astonishing is the fact that American and Old World species of different genera are readily crossed. This puts the facts concerning hybridization in a new and unexpected light.

The Fragrant Shield Fern.—I have found the fragrant shield fern (*Nephrodium fragrans*) at Drums Notch near Andover, Me. Gray speaks of it as at St. Croix Falls and northward. As there is a fall at Drums Notch, I have always associated the species with falls in a mountainous region.—*E. W.*

A Saponaceous Family.—Several species of *Ceanothus* in the West produce a lather when rubbed up in water and Mr. C. F. Saunders, who has been experimenting with them in California, recently asked the editor of this journal if our family New Jersey tea, *Ceanothus Americanus*, possessed the same properties. The editor did not know but immediately set out upon the trail of this information. At the time the plant was just going out of bloom and the blossoms, of which a quantity were gathered, gave no indications of soapy qualities. The young fruit, however, yielded better results and a fair lather was obtained from a single handful. The saponaceous matter seems to reside in the covering of the seed capsule and the persistent base of the calyx.

More About Odd Odors.—Speaking of odd odors, of which your June issue has something to say, you would be endlessly entertained by the malodors of this California flora. It seems as though almost every wild plant that one finds in the semi-arid regions has a pronounced smell. The ubiquitous white sage (*Audibertia polystachya*) famous for its honey making qualities, has so strong an odor of camphor that a dog running through the chaparral where it abounds, will bear the smell of it in his coat for

quite a while. The foliage of the California bay (*Umbellularia California*) reeks with the odor of bay rum and to smell it for a few minutes will develope headache. Over in the San Jacinto Canons we came across an asclepiad (*Sarcostemma heterophylla*) which for vileness of smell beats anything vegetal that my nostrils have so far encountered—a sort of sublimated essence of stale garlic and onion, like the smell you generally encounter in the entry of a third rate boarding house multiplied by a hundred—so we got into the way of calling it "the third-class boarding house plant." So do common names arise.—*C. F. Saunders.* [The probable explanation of the strong odors possessed by plants in arid regions, is doubtless to be found in the fact that certain oily secretions help them to resist evaporation. These oils would therefore be likely to abound in plants of dry regions, and as most of them are strong scented, the plants would naturally give off the same odor.—Ed.]

The Definition of a Weed.—I have been interested—and somewhat preturbed (mildly) as to the definition of a "weed" and I have struck upon three definitions. The *botanist's*: A weed is a plant out of place. According to this a rose plant would be a weed in a cornfield. The *gardener's:* A weed is a plant which grows unbidden, and insists on surviving under no matter what adverse conditions. You may expose the roots or give other unfavorable conditions and it insists on living and doing what it can to make it unpleasant for the plants you wish to raise. The *popular:* A weed is a plant of spontaneous growth. In some cases the three are in accord, in others they are at variance.—*E. W.*

Editorial.

It is our wish that every subscriber to this magazine who is preserving the back numbers may have complete files and to that end offer to replace free any missing numbers if requested to do so at once. As the supply of certain issues is nearly exhausted, this offer holds good only until they are gone. Look over your files and make your requests now.

* * *

Doubtless many of our readers noticed that the words pollinate and pollination used several times in the July number were invariably spelled pollenate and pollenation. This is not due to any desire on the part of this magazine to establish a new way of spelling but is to be charged to the compositor who mistook the i in these words for an e doubtless reasoning that if pollen is spelled with an e, pollination should be, also. In the hurry of getting out an already delayed number, the proof reader overlooked the mistake, but it did not escape our eagle-eyed readers. We are glad, however, to have such excellent proofs that the magazine is closely read as are these letters calling our attention to the error. We are not sure but what it would be a good plan to make an intentional slip, now and then, just to see if we are still holding the attention of our readers!

* * *

In the spring and summer of 1902, the valley in which this journal is published, received daily rains for nearly four months. This year the weather went to the other extreme and a drouth of fifty-four days was the result. In both cases great damage was done to wild as well as cultivated plants. The drouth was especially hard on the early spring flowers as it occured when they were perfecting their corms, bulbs and rootstocks for another season. In many places the adder's-tongues (*Erythroninm*) with-

ered before completing their season's work. Many other plants died outright. At first glance such extremes may seem wholly inimical to plant life, but a more careful survey appears to indicate that occasional trials of this kind are beneficial to vegetation in general by weeding out the weaklings. Plants that can endure being nearly drowned one season and nearly scorched the next ought to be proof against anything other seasons may have in store for them.

BOOKS AND WRITERS.

Floral Life for August appears under new editorship, John Habberton, author of "Helen's Babies" and other well known works having succeeded S. Mendelson Meehan.

Bee keeping is so nearly allied to gardening—each being in its widest sense somewhat dependent upon the other—that it is no surprise to find "The Book of the Honey Bee" among the handbooks of practical gardening from the press of John Lane. This new book is by C. Harrison and treats the subject of bee keeping in all its phases, describing the making of hives, the arrangement of the Apiary and the marketing of the honey as well as the general care of bees. The book is uniform in style with those that have preceded it in the series, and is well illustrated. (New York, John Lane, $1.00 *net*.)

The whole subject of variation in plants and animals seems to be one that biologists know comparatively little about. In recent years, various experimenters, have been amassing a great number of facts on this subject, some of which have become familiar to botanists through the experiments of DeVries with the evening primrose. In Dr. H. M. Vernon's new book on "Variation in Animals and Plants" we are given an up-to-date presentation of all sides of the subject. The book is divided into three parts, entitled "The Facts of Variation," "The Causes of Variation" and "Variation in its Relation to Evolution" respec-

tively. In the first part the measurement of variation chiefly from the mathematical standpoint is considered together with discontinuous and correlated variation. In Part II the effects of temperature, light, moisture, salinity, food, etc., upon developing organisms is discussed, this part constitutitg the bulk of the 400 pages in the book. The third part treats of the action of natural selection on variations. An immense number of experiments are detailed, the book in this respect being one of the most complete to be found. All students interested in systematic botany will find much food for thought in its pages. (New York, Henry Holt & Co.)

The completion of Dr. John K. Small's "Flora of the Southeastern United States," which covers the region from North Carolina to Arkansas and Texas and south to the Gulf, adds a most remarkable volume to the botanical literature of America. Manuals we have had, heretofore, that made species of many mere forms, but in none has the division of species been pushed half so far as in this. It is the author's belief that any plant possessing a single permanent distinguishing character no matter what that character may be is entitled to specific rank and he has apparently kept this precept well in view during his work. However much we may differ from him in our opinions regarding various features of the book, it cannot be denied that the work has been most carefully and conscientiously done. It is safe to say that never in the history of American botany have the plants of any region received more thorough study or more accurate description and the author is to be congratulated upon the completion of so stupendous an undertaking. While students of our southern flora are thus greatly indebted to Dr. Small for his exact delimitation of the forms it contains, it may well be questioned whether, owing to the absence of anything to indicate which are, and which are not, species in the recognized sense of the word, the book will ever supplant Dr. Chapman's excellent and less elaborate flora of the same region. It will probably be impossible for a novice using

this book to identify the plants he may find. For instance, there are 184 species of *Cratægus* given, while other books name less than fifty. In the key for separating these one frequently finds such expressions as "anthers pink" or "anthers yellow" as the sole distinction between species. Since the hawthorns bloom for only a few weeks, it follows that Dr. Small's key, or rather Mr. Beadle's is of use only once a year! It seems absurd to claim 184 species of hawthorns for the Gulf States, but we are told that the species given are based upon material in the Biltmore herbarium, only. Along with this inclination to split up recognizable species, is a similar tendency in the treatment of genera. Where one genus was once enough we now have several often apparently selected with a whimsical regard for assonance as *Oxalis*, *Ionoxalis*, *Monoxalis*, *Lotoxalis*, *Xanthoxalis* and *Paronychia*, *Anychia*, *Odontonychia*, *Siphonychia*, *Anychiastrum*. If narrowing the generic lines will facilitate the study of plants, no one will begrudge the author these new ones; but no such excuse can be shown for changing the names of several orders which have the authority of universal use for existing. What is gained by substituting Opuntiaceæ for the better known Cactaceæ? Or Frangulaceæ for Rhamnaceæ? These seem over refinements prompted by a regard for form rather than for substance. In this book the well known Umbelliferæ, Labiatæ and Scrophulariaceæ are discarded and in their places one finds Ammiaceæ, Lamiaceæ and Rhinanthaceæ. Juggling with the names of the orders is a comparatively recent practice, but the possibilities for changes are numerous. It has not been long since Leguminosæ gave place to Papilionaceæ but now this is superseded by Fabaceæ. Some idea of the immense amount of change this book would introduce into the botany of the South may be gleaned from the fact that in addition to a large number of new genera and species there are more than six hundred new combinations of generic and specific names. It is fairly well printed, though it is manifestly too great an undertaking for the company

who did the work. The book is too large for class and field use, since it contains nearly 1,400 octavo pages and weighs about six pounds, but as a work of reference it will be invaluable to all southern botanists. It is to be hoped that the author will some day give us a smaller volume, in which the less important segregates from older species may be indicated in some way. (New York, Published by the Author, 1903, $3.60 *net*.)

A new fern book that fills a place between popular handbook and scientific manual has just been issued by Dr. C. E. Waters. It is entitled "Ferns" and covers practically the same ground as the popular books, but with a chapter on fern photography and a key to the species based on their stipes, added. There is, of course, another key based on the usual characters for identifying ferns. Upward of 200 illustrations are given, all from photographs, among which is a series of illustrations of the sori enlarged. These latter are especially good and form a unique feature of the book. In the matter devoted to the species, the technical description is first given after which comes more or less comment, principally from the author's experience with ferns in Maryland. The nomenclature follows that generally accepted in America and old names are therefore for the most part unchanged. The book is remarkable, however, for the entire absence of citations of authorities for these names. The principal criticism that can be made of the book, is that the author has been very reluctant to give credit for recent work. He has included many forms lately described but has entirely omitted to say who described them, or where they were described, thus preventing the beginner from looking them up further for himself. The book is an octavo of about 350 pages, and very well printed. (New York, Henry Holt & Co., $2.75 *net*.)

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THE DEFENCES OF PLANTS.

BY DR. WILLIAM WHITMAN BAILEY.

FEW persons think of the ways in which plants defend themselves against enemies or agressors. The facts are so patent that we fail to notice them. Eight people out of ten have their eyes shut to all natural phenomena. Sometimes we have thought that we shall be held accountable for our neglect; but this is trespassing on metaphysics.

Even the least observant have had experiences with thistles, briers, prickly-pears and the like. The trouble is that few persons ask the why and wherefore of things. There is a reason for every hair or thorn. The study of these defences is one of the most fascinating branches of botany; a division of that delightful science, moreover, not hedged about with technicalities. Terms are the bugbears of the beginner; here we have few to deal with.

It stands to reason that the flowers and fruits, so important themselves, should be in some way protected. We often find them so guarded by most ingenious contrivances. Many plants, like the catch-flys, have bands of sticky secretion at the nodes. In this adhesive matter ants or plant-lice get mired. But suppose it should happen that a blade of grass blown against the stem, acted as a step-ladder to the aggressor. Nature provides for such a contingency by repeating the protection at the superior nodes. A still neater contrivance is isolation by water. Every one knows how in the East, where ants are a crying nuisance, tables are protected against their depredations by immersing the legs in water; or how sometimes a florist will protect a tender plant by setting it's pot on an-

other which is half immersed. Now, some species of "teasel" have the opposite leaves so united around the main stem as to form a cup. This is partly filled with water, which, of course, isolates all the stem above.

In our water knot-weed, a plant common to both hemispheres, if the individuals are growing in water, no hairs are developed on the stem. If, however, it happens during the summer that the pond dries so far as to strand the plants, at once protective hairs make their appearance. Great use is made of hairs by many plants. Often they have their points directed in the way of intruders, much like a military *chevaux-de-frise*. Insects readily pass over them when proceeding, so to speak, *with* the grain, but are much embarrassed by them when going in the opposite direction. Wool or down, too, is often an effective hindrance to ants, aphides, etc. Slugs are excluded by sharp prickles. As in the case of law, total prevention is not expected, but a reduction of crime to a minimum. If all the contrivances succeeded we should have the millenium.

The fearful little spines of the prickly-pear, or bayonet like thorns of other Cactacæ, make them formidable to the largest animal. *Nemo me impune lacessit* is the motto of the thistle, poetically assumed by Scotland. "Touch-me-not" is the fighting word of *Jatropha urens* and many a stinging nettle. "Don't tread on me," the warning of burgrass. Look at the prickles of nettle under a glass and see what a fang is here—a serpent-tooth with a poison-gland!

Prickles, as in the rattan, and some other plants, often serve another purpose; they aid the plant in climbing. The rattan, according to Wallace, has been found 600 or even 1,000 feet in length. It attaches itself to the jungles and copses by its prehensile hooks.

Acrid, poisonous or sticky secretions are much used by plants in their defence. The reader will at once think of many plants provided with such juices—the milk-weeds, spurges, dandelions, celandines, lettuces, hawkweed, pop-

pies and the like. Juice, which when first issuing from a plant is liquid, very quickly hardens. Such is the case with many milky secretions. An ant climbing a stem, punctures the epidermis with his sharp claws, when at once the milk exudes, quickly sets, and holds the intruder an unwilling victim. He will try to cleanse one foot and thus mire others, and often perish miserably where he is first caught. The use of acrid secretions is well seen in our common tall buttercup, which, until cut and dried, is well avoided by our grazing cattle. Often herds will shun some plant which to us exhibit no obvious cause of avoidance; they simply don't like it. Bad or pungent odors, like that of chamomile, are powerful preventives of aggression.

In Bell's "Nicaragua," one of the most charming books of natural history travels ever written, we are told of a species of acacia which is singularly protected by ants. These live in the hollow stems or thorns, and when the plant is touched or roughly shaken, emerge in swarms for its defence. No doubt their primary object is self-protection; but in repelling their own enemies they guard as well the shielding tree. Indeed, in some species of Myrmecodia from the East, it would seem that the life of plant and ant was so inter-woven that neither could exist without the other.

Brown University, Providence, R. I.

COLLECTING SEEDS.

BY M. F. BRADSHAW.

BOTANY, always interesting, becomes absorbing when one has to search for a new plant. Having become acquainted with the plants of my locality so well that finding a new one marks a red letter day, I was wondering last spring where I would find material for study.

One day it occurred to me to collect and study seeds for a special work this summer. While I was considering whether it would not be a lot of drudgery for a very little gain and whether it might not be rather ridiculous to add

another "collection" to those already in the house, I saw a little editorial note in THE AMERICAN BOTANIST that crystalized my intention.

So I began with little interest at first and still with the notion I was most likely adding another burden to an over full life; but before long I began making discoveries. Every plant has different seeds, while they keep some sort of family likeness. All of them are pretty and many of them are wonderfully beautiful, seen with a lens. Then the variety of seed vessels and the cunning arrangement of seeds in such infinitely various ways.

I had no idea how much of the beauty of flowers went deeper than the surface. Everybody admires them, the artist sees also beauty in the color, grace and pose of the whole plant. But the botanist is going to find more than these; he finds the wonderful structure of the plant inside, and many things hidden from all the world but him.

Then it did not take long to fill me with amazement and chagrin to find how many things I do not know about the commonest and most familiar plants. For instance, the mustard. We have two species here—which you can't make anybody believe—and only a botanist knows. They look alike in every respect to an ordinary observer and I am sure I cannot see any difference in their flowers; but I know that *Brassica campestris* has some clasping upper leaves, and that in *B. nigra* they all have petioles.

I also know that *campestris* comes earlier and that *nigra* grows larger. In fact, I thought I knew all about mustard, for it grows everywhere in all vacant places and sometimes we drive through groves of it on country roads. But imagine what I thought of myself when I came to gather the seeds and found that *B. nigra* has a long rachis with seeds pods not more than three-fourths of an inch long and a line or two wide, lying close—quite parallel—while *campestris* has seed vessels two or three inches long, inflated, and standing at right angles to the stem quite like the garden radish.

And so it has been with many other plants and I find I have a new world to conquer.

It is possible in many cases to identify a plant by its capsule and in some families—in all families for anything I know—the seeds look enough alike to tell where the plant belongs.

Again there are some of the most clever and wonderful arrangements, noticibly one of our wild flowers of the Hydrophyllaceæ. It is a slender herb a foot or two high in favorable situations, much branched and very delicate. The flowers are white, something like heliotrope, and the leaves are finally cut more like a skeleton leaved geranium than chrysanthemum, as the name, *Ellissia chrysanthemifolia*, implies. Though pretty I never considered it anything very wonderful till I thought to collect the seeds.

The capsules are globose and have four cells, one round, black, rough seed in each cell and all looking very perfect and complete. You might shell out a quantity and not suspect there was anything further to find, but there are two more seeds.

In two sides this capsule is a little thickened and when picked open with a needle we find a seed in each, not like the others, but larger, almost flat, paler in color and shining smooth.

Now why this sly hiding away of two extra seeds? Why not four, I would like to know? Has any other known plant this peculiarity?

Instead of the anticipated drudgery the new pursuit has been fairly fascinating; I am continually finding something new to admire and wonder at, and as for the benefit to a botanist, it is an education. And if you want to find out how many things you don't know, just try collecting seeds.

Perfectly cleaned and properly put up in small vials with a slip inside containing name and number, they are lovely, a "collection" to be proud of. I have only begun, not having more than ninty-five kinds, but enough to see, in a measure, the great value of the knowledge I am gain-

ing and enough to make me wish to recommend it to other amateurs like myself who have overlooked this part of the study of plants.

Orange, California.

BOTANY FOR BEGINNERS—VI.

MODIFICATIONS OF THE PETALS.

As a general thing the petals are the most conspicuous parts of the flower, in fact their chief use seems to be to attract as much attention as possible. To this end they are usually brilliantly colored with flat expanded blades that show off to the best advantage. But there are other organs nominally petals that have little in common with these, having taken on such strange forms that even the young botanist would scarcely recognize them.

Disguises of this kind seem to run in certain plant families of which the crowfoot or buttercup family is a striking example. Some members of it, like the buttercup, marsh marigold (*Caltha*), anemone, clematis and hepatica are guiltless of the habit but in their relatives, the larkspur, monk's-hood, columbine and others, it is very pronounced. In the monk's-hood (*Aconitum*) the colored sepals are often taken for petals, for the latter are neither conspicuous nor petal-like. Two of them are hood-shaped on long claws and function as nectaries (fig. 14 *a*.) While the other three are so small and narrow as to scarcely be distinguished from the stamens. In the gold-thread (*Coptis*) the sepals are white and petal-like, while the five real petals have dwindled to club-shaped organs that are usually mistaken for stamens. In the larkspur (*Delphinium*) the four petals are united into a spur, while in the columbine (fig. 14 *c*) each petal forms a hollow horn

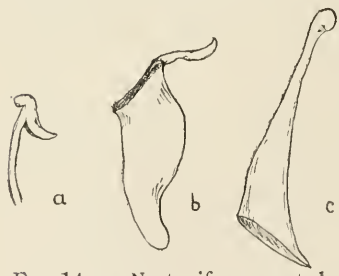

FIG. 14. *a* Nectariferous petal of monk's-hood, *b* sac-shaped petal of Dutchman's breeches, *c* tubular and nectar-bearing petal of columbine.

or spur that bears nectar at the farther end. In the hellebore the petals are short, tubular and two lipped. In the Dutchman's breeches (*Dicentra*), of the fumitory family, the two petals are large and sac-shaped (fig. 14 *b*).

APPENDAGES TO THE PETALS.

As we have seen, many, perhaps all, the transformed petals are concerned in secreting nectar. Of the same nature, also, are many of the appendages possessed by petals, such as the scale on the claw of the buttercup petal (fig. 15 *b*) and the appendages in the corolla of the water leaf (*Hydrophyllum*). Other appendages, however, are manifestly for different purposes. The scales in the throat of the corolla of certain borrage-worts, notably comfrey (*Symphytum*), forget-me-not (*Myosotis*) and hound's-tongue (*Cynoglossum*) are certainly for keeping small insects away from the nectar and pollen, and the folded appendages between the petals of certain gentians are doubtless for the same purpose. Other appendages of like nature may be seen in the outgrowths from the petals of many catch-flys (*Silene*) at the juncture of claw and blade, (fig. 15 *a*) and in the narcissus where it forms a deep or shallow cup. To such structures the name of *crown* is given. In the milkweed family (*Asclepias*) the crown (fig. 15 *c*) is usually the most noticable part of the flower, the petals and sepals being more plainly colored and reflexed. Instead of a crown or scales in the throat of the corolla many plants bear tufts of hair or wool. It is a singular indication of the use of such outgrowths to find that when the flowers are upright and likely to be visited by insects from any direction, all the petals bear this tuft of hairs; but in species with flowers facing sidewise, only the lower petals

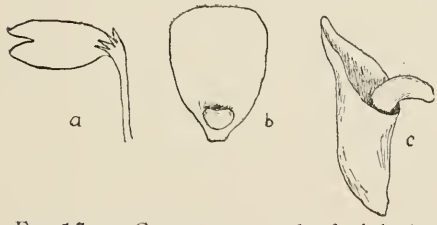

FIG. 15. *a* Crown on petal of pink, *b* scale on petal of buttercup, *c* one of the five lobes with its horn from the milkweed crown.

upon which the insects naturally alight are thus decorated. This is well seen in the garden nasturtium.

CONSOLIDATED PETALS.

In the least specialized flowers each petal is distinct and separate but one can scarcely walk a rod along a country roadside in summer without finding many flowers in which the petals are variously joined together. Some, as in the flowers of the elder (*Sambucus*) are only joined at base, others like the partridge berry (*Mitchella*) and the phlox are joined half way to their tips, while in the morning-glory and petunia the five petals are completely joined and the corolla appears as if made of one piece. However, as in the case of consolidated stamens and pistils, the petals are seldom so completely joined as to leave no trace of their union. Indications of this may be found in the number of lobes on the border, and in the markings of the interior. When the parts of the corolla are united at all, it is called a *gamopetalous* corolla, when it consists of separate petals, it is a *polypetalous* corolla.

The gamopetalous corolla may be *campanulate* or bell-shaped as in the dog-bane (*Apocynum*) and hare-bell (*Campanula*), *rotate* or wheel shaped as in the tomato and star chick-weed (*Trientalis*), *cup-shaped* as in the mountain laurel (*Kalmia*), *funnel-form* as in the morning-glory, *salver form* as in phlox, petunia and nicotiana, *urn-shaped* as in most of the heaths and *tubular* as in certain honeysuckles. The difference between tubular, salver-form and funnel-form corollas is, that in the first there is no speading border, in the second there is a spreading border at the top of the tube, and in the last instead of tube and border the corolla gradually widens from the base upward. In composite flowers like the dandelion. hawkweed, lettuce, etc., the corolla is *ligulate* or strap-shaped. It appears as if it might have once been tubular, but was afterwards split down one side and flattened out. We can still see evidences that it is five-parted by the five lobes at the tip and by the longitudinal marks of the union. In the sunflowers. asters and the like, the outer ray flowers are ligulate and those in the center tubular.

Two other familiar forms of corolla deserve mention. One is the *bi-labiate* or two-lipped in which the corolla is unequally divided with three petals forming one lip, and the remaining two, the other. Illustrations of this are at once called to mind by the snapdragon, toad flax, catalpa, bladder-wort, fig-wort, turtle-head, beard-tongue, monkey-flower and fox-glove. The second form is called *papilionaceous* or butterfly-shaped and is most common in the great bean family. The sweet pea is a typical flower of this kind. In such flowers the petals have different names. The broad upper petal is the *standard*, the two side petals are the *wings* and the two lower petals, usually form the *keel*.

POISON IVY AND ITS EXTERMINATION.

BY CHARLES FRANCIS SAUNDERS.

IN view of the great number of people who are subject to rhus poisoning and who are annually made sufferers from it, does it not seem strange that no systematic effort is made to rid the country of this pest? It is a plant that serves no good purpose in the world and is distinctly a menace to human comfort. Why then is its existence tolerated? There would appear to be no physical obstacle to its eradication, if a determined and intelligent movement were started to that end. Of course, it would take work, but it grows and spreads most luxuriantly near the abodes of men where effort is most readily expended upon it. Any land owner whose property now harbors it could, at the cost of a comparatively small amount of time and labor, have it torn down from his trees and fences and uprooted in his fields; then as the new shoots put up they might be cut off at once, and on subsequent reappearing nipped down close again. A plant that is not allowed leaves to breath with and digest with, must eventually die of suffocation and mal-nutrition, and poison ivy is no exception to the rule.

Again it is possible to do something by making use of the aid of other and more vigorous plants that will

smother it out. A gentleman whom I know intimately and who has an estate near Philadelphia, has seen it eradicated entirely from a large part of his grounds by the common Japanese honeysuckle. The latter took a fancy to a certain sunny slope where the rhus had been very troublesome and spreading gradually it choked out every vestige of the rhus in the course of a few years.

America is a big country and it may seem like a labor of Hercules to get rid of so prevalent a weed, but if the will exists it can, one would think, be exterminated quite as surely as any attractive bird whose plumage the milliners desire. Perhaps, too, the aid of legislation might be had in the shape of an imposition of fines and penalties upon property holders who permit the nuisance on their ground. It may be urged that the public have no say in what a man shall raise on his own land; but on the other hand it seems unreasonable that people who visit his place on business should be exposed without redress to such a nuisance, and that the traveling public should be constantly subjected to the needless peril of poisoning from the veritable hedges of the plant which through the carelessness of some land-owners border many of our highways. If a man may be enjoined by law from letting a vicious dog run at large or from keeping diseased cattle in his herd, why may he not be made the subject of prosecution for permitting the existence and spread of this public nuisance of the plant world?

There has of late been some praiseworthy activity in establishing societies for the protecting of our wild flowers. An equal need seems to exist for a society for the extermination of poison ivy; but to be a live organization, its officers and board of managers would best be persons who "take" poison and know its tortures. Such would realize as none else could, how worthy would be the aim of a society of that kind; and every fellow sufferer the land over would doubtless be glad to subscribe to the cause.

Pasadena, California.

VARIATIONS IN THE COMMON POLYPODY.

BY J. C. BUCHHEISTER.

Fig. 1.

TO gain a complete knowledge of any fern it is not enough to collect and to study the type only. Varieties and forms are equally to be noted. Variety hunting is not only a logical and legitimate sequence of the pursuit of species, but is also full of scientific interest. Whether some of such varieties are to be elevated to the rank species or not, has nothing to do with the case. The "species makers" should not go to extremes, of course, but on the other hand those, who will acknowledge nothing but the type, are wrong also.

Acting upon this conviction I began this season an investigation of the common polypody (*Polypodium vulgare*) with the result, that I have now a series of interesting forms and varieties, the existence of which was unknown to me, since I had contented myself with the collecting of the type, and imagined that I knew all about this "common" fern.

All ferns are inclined to fork and to sport otherwise, and I have quite some experience in this line in regard to the Christmas fern (*Polystichum acrostichoides*) and others but I never knew of what our polypody is capable of until I found such specimens as are here shown. Fronds slightly crenate are frequent, but the form figured in No. 1 is distinctly lobed. Usually the fronds are large while the stipe is short.

Figure 2 *b* represents a form in which the fronds are narrow lanceolate and the pinnæ short, blunt and rounded. Figure 2 *a* is the opposite form. The fronds are broad and the pinnæ long and tapering to an acute point.

Figure 3 is the most remarkable variety of all those observed this fall. It might be called variety "*auritum*" on account of the conspicuous "ears," the lower pinnæ are decorated with. Not only the lowest pair, but often several other pairs above have these remarkable ears. The outline of these fronds is broadly triangular, *not* lanceolate, with a remarkably long apex. They do not grow on the top of exposed ledges as does the type, but on low rocks in shady, rather moist and moss grown situations.

Fig. 3.

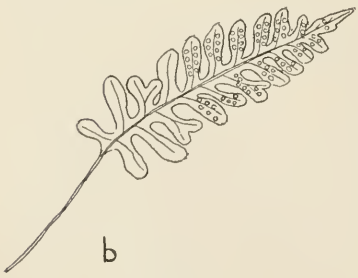

Fig. 2.

Finally we have the variety figured in figure 4. They

may be the the variety "*Cambricum*," and if not, they are certainly close to it. I found only these two fronds. They seem to be exceedingly rare.

FIG. 4.

Although the sori of *Polypodium vulgare* are among the largest produced by any fern, yet I found them frequently of extraordinary size. Often I found them all destroyed by a small whitish worm, the larva of some bug or fly probably, which feeds on the sori, but leaves the fronds intact.

Under favorable circumstances this species is a regular "tree-fern." I have often seen it growing on moss-covered old trees, quite a distance up, or in the crotches of such old trees, where a little humus and a layer of moss had accumulated. It is an evergreen species but it seems that not all fronds go unscathed through the winter. Under the influence of a severe frost the younger fronds curl up sideways with pinnæ inverted and frequently die. Then the pinnæ decay, the stipes fall down and next summer out of the decaying dead stems a pretty little fungus arises, long stemmed, about two inches high, with a little yellowish pileus, with white lamellæ. I do not know its name, but I notice it always growing on the rotten stipes of last year's *Polypodium vulgare*.

Griffins Corners, N. Y.

THE JEWEL WEEDS.

BY E. S. GILBERT.

IN early spring, before all the old snow has gone and only the hardiest plants are beginning to appear—wild leeks, adder-tongues, claytonias and the like—while you see that the grass is greening at least in some places, you may find in damp rich soil along spring runs or near the

larger brooks many broad-leaved seedlings with smooth rounded seed-leaves very numerous and conspicuous. They are jewel weeds, probably *Impatiens fulva* for this species is more common than *I. pallida* though the latter may be plenty where it grows at all.

The garden balsam and the "every day flower" (*Impatiens Sultani*) are of the same genus and there are others in Southern Asia but we only have the *fulva* and *pallida*. *I. noli-tangere* is found in Europe and John Burroughs states that our *fulva* is naturalized in Scotland and is spreading fast along certain rivers.

The snow or freezing rain may cover these seedlings again and again, the ground may freeze any number of times; it is nothing to these hardy plants. Soon there is a branching bush (it may become five feet high) of most graceful habit and with beautiful smooth foliage forming with its numerous comrades dense thickets all over its chosen ground or standing alone as it may be, covered with lovely and curious flowers, budding and blooming month after month. The young leaves put into water show a quicksilvery reflection and formed one of the diversions of childhood. Silver leaves, we called them. To explode the ripe pods was another resource of our younger days. Touching the capsules tip carefully with the finger the pod would split and the pices coil up so suddenly that capsule and seeds would all fly to some distance. You hear them sprinkle all around but the whole pod has vanished instantly.

The garden balsam pod splits and coils in the same way. Very likely it is also explosive in its East Indian home, our paler sun not being able to perfect it. Botanists do not altogether agree as to the structure of these singular flowers. The two little greenish leaves above all the rest (really below but uppermost as the flowes hangs from its pedicil) are sepals and the large spurred sac is also sepaline. The orange sac of *fulva* is richly spotted inside with red-brown, something like the sac of the orchid *Cypripedium pariflorum* while the petals are also thickly spot-

ted. The lemon-yellow flowers of *pallida* have only a few dark specks.

There is not so much poetry connected with these plants as with the violet or a daisy, but that is not their fault; it arises from a lack of poets. To be sure they have no fragrance which is perhaps a draw-back. Still, they have as much as the daisy does.

Some expert hybridizer should try his hand on the jewel weeds. Once started on a career of variation, white, crimson, tiger spotted, and other sorts of flowers of many sizes and forms might be ours. Who will undertake it?

Arkport, N. Y.

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 NATURAL CHEWING-GUM.—The spruce and the sweet gum are not the only plants that afford a natural chewing-gum. On the western prairies the rosin-weed (*Silphium laciniatum*) exudes a resinous substance that after it hardens may be used for chewing. Country boys are wont to pull the flower-heads from the plant and to return later for the hardened juice. This same *Silphium* is familiar to many by the name of compass-plant and it is probably the species to which Longfellow refers in "Evangeline." Its leaves are as large as the largest leaves of the burdock, but cut something like an oak leaf. These great leaves are always held aloft with their edges, instead of their sides, turned toward the sun. Those who believe plants possess consciousness might fancy this indicated the plant's desire not to be overlooked. At any rate it seldom is. Wood says this plant produces columns of smoke in the burning prairies by its copious resin, but such sights are not as common as they were in his day.

Willow Bark for Smoking.—Further correspondence in *The Atlantic Slope Naturalist* brings out the fact that the so-called "red willow" used for smoking by the American Indians, is not a willow at all, but the well known silky cornel or kinnikinik (*Cornus sericea*). This cornel has purplish twigs, and being found from Maine to Dakota and southward to the Gulf, is doubtless the plant used throughout under the name of willow. One writer notes that when the silky cornel was not to be obtained, the bark of the panicled cornel (*C. paniculata*) was used instead.

Names of the Elephant's Ear.—In The American Botanist for July the old and fearful question of the popular names of *Colocasia antiquorum esculenta* was brought up again and along with its usual complement of errors we note the interesting statement that "in Porto Rico it is called bleeding heart." Now, on the face of it, "bleeding heart" does not sound very Spanish-like; besides I have yet to hear the equivalent of the words in Spanish as applied to any plant. The name is properly applied to those ornamental hybrids of *Caladium* spp. which happen to have the central area of the leaf blade reddish in color. In Porto Rico the edible variety of elephant's ear is called "Malang"; it is popularly and erroneously believed to be a variety of "Yautia" (*Xanthosoma* spp.). Until Prof O. F. Cook straightened out the matter two years ago, the 15 or more varieties of "Yautia" were treated as "Taro" by nearly all writers. Now let us get this thing correct for once: *Colocasia antiquorum* var. *esculenta* is called "Taro" in Polynesia, "Malanga" in Porto Rico, "Cocoes" in Jamaica, and "Eddoes" or "Eddas" in the Gold Coast and British West Indies. *Xanthosoma* spp. are known as "Taya," "Tanya" and "Tanier" throughout the West Indies; (it doesn't make much difference how it is spelled—the sound is surely Negritic if not its origin also); in Porto Rico it is always "Yautia," and in South America it is highly respected under several local names. The two genera stand side by side in that aristocratic family of

1,000 eccentric members—the Araceæ.—*O. W. Barrett, Mayaguez, Porto Rico.* [The editor's authority for applying the name bleeding heart to the plant in question, is Mr. Barrett's stand-by—O. F. Cook, and since Mr. Barrett also notes that certain forms are called bleeding heart in Porto Rico, this makes a second good authority for the statement. *Colocasia* and *Caladium* have often been combined as one genus and their separation is a matter of opinion. Therefore it looks as if it might also be a matter of opinion whether the errors mentioned are really errors or not. As to the Jamaican name, if the way it is printed is any criterion, it can be asserted that it is spelled coco. Certainly both negroes and whites pronounce it as if spelled that way.—Ed.]

How to Hull Walnuts.—Hulling walnuts, as usually performed, is a dirty and disagreeable task, for the juice stains the hands a deep brown very hard to get off. There is, however, a cleaner and easier way of removing the hulls to which Mr. W. W. Ashe has called the editor's attention. It is simply to bore a hole slightly larger in diameter than a hulled walnut, through a piece of maple or other hard wood, and then drive the walnut through it. This not only removes the hulls, but does it quicker then any other way with which we are acquainted.

Age and Plants.—Old age comes slowly to some plants or at least they are slow in appearing aged. Old trees often show plainly the ravages of time, but for an illustration of the phrase "a green old age" there is probably nothing better than the vine. According to *The Gardening World*, there is a vine at Hampton Court in England that was planted when George III was King, which is still bearing. This year it will yield a thousand bunches of grapes.

Editorial.

The editor is again away from home. This will account for any delays in his replies to correspondents. All mail requiring his attention will be promptly forwarded if sent to the usual address.

* * *

The editor knows an entomologist whose knowledge of the insects of his own region is excellent, but who, whenever he writes for publication, invariably selects the species of Africa or some other equally distant and unknown region for his subject. He has never seen these species except in collections; but he seems to have the feeling that only objects brought from afar are worthy of being called to the attention of his readers. Unfortunately he is not alone in such feelings. Plant students are far too prone to write of things upon which, at best, they can bring to bear only second-hand information. When you start to write, select the subject with which you are most familiar, and do not think that because a plant is common it is well known. Usually it is the other way about. When your article is finished, test it by examining it for ideas derived from books. If there are many of these, you would do well to burn the article and try again. What the public asks of you is either fresh information, old facts in a new light, or both. The day of mere lists and categorical articles has passed, but the beginner is still offering such matter to publishers. If you can only record the number of species found on one of your tramps or the species of some genus in your vicinity, don't write. Nobody cares for that. But all have a lively interest in anything new you may have discovered while observing such species. Undescribed species are becoming extremely rare in inhabited regions, but undescribed habits of plants and unrecorded facts about them are as abundant as the plants themselves. "Do you remember," asks a correspondent, "how

in the first place I did not think I could write as I did not know enough about plants? Now I find so many interesting things that I believe I could write the whole paper." Would that there were many more in the same position!

* * *

This journal counts itself fortunate in having several friends who take enough interest in its welfare to frequently suggest new ways for making it valuable or advise us in regard to the course it is pursuing. One of these recently wrote: "Did it ever occur to you that some who might subscribe will be afraid they are putting their money into a sinking ship if you say too much about needing more subscribers? I, for one, have had awful luck, and the BOTANIST is the first plant journal that did not fail the minute it got my money." As to this, we must say that if we have given anyone the impression that we *need* more subscribers, we have given him an impression far from the truth. This journal was launched with the definite understanding that it was to fight its own way and not to expect something easy in the way of subsidies. Thus far it *has* paid its own way and more, for it has twice enlarged in size. No; to keep the journal running at this size we do not *need* a single additional subscriber but we *want* about ten times as many. It is our ambition to make this a much larger publication and we must have more subscribers to do it, for under our rule the magazine must pay as it goes. The publication that starts out with a flourish is usually heavily subsidized. If the subsidy holds out until it becomes established, well and good; if not there is an immediate crash. On the pay-as-you-go plan we do not see how a publication can come to ruin. Therefore the sooner those hesitating plant-lovers realize this and send on their dollar, the sooner will this magazine be able to rival *Harper's* in size. We don't increase the size every time we get a new subscriber, but we do whenever we get enough new ones to warrant it. Moral: Now is the time to subscribe!

The Society of American Authors has taken up the subject of cheaper postage for manuscripts and as much pressure as possible will be brought to bear on Congress, at the next session, in the hope of changing the present unjust rate. In the United States authors now pay the same rate upon manuscripts that they do upon private communications, notwithstanding the fact that manuscripts are clearly in the nature of commercial papers and have been so defined by the Universal Postal Union. Other countries recognize the fact that though a manuscript may be in writing, it is not a letter and charge only one quarter of the rate prevailing in the United States. For twenty-five cents a writer in Borneo, Persia, Korea, Zanzibar or even Terra del Fuego can send a manuscript to an editor in this country but it would cost the editor a dollar to remail it to a friend on the next street. Under what we are accustomed to call less enlightened rule, Cuba, Hawaii, Guam, the Philippines, etc. had this lower rate, but the American occupancy has now made the rate the same as we have at home. When we consider that even good manuscripts are often returned again and again, before they are accepted, the burden this high rate puts upon the writers of this country is apparent. It is expected that a bill making the rate the same as in other countries will be introduced simultaneously in both senate and house at the next session of Congress. It is hoped that all who are interested in the matter will, at the proper time, write to their senators and congressmen about it and that in the meantime they will call the attention of others who might be interested. to the movement. Further particulars may be had by addressing G. Grosvenor Dawe, Secretary Society of American Authors, 128 Broadway, New York.

* * *

A meeting of fern students, which the editor expects to attend, will be held in St. Louis, Mo., during the Holidays, in conjunction with the meeting of the American Association for the Advancement of Science. A further announcement will be made later.

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CONTENTS.

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THE AMERICAN BOTANIST.

VOL. V. BINGHAMTON, N. Y., OCTOBER, 1903. No. 4.

MORE ABOUT SEEDS.

BY DR. WILLIAM WHITMAN BAILEY.

I WAS very much interested in the suggestive article by Mrs. Bradshaw in the September number of the BOTANIST. The writer is correct in saying that seeds are not only fascinating to collect, but are most instructive to study. Amassed perhaps in the first place simply in response to the individual's desire to collect—a tendency apparently inherent in the race—closer inspection endows them with varied attributes of interest.

At Brown University we have quite a large collection of seeds gathered either personally or by exchange, by a former curator Mr. J. L. Bennett. They illustrate a wide range of families, genera and species. They are preserved in bottles with a loose label, easily read in any position the bottle may assume and containing full data. The preparation of the seeds often entailed much labor, as in separating the seed from surrounding parts. Indeed, in case of achenes, or where the calyx permanently persists, or when the ovary wall adheres to the seed, this was not done. It would be next to impossible and not specially desirable.

The bottles, arranged in drawers, are kept in a convenient cabinet. This allows the arrangement by families. In the case of very large seeds, special drawers must of course be provided, nor would these be bottled.

In such a collection color is perhaps the first thing that attracts attention. Nearly every hue is seen here, pure white, jet black, azure blue, yellow, orange and intense scarlet or vermilion. Some beans and peas, as every one knows, are a brilliant red with a black eye and are strung

together in necklaces. Indeed, among savage tribes always enticed by beads, they are constantly employed as ornaments. No coral can surpass them in brilliancy. The outer surface or testa of the seed may be smooth and highly polished or roughened, embossed or sculptured in many marvelous ways. Then there is a long range of seeds provided with wings, hooks, grapnels or other mechanical contrivances to aid in distribution by wind. Of parachute arrangements there is no end, as in the achenes of Compositæ and the seeds of milkweed and Epilobium. These contrivances, alone, will afford months of study. Again, while but four technical forms of seeds are recognized, such as the orthotropous, anatropous, etc., these are constant to their belongings; they help to distinguish or classify large groups of plants. But apart from the shapes to which these long names are applied, each seed has a geometric form of its own. Hence, the fine globular, ovoid, cylindric or polyhedral seeds. The size, too, varies from the cocoanut on the one side to the dust-like seeds of orchis or poppy on the other. Mrs. Bradshaw is correct in saying that any group of seeds will afford profitable study. Much remains to be accomplished, not only as regards the externals, but the anatomy of seeds. If that work is followed by long, careful observation of the germinating plants, the student may make a useful supplement to the great work of Lord Avebury or the remarkable herbarium of Mr. Walter Deane.

Brown University, Providence, R. I.

BOTANY FOR BEGINNERS—VII.

USES OF THE PETALS.

The beginner in botany will not go far in his studies before he finds flowers that have no petals; and yet these plants with petal-less or *apetalous* flowers seem to get along just as well as their neighbors whose flowers have petals well developed. The meadow-rue, spurge, Canada ginger, willow, birch and many others thrive and fruit abundantly without petals and one might be inclined to

wonder why all flowers are therefore not apetalous. Evidently the reason they are not is because some of them have found petals useful. It is fairly certain that the first flowers had no petals, but in one way or another a large majority have since acquired them, until now, from at first being merely useful to the plants, they have become so important to certain species that they may be said to be absolutely essential to their existence.

In the closing of flowers at night and in cold or stormy weather, we see how the petals act as a protection to the tender essential organs. The grape seems to require its petals for this use alone, for the corolla never expands. When the flower blooms or "opens" the petals simply fall to the ground. Other flowers seem to need their petals principally for the attraction of insects. They encourage their visits in order to secure cross-pollination and do not spread their many colored petals in vain, for the insects have learned that food is to be obtained at the sign of the brilliant corolla and are sure to visit it. In plants whose flowers are borne in close clusters we may often see indications of plant frugality in the matter of advertising. Thus in the wild carrot or Queen Anne's lace, while the great majority of the flowers have small petals, those on the outer edges of the cluster have their petals much increased in size, this advertisement serving the whole cluster. The same feature is noticeable in the hobble-bush (*Viburnum lantanoides*) though in this case the outer flowers are almost all corolla. So much vigor has been used up in corolla making that the essential organs in these flowers are functionless. A still more familiar example is found in the great composite family in which the showy "rays" are formed of the enlarged petals of the flowers in the outer circle while the other flowers in the center have small and inconspicuous corollas designed strictly for business. The sunflower, daisy and aster are good types of this.

The most important use of the petals, however, is not in attracting insects to the nectar but in controlling their motions while they are getting it. We have seen that

many flowers ensure that they shall be pollinated by pollen from other flowers by the simple expedient of ripening the pistils and stamens at different times, so that when their own pollen is ready the pistils are not, or *vice versa*. Insects going between such flowers must bring pollen at one time and carry pollen at another, but with the aid of petals, the flowers are able to double up on the insects and make them fetch and carry at the same time. In the simplest forms of such flowers, the petals are formed into a tubular corolla and the pistils and stamens are of different lengths, some flowers having long pistils and short stamens and others the opposite. It will readily be seen that flowers with short stamens and long pistils could never be self-pollinated, for the stamens could not come in contact with the pistils. Insects must be induced to act as go-betweens. When therefore an insect, bent on securing the nectar at the bottom of the corolla, visits a flower with short stamens, the pollen is brushed by a certain part of its proboscis which becomes powdered with it. When it later visits a flower with a pistil of the same length as the stamens, the latter is sure of pollination. If the insect next visits a flower with long stamens, it receives pollen in just the right place to pollinate the long pistils. Soon, therefore, its proboscis is likely to have two bands of pollen upon it and every flower thereafter visited, whether with long or short pistils, is likely to receive its share. The corolla closely surrounding the essential organs insures that pollination must occur if the insect secures the nectar. In some of the flowers of this kind there are three different lengths of stamens and as many different lengths of pistils, giving a much wider range of crossing.

Other flowers have different means of accomplishing the same result. Many species in the bean and pea family have pistils and stamens concealed by the keel formed of the two lower petals. When an insect alights on the flower the keel is depressed, allowing the pistils and stamens to brush across its body, the one set to obtain any pollen that may be adhering to it, the other to deposit more pollen for

the use of another flower. In the mint family many flowers have stamens and pistils so arranged that they will brush the insect's back in a similar manner. In these the pistils usually project beyond the stamens so as to sweep off the pollen as the insect enters and before he has been dusted by the stamens in its own flower.

These are some of the methods by which cross-pollination is effected, but the variations in the way it is accomplished are almost as numerous as the flowers themselves. Many whole books have been written on the subject and to these the reader is referred for further information unless he prefers the more fascinating proceedure of interrogating the blossoms themselves.

FLOWERS TURNED TO LEAVES.

BY WILLARD N. CLUTE.

LAST summer, owing doubtless to a lack of sunlight and a surplus of moisture, a large number of the garden nasturtiums (*Tropæolum*) ceased to produce their showy flowers and we concluded that they had finished blooming for the season. An examination later, however, showed that they were still doing their best to blossom, but that the flowers had all reverted to small green leaves. There were great numbers of these transformed flowers, of all degrees of reversion, one of the most regular being shown in the accompanying figure. This still shows a considerable likeness to the showy blossom. There were five sepals and five petals, the three lower still retaining the fringe of bristles which they have in the normal flower, but all were of a deep rich green like the

leaves. The normal ovary is three lobed with a single style, but in the abnormal flowers this was lengthened into a three lobed column with three leaf-like tips, showing that the ovary is really three pistils consolidated into one. The stamens were the only parts of the flowers that did not become leaflike. It is also of great interest to note that the sepals did not form the usual spur and that the whole flower was nearly regular, from which it may be inferred that the slight irregularity in normal flowers is of comparatively recent appearance.

CAN SQUASHES AND PUMPKINS BE FED ON MILK?

BY EDWARD F. BIGELOW.

"NATURE AND SCIENCE" EDITOR OF THE ST. NICHOLAS MAGAZINE.

THE question, "Can squashes and pumpkins be fed on milk?" was asked me a few weeks ago. The inquirer explained that the method alleged was to cut a hole in the top of the half grown squash and every day pour in all the milk that the squash would hold. At first thought, recalling statements as to this method of forcing abnormally large squashes or pumpkins, that I had often heard alleged in boyhood days on a Connecticut farm, I replied to the question, "Yes. It's some trouble and expense but the result is an astonishingly large squash or pumpkin. I have often ——."

But right there I stopped and thought. Have I ever seen the process or results of a squash or pumpkin so fed? No I haven't, nor upon further thought, have I known a person who had positively seen it done. But I have heard many farmers and others state that it can be and is done. "Why, of course, everybody knows it!" Since that question was asked me I have made extensive inquiries, personally and by letters, of farmers, botanists, colleges of agriculture and of others. The astonishing result is that over ninty per cent. of all of whom I have inquired, have "known that this can be done."

My inquiries revealed a knowledge of the subject closely parallel to that of evolution as ascribed by Grant Allen:

"Everybody nowadays talks about it. Like electricity, the cholera germ, woman's rights, the great mining boom and the Eastern Question it is 'in the air.' It pervades society everywhere with its subtle essence." So it was with squashes and pumpkins fed on milk. Nothing, seemingly, but the moon controlling the weather, could equal it.

Only one person, a farmer in Pennsylvania, claimed to have actually had personal experience. But even he said it was "a neighbor," who fed the pumpkin not by cutting a hole and pouring the milk in, but he insisted that the first leaves towards the root should be cut off and the milk poured into the tubular leaf stalk. He laid great stress on the exact leaf, (not the one on the other side of the pumpkin) and that it must be cut close up to the leaf. Indeed, he went into detail that so flavored of occult performance that it would have been in harmony for him to have brought in something about looking to the north, after sundown, and turning around three times.

Several botanists thought that it could be done, but none had tried it notwithstanding the very important bearing it would have on physiologic botany if the interior of the squash ovary or the interior of the stem could digest or assimilate milk. If it could do that why not other substances, why not a sort of hypodermic chemical feeding. If—but think of the possibilities—and the great importance—and yet every one of these botanists had neglected the opportunity of making himself famous!

Even the Department of Agriculture at Washington had heard of this but had not investigated it. Here is the letter from that Institution:

"Your letter of August 24, addressed to this department, is at hand. I regret that we have no references at hand to literature on the subject of feeding squashes with milk. I have heard of this practice, but have never seen a squash thus fed.

Regretting our inability to help you in this matter, I am, Very truly yours,

A. F. Woods,
Pathologist and Physiologist.

One State College of Agriculture thinks it can be done, and writes as follows:

"I have never tried the feeding of milk to squashes. I have seen it mentioned for a number of years and have always been on the point of trying it. My impression is that under the proper conditions it can be done with success. I think that we shall try it ourselves next year. In the meantime I do not care to be quoted in respect to the matter because I do not know."

Another is inclined to favor the possibility of the success of the experiment and writes:

"Your inquiry touches upon one of those horticultural stories which seem to lie upon the borderland between fact and fiction. I have often heard of cutting off a leaf or piece of squash vine and inserting the cut end into milk for the purpose of feeding the vine and increasing the growth of the fruits, but I am frank to say that I have never tried it or seen it tried and I do not know whether there is anything in it or not. On general principles, it does not seem reasonable that it would work. It certainly seems unreasonable to suppose that cutting a hole in the squash itself and pouring in milk as suggested would be of use. I should expect it to cause the squash to decay instead of making it grow. However, I should not like to pass judgment upon the problem because some things which seem unreasonable are, after all, true. I know of no place to find anything written about it. I am sorry not to give an intelligent answer."

Of the large number of letters and personal inquiries, only one stated positively that squashes and pumpkins cannot be so fed. This is from Professor A. G. Gully, horticulturist at the Connecticut College of Agriculture, Storrs, Conn., and president of the Connecticut Pomological Society. Professor Gully is not only an acknowledged authority on matters horticultural, but on some other matters, and is a humorist, all of which are self evident by his letter.

"Yours of 24th received. I may say you can fatten

pigs, cats and babies on milk. Have tried them all. But there is 'nothin' doin'' when it comes to squashes. It is the old idea of fatting watermelons on sweetened water. It won't work. It's all right in stories, but don't go in horticulture."

When doctors disagree who shall decide? Will someone please throw a little light. From any point of view the claim seems to me most astonishing. If it is a myth how did it come so widely and firmly disseminated in the public mind,—colleges of agriculture, botanists, farmers, even school children, everybody. If it is a fact, why is it that so important a matter has not been fully investigated botanically? Why not made more use of in raising prize specimens for fairs? Why? But echo answers, "why" and again, "why." I await some more tangible reply.

Stamford, Connecticut.

THE LARGEST CENTURY PLANT.

BY O. W. BARRETT.

THE common century plant of our northern gardens is a degenerated descendent of a wild agave, or "Maguey," as the Mexicans call it. It is a very slow-growing plant and seldom or never flowers under conservatory treatment. Throughout the Southwest Mexico and Central America there are many other species which have more or less the same habit as the cultivated sort, and most of which have leaves from three to six feet long and a flower-stalk from ten to thirty feet high. But here in Porto Rico we have the very largest of all the race. *Furcræa fœtida* or *Fourcroya gigantea*, is probably the tallest erect plant which is neither tree nor shrub nor bamboo; and of all the 120,000 species of flowering plants it is quite certain that no other possesses a true peduncle forty to fifty feet in length.

This plant grows wild on hillsides in the poorest of soil and seems to delight in dry and rocky situations where no other plant can live. Its huge clusters of dark green leaves

form striking features of the landscape and may readily be detected a mile or more away. Its growth is slow at first and several years may elapse before it gets a good start; but as soon as a "head" of leaves is formed, growth becomes rapid and when the leaves have attained a length of about six feet the great flower-stalk begins to shoot upward; this stem, which is six to nine inches in diameter where it emerges from the leaves, rapidly attains a height of 30, 40 or even 50 feet.

The leaves are flatter and not so thick in the middle as those of most century plants, while the spines on the margin are much fewer and the point is blunt instead of being prolonged into a savage-looking awl. The true stem is two to five feet high and some nine or more inches in diameter. The old leaves at the top of this trunk, after about one year, turn yellow and hang down, thus even after their death forming a protective covering to the only vulnerable part of the plant.

The flowers are borne on the peduncle in the style of a receme with the branchlets irregularly placed and about two to four feet in length; in shape they resemble the tuberose, though they are over two inches long; the color is greenish yellow with a few pink dots on the outside; the odor is pronounced, but, as may be inferred from the name, it cannot be called fragrant.

This queen of century plants is too wise to produce a 40-foot flower-stalk and keep it fresh for a year and still run the risk of failure to mature seeds. No matter how heavy it rains or how few the pollen-bearing insects, it still can abundantly reproduce its kind; in fact it seems to have lost faith in seeds entirely, for I have never been able to find a seed-pod on the plant. Scattered along the branchlets with the flowers and even in the axils of the stem, are borne vast numbers of bulbils, or small plants in the form of adventitious shoots. These may be regarded as merely transformed flowers, but since there are no halfway stages and as the axils are invaribly filled with them, it would seem better to consider them as modified, leafy

branches. At first the bulbils are elliptical in shape with the tip quite sharp but as they ripen, if we may use the word, two or three of the topmost leaves lengthen until they protrude two inches or more beyond the point; and so when the little plant falls to the ground it virtually has a good six months' start in life already.

Since the flowers are few as compared to the number of bulbils, and since they never produce seed, it will be a question of only a few hundred centuries, I suppose, according to the laws of heredity and Darwinism, when this "giant lily" will bear no flowers at all.

A 40-foot stalk of only a few inches diameter and carrying 50 pounds or more of bulbils, even when strung with first-class hemp (as it is), is liable to be broken in a strong wind and so be lost the labor of years. To mitigate this disaster when it does occur, the desperate and dying plant sends out numerous suckers around the point of breakage, and each of these may grow into a goodly plant if it should happen to be broken off and fall into a favorable spot. But if the peduncle be cut or broken before it has seriously drawn upon the plant's vitality, from three to six or more small peduncles will soon start out from the uninjured portion of the stem. The *Furcræa gigantea* provides itself against all possible disasters.

The inside portion of the flower-stem is a soft white pith containing yellowish "strings," or bundles of the vascular fibres. Pieces of this pith are commonly used by the natives here for razor hones. The fibre is turned to many uses, but principally to the making of cordage and hammocks; it ranks but little lower than Sisal or Yucatan hemp. From being extensively cultivated in the island of Mauritius it has received the market name of "Mauritius Hemp." It is worth about six cents per pound.

Thus wins the largest century plant in the strenuous struggle for life in the war of circumstances.

Mayaguez, Porto Rico.

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 JACKSON VINE.—Some time ago, a note was published in this journal asking for the identity of the Jackson vine without eliciting a reply. Chance, however, has made it possible for the editor to answer the question. The Jackson vine is another name for the so-called southern smilax (*Smilax lanceolata*) which is at present very noticable in decorations on festive occasions. At the rate it is being brought to market it would seem that the supply cannot last long. The plant protection societies might find the matter worth investigation.

THISTLE-DOWN.—Who of those, to whom the sight of thistle-down is familiar, have ever closely examined it? Those who have not may find an interesting experience in taking a ripe thistle head and by grasping the tips of the persistent corollas and pappus bristles, carefully pulling them out altogether. As soon as they are released from the urn-like involucre every feathery pappus begins to expand, the whole mass slowly growing until it occupies many times the space it did when packed away in the involucre. This silky pappus is really a transformed calyx as may easily be seen by its position surrounding the corolla. It has fifty or more soft bristles, each of which is provided with a great number of silk-like hairs. At the base these bristles are joined into a ring and there is a cylindrical projection at the top of each seed just big enough to fit into this calyx-ring. When the pappus is fully spread, the lightest breath causes it to move away with its depending seed until it finally lodges in some distant spot where the seed drops off ready to form a new plant.

Poison Ivy in England.—According to the *Gardening World* our common poison ivy (*Rhus toxicodendron*) is often planted in private gardens in Great Britain.

Willows Used in Pharmacy.—According to the *Gardening World* it is only certain species of willow whose bark yields the salicin of the shops. Experiments have shown that in England the best yield of this product was from *Salix triandra*, *S. purpurea*, *S. rubra* and *S. decipiens*.

A Seed Problem.—Happening to examine some seed-pods of *Baptisia leucophæa* recently, our attention was drawn to the fact that the individual seeds are covered over with tiny dots of a resinous substance so sticky that the seeds stick to each other and to the pod in which they are enclosed. Now the question is, Why this resin? Are we to assume that it is a mere by-product, or of some service to the seed?

Frost and Falling Leaves.—Many plant students are likely to think that the frost is responsible both for the color of autumn leaves and for their falling from the tree. This, however, is a mistake. Frost may make some slight changes in the color of the leaves, but the effect of frost on tender herbage is to wilt rather than to color it. Long before there is a hint of frost in the air the trees and shrubs have begun to move from the leaf into the trunk such substances as it can use and at the same time begins the formation of a cleavage plane which when complete will sever the leaf stem from the twig. It thus happens that trees often cast their leaves before there has been a frost while even after several hard frosts other trees still retain a part of their leaves. There is a phenomenon connected with this, however, which seems as yet unexplained and that is the way in which certain trees suddenly cast all their leaves. This year, in the region south of Lake Michigan, the night of October 23rd was the crisis. Up to this time many had stood fresh and green but on the morning of the 24th, when there was a heavy frost, every leaf was stripped from them. The Ailanthus became an utter wreck in a single night. The day before, its long

pinnate leaves spread to the sun as if it were mid-summer. the next morning all laid in a tangled heap on the ground beneath the tree fallen straight down in the still air. The Catalpa showed a similar condition and it was noticed that the other trees thus affected were species whose centre of distribution is in warmer regions. Has this fact anything to do with the case? If not, who can offer an explanation? Further observations are desirable.

COMMON NAMES OF ORANGE HAWKWEED.—The orange hawkweed (*Hieracium aurantiacum*) is a plant not easily overlooked and as a consequence it has accumulated a variety of common names. Although it landed in America as the orange hawkweed, its noxious qualities soon induced the agriculturist to re-christen it devil's paint-brush. According to *Gardening World* it has been called grim and collier in Great Britain in allusion to the sooty appearance which the black hairs on stem and involucre give to it.

THE EUCALYPTUS AS A RIVAL OF COAL.—An article in *Forest Leaves* states that the species of *Eucalyptus* have a remarkable capacity for storing the energy received from the sun. Experiments in south Africa have shown that a forest of these trees will each year produce twenty tons of fuel per acre. The dry timber is heavier than coal and gives out as much heat when burned. The trees thrive best in hot moist regions and it is asserted that if half the area capable of supporting the trees was planted to *Eucalyptus* forests, it would yield nearly three hundred times as much fuel per year, as the world now requires.

TEMPERATURE AND THE COLOR OF LILACS.—A writer in *Gardening* notes that in forcing lilacs for winter blooming it is not necessary to have white varieties to obtain white flowers. Colored lilacs grown in a temperature of 65 or 75 degrees in greenhouses with little ventilation, all produce white flowers. The editor of THE AMERICAN BOTANIST long ago pointed out a relation between blue flowers and temperature. Flowers of this color are always most abundant in cool weather, as in early spring

and late autumn. The blue violets are conspicuous examples, beginning to bloom in the cool days of early spring and ceasing when the weather becomes warm only to begin blooming again as soon as cool autumn days arrive. In long, moderately cool autumns, like the psat one, nearly all the blue violets began blooming again. Just how color is affected by temperature does not seem to be known at present. Physiological botanists are hereby apprised that this affords a promising field for investigation.

THE GENUS LONICERA.—More the one hundred and fifty species of honeysuckle (*Lonicera*) are now known. All are found in the Northern hemisphere, the limits of their southern range crossing Northern Africa and Mexico. The color of the flowers varies from white to yellow, purple and scarlet and the berries may be red, yellow, black, bluish or white. While North America has a fair number of species, northern Asia has more than all the rest of the world put together. In an elaborate revision of this genus just published in the Fourteenth Annual Report of the Missouri Botanical Garden, Mr. Alfred Rehder divides the genus into two sub-genera, *Chamæcerasus* characterized by flowers in two-flowered axillary peduncled cymes and separate leaves, and *Periclymenum* with flowers in three-flowered sessile cymes and the upper leaves connate. The first is much the larger and the writer asserts that it cannot properly be divided according to the shape of the corolla though most botanists follow this arrangement. Such characters, he says, can scarcely be used to distinguish sub-sections as it would separate closely related species. The two-lipped corolla is now regarded as having arisen late in the history of the genus being a modification due to certain insect visitors. He therefore divides the sub-genus into two sections, one characterized by regular flowers with five nectaries and the other by irregular flowers and one to three nectaries. This latter group is again divided, the principal character being taken from the branches which in some species are hollow and in others filled with pith.

Asclepias Curassavica Medicinal.—A recently suggested remedy for consumption is derived from *Asclepias curassavica* a milkweed with bright scarlet flowers found wild in many tropical lands and often cultivated for ornament in our Southern States. The plant is variously known as red-head, blood flower, false ipecac, Jamaica wild liquorice and swallot-wort and is a common weed in the West Indies. According to *Indian Gardening* a tincture of the leaves is said to be very beneficial in the first stages of consumption and further investigations of its reputed properties are likely to be made. In this connection it will be recalled that similar powers have been ascribed to *Asclepias tuberosa* one of its common names being pleurisy root.

Insecticides for Herbarium Pests.—The herbarium beetle (*Sitodrepa panicea*) and the book louse (*Atropos divinatoria*) are a pair of pests that unite in making things interesting for curators. It is to guard against their depredations that plants are poisoned, fumigated and kept in close cases. The little brown herbarium beetle is the greatest of these pests. It devours not only the tender parts of plants but even woody stems. Long association with plants has perhaps given it some botanical knowledge, at least it knows how to distinguish between families and genera. It leaves the sedges, grasses and ferns decidedly alone, but has an overweening fondness for composites, lily-worts and plants of the bean family. Saprophytes and plants with milky juice are also in great favor. The commonest method of preventing its depredations is by poisoning the plants with corrosive sublimate, the specimens being dipped in the solution. This is objectionable because it discolors the specimens besides causing thin leaves to curl. It also appears to fail to protect after the lapse of years. Solutions of arsenic are objectional for similar reasons. In view of these facts plants are no longer poisoned in most large herbariums, but instead they are fumigated with carbon bi-sulphide. At the Gray Herbarium of Harvard University, the mounted plants are

fumigated in an air-tight tin box and as an additional safeguard flakes of naphthalin are scattered on the herbarium shelves to prevent the entrance of more insects. In this way they have practically gotten rid of the pests. Since the fumigation method has been found effective, efforts have been made toward securing cases that are practically air-tight so that the plants can be fumigated without removing them from their cases. This has resulted in the installation at the Gray Herbarium of a series of cases made of sheet steel. An extended account of the experiments with cases and poisons is given in *Rhodora* for October.

Orchids and Symbiosis.—The comparative rarity of many orchids has been accounted for upon the supposition that the flowers are so dependent upon certain insects for pollination that they seldom set seed, but all who have examined orchid seed-pods know that when the plants do produce seed the seeds are minute and very numerous, and they may have wondered how plants which can produce so many seeds should still be so few in numbers. It now transpires that young orchids are most successfully reared if the seeds are sown in soil in which the same or similar species are growing and the reason that the new plants are thus able to thrive is because they form partnerships with certain microbes common on the roots of the older plants. Growers have often induced large numbers of seeds to germinate, only to see them fail later for no apparent cause. Their lack of the microbes now seems to be a solution of the mystery. Possibly the same state of affairs exists in nature, in which case the rarity of orchids is easily accounted for.

Editorial.

Now approaches the time when the tree-agent with book of gaudily colored lithographs in hand wanders up and down the earth taking orders for the spring delivery. And as of yore, he will of a certainty unload upon the gardening public many specimens of the few species that constitute his stock in trade. One does not need the agent's book in order to name them, for specimens of the same things may be seen in almost any garden. There are of course the lilac, rose, spiræa, honeysuckle, Japan quince, syringa and hydrangea in the north, and an equally well known list for gardens nearer the equator. That the agent is able to dispose of the same things year after year when there are so many equally valuable shrubs that might be planted is one of the mysteries that possibly may never be solved.

* * *

There is really no objection to the shrubs above mentioned except that they are too frequently planted. A rose or a cluster of lilac blossoms is both beautiful and fragrant but in an attempt to ornament garden or lawn, there is a chance of overdoing the matter by planting too many. One must not fall into the error made by Nature when she planted daisies, buttercups, dandelions and toad-flax. There are corners of the world where these flowers are valued for their beauty, but it is not in the Northern and Eastern United States. A rose garden or a garden devoted to varieties of any other shrub or plant can not be criticised except when it is attempted to substitute it for a properly embellished lawn. Monotony of any kind is distasteful and even a rose garden may fail to satisfy the average individual.

* * *

A garden planted to the shrubs already mentioned can scarcely be characterized as monotonous, but when all the gardens on a street or in a town are planted to the same

things the effect is decidedly so. A garden in such surroundings, planted to other species, is individualized and enhanced in beauty by the contrast. Fortunately, too, the cost of such planting is no greater. There is a long list of handsome flowering shrubs to select from, though, at present, even their names have an unfamiliar sound to many. Among the best may be mentioned species of *Corylopsis*, *Exochorda*, *Shepherdia*, *Cotoneaster*, *Kerria*, *Laburnum*, *Halesia*, *Styrax*, *Buddleia* and *Euonymus*, to say nothing of our own species of *Ribes*, *Rubus*, *Hamamelis* and *Cornus*.

* * *

In Great Britain the rhododendrons, azalias, kalmias, andromedas and other heath-worts are known as American shrubs and several species are there cultivated that find scant favor at home. And the British do not stop at our heath-worts but cultivate many another of our native plants. Similarly, they cultivate the plants of Japan, Asia, Australia and other parts of the world. This example might well be followed in America. To be sure we are not entirely lacking in these exotic plants, but the cultivating of such species is by no means as general as it should be.

* * *

Too often, the planter of a garden has a mania for double flowers, but no botanist is likely to plant many of these except for mere decorative effect. When one has come to know the plan of the flower and to understand in a measure why the different parts have the positions and shapes they do, he is likely to resent the gardener's attempt to improve upon nature by offering more petals and less stamens. Nor does he look with more favor upon any other botanical monstrosity.

* * *

One of the inestimable advantages of a plantation of uncommon shrubs is the opportunity afforded for study and comparison. One can scarcely make a tour of such a garden without discovering something new. It is like living in a new country. The garden is of special interest if

planted to foreign species of genera represented in our home locality. There is then a chance for endless study in noting their differences.

* * *

The relation of the flora of Eastern America to that of Eastern Japan is a constant surprise to botanists. Many of the genera are identical and in some cases the species are also, though in general they are enough unlike to be considered different species. Since most of them are hardy in the United States their cultivation offers an enticing field for activity. The various species of barberry, witch hazel, daphne, magnolia, styrax, euonymus and others are especially valuable.

* * *

These observations have been suggested in part by the receipt of a little book on shrubs by George Gordon, editor of *The Gardener's Magazine*. Although not a large book it contains a great deal of information about the best shrubs to plant, the kind of treatment to be given them, their chief points of excellence, the color of the flowers and the countries from which they are derived. Supposed to be devoted to shrubs, it also contains chapters on flowering trees, conifers, other evergreens, bamboos, etc. It is a book from which the planter can gain many a hint. It is published by John Lane at $1.00 *net*.

* * *

The fern meeting to be held in St. Louis, late in December, promises to be most successful. Any one interested in ferns may secure a copy of the program by addressing Prof. N. L. T. Nelson, High School, St. Louis, Mo.

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GLEANINGS FROM SEA AND MOUNTAIN.

BY PAULINE KAUFMAN.

JULY and part of last August were spent at Avon, N. J. This place was originally a kind of Chautauqua. Artists and students of all branches of natural history used to meet there to teach and be taught. The flora, being a sort of connecting link between North and South, proved of great interest, as also did the fauna. Many of the small sea horses (*Hippocampus Hudsonius*) were at that time taken from the Shark River, but have since disappeared. Some years ago I found in a mound of earth, quite a distance from the river, a great number of what I then took to be dried star-fish, but which may have been earth stars. Though better able at present to identify them, the various changes in the place prevent my finding their location.

Two summers ago these was, between Ocean Grove and Avon, a fine bog filled with the most exquisite flowers. The swamp grass was jeweled with meadow beauty (*Rhexia Virginica*), sea pink (*Sabbatia stellaris*), water lillies, yellow-eyed grass (*Xyris*), milkwort (*Polygala sanguinea*), swamp St. John'swort (*Elodes*) and water lobelia, while great spikes of the white fringed orchis (*Habenaria blephariglottis*) stood here and there like sentinels.

With red hair bristling, waiting open-mouthed for their victims were hundreds of the thread-leaved sundews with their spikes of rosy, innocent looking flowers. Nearby among the cranberries the small white-flowered *Drosera Americana* helped along the carnage, and in the water the yellow helmets of the bladderwort just eluded our grasp. *This* year the lovely bog was a dried up mud-puddle. But the orchids were more plentiful than ever.

Many white fringed beauties fell on the wayside with the grass, laid low by the mower. Among these was one with three branches, each bearing seven flowers and a tuft of bracts. The pale yellow fringed orchis (*Habenaria cristata*) a smaller relative of the white was also quite well represented. The smaller green orchis can be found along the coast, and the gorgeous yellow fringed orchis (*H. ciliaris*) repays a diligent searcher. In the latter part of August a beautiful specimen of *calopogon* was seen where many others had been in June and July with their companion the pogonia. *Spiranthes* or ladies' tresses were numerous, and the ragged orchis finished the list, though these were plants of earlier flowering species. Of course much ground was covered to bring about this result, and trips were taken from Asbury Park to Bay Head. In one of these trips I saw growing for the first time the beautiful *Sabbatia chloroides*, the button snake root with its grey green thimbles and the large cotton grass, aptly called pussy toes, for in the tuft of tanny silk you will find five well sheathed claws. Many young persimmon trees, beach plums, whortle, blue and dangle berries, as well as black berries and raspberries and whole roads covered with cranberries are here found. Golden hyssop, *Polygala lutea* and the larger pipewort (*Eriocanlon decangulare*) were confined to one very small area. The plant most in evidence was the sweet pepper bush.

The latter part of August to the middle of September was spent at Griffin's Corners in the Catkills, a locality new to me, where I was fortunate enough to have our Secretary, Mr. Buchheister, to look to for guidance. Here, too, the most ubiquitous flower was white—*Eupatorium ageratoides*. The joy of the season was my finding on a rock on the bank of Portertown Creek a few plants of *Linnæa borealis*. I did not know just what I had found, but knew that it was distinct from anything ever found before by me. Mr. B. identified it. So far as I could discover it was a new locality for it. The witch hazels were loaded with flowers, leaves and fruit and gave forth some

fragrance. In this region we found the yew with its beautiful coral cups, and became acquainted with the stately teasel, the giant hyssop with flower-heads four inches long. On the rocks back of the house the celandine ran riot and the lovely white violets were blooming all around. The hawkweed brightened the upland slopes and the bee balm was quite frequent and of a beautiful glowing red. New to me were the plants of *Hepatica acutiloba*, *Clintonia borealis* and *Calla palustris*. The season's list of orchids was increased by the finding of *Habenaria psycodes*, *Microstylis*, also new, and the larger *Goodyera* or rattle-snake orchid. The flower-spike looked much like the *Spiranthes* and I was about to pass it by when, stooping to look at something else, the beautiful mottled leaf caught my eye. The smaller cotton grass also grew in one of the boggy places. It seemed strange that never having found this plant before, mountain and sea should this year combine in showing me two varieties of it.

The above are but a few of the flowering plants found. At the sea-shore the poison ivy was everywhere apparent, but in the mountains not a trace of it was seen. The whortleberries on the coast grew on very high bushes, those on the mountain top on branches two inches in height. Now for the ferns. The following, new to me, so far as their native haunts are concerned. *Ophioglossum vulgatum* (adder's tongue) we found in wet meadows most of the fruit spikes had, alas, been guillotined—again by the mower, and the leaf looked much like that of the pogoina, but more yellow. Not far from their haunts were *Botrychium lanceolatum*, *B. matricarifolium* and *B. simplex*, but *not B. lunaria*. Farther on in the woods the splendid ostrich fern, five feet high, met our view. Among its handsome green feathers we found the dark fruited spikes. All the country people call them "brakes." In a ravine at High Mount on a limestone cliff, worn by glaciers and at least eighty feet high, we found, after an arduous climb, *Pellæa gracilis*. A single rock in another part of the ravine bore a few plants of the walking fern,

which, with the rue spleenwort and purple cliff brake (or neck-break as some of my friends called it) I first met in Central Valley, N. Y. On the same rock was the maidenhair spleenwort. Other finds were the maidenhair, *Dryopteris Braunii*, *Cystopteris fragilis* and *bulbifera*, oak beech and rattle-snake ferns *Botrychium ternatum*, the sensitive, hay-scented, Christmas and lady ferns and the brake. All of the *Osmundas* and several of the *Aspidiums* had been found earlier in the season. The walking fern with several of the other smaller ones I brought home and planted in a large tin pan. Pellæa has already succumbed, but I hope that it will reappear and not act like the rue spleenwort which never came back. Has any one been successful in keeping this fern more than one year? Plants sent to both Central Park and the Bronx did not thrive for any great length of time.

New York City, N. Y.

FAMILY LIKENESS.

BY M. F. BRADSHAW.

WHEN we meet with a new acquaintance in a friend's family are we not likely to look first of all for some likeness? Was ever a baby born that was not declared the image of its father or some other relative more or less remote? It is a silly thing and yet do we not all plead guilty?

In plant families we are apt to expect the same, but there are times when we look in vain for any similarity. Careful microscopic investigation will surely bring to light the family feature but on the surface no one could suspect relationship.

I have lately been interested in looking at some of the Euphorbias. First and most familiar is *Ricinus Communis*. This plant is large and tall and handsome; one would not expect to find a cousin growing as a thin mat on the ground, but *Euphorbia albomarginata* grows thus and its leaves and blossoms are both minute.

The color of *Ricinus* is a dark glossy green with much

red in stems and the young leaf growth. *Euphorbia* is a pale blue green with white flowers dotted along the strings of stems. It is a solid mat, too, a lovely example of leaf mosaic and no earth can be seen through its entire surface; it is sure to be admired by any one unless I except the gardener who finds it something of a pest.

Then we have *Croton Californicus* growing along the banks of dry streams, an ashy gray, scanty leaved plant which I took for a relative of the smartweed till I examined it.

Eumocarpus setigerus or "turkey mullein" is another cousin, a dry-weather product, covered with the harshest of hairs, thick and bristly and giving off when touched a most repelling odor. This is low growing, too, yet has stiff stems and branches spreading horizontally near the ground.

Then one day I bought a plant called by florists "The Crown of Thorns," and of course my first move was to analyze it. The stem is woody and thickly covered with large spines or thorns and were it not for an occasional green leaf and clusters of odd little red flowers, it might be taken for a cactus. Nothing but an analysis could have given me a clue to its identity, and suggest its name *Euphorbia splendens*.

Orange, California.

BOTANY FOR BEGINNERS—VIII.

THE SEPALS.

Last in the list of floral organs, and the least important to the flower, as a general rule, come the *sepals*. They are found on the very outside of the blossom, are seldom of any other color than green, and by the uninitiated are likely to be considered as small green leaves. Green and leaflike, they are for a certainty, but they occur so regularly in flowers that we cannot help regarding them as belonging among the floral organs—especially as they are subject to the same laws of development and may be joined into tubes and cups as petals often are. Moreover,

while green is the usual color for sepals, in some plants they are able to become as brightly colored as the petals. Examples may be seen in the lily, crocus, cactus and Carolina allspice. In fact the principal difference between petals and sepals, aside from color, seems to be that when both are present in the same flower, the sepals are always in the outer whorl and are if anything a trifle coarser in texture.

The first use of the sepals is doubtless that of protection. Usually in the young flower-bud they completely enfold the other organs. The magnolia, the bloodroot, the poppy and many other flowers seem to find this the only use for their sepals and as the flowers open they are cast off.

In the buttercup family—a family famous for its many deviations from the conventional—there are numerous species that do not bear petals. There is often, however, a whorl of colored floral organs which botanists believe to be sepals. The rule is that when only one whorl of petal-like organs is present, the members of it are sepals. One may find such a state of affairs existing in many species of clematis, the hepatica, the anemone and the marsh marigold. In the meadow-rue there are no petals though the flowers have colored sepals in the bud which drop off at blooming time, leaving stamens and pistils entirely unprotected. When petals are not present the sepals are not always colored, as many examples from the pink family show.

It is extremely rare that the petals continue to live on after the flower has been pollinated. We are all familiar with the evanescent nature of these organs for when the petals fall we say the flower has faded and commonly think no more about it. From the plant's point of view, however, the flower may be said to have just started upon a successful career for now it will ripen its seeds. The pistils increase in size to become the fruit, and though petals and stamens fall, the sepals not infrequently continue to live. Examine the "blossom-end" of an apple, pear, quince, huckleberry or rose hip and you will there find the

tips of the sepals. The apple is, in fact, an enormously enlarged torus or receptacle that has grown up around the pistils, bearing the sepals on its apex. If one examines a rose fruit he will find the rose apple not quite closed at the top and so be able to form an idea of the probable evolution of the apple from some rose-like ancestor. The pulp that surrounds the papery envelope enclosing the rose seeds is a succulent receptacle. In the wild crab the envelope surrounding the seeds is hard and compact, so that the fleshy receptacle separates readily from it. It was formerly believed that in cases like those just mentioned, the parts called the receptacle were really parts of the calyx. Thus when the parts enclosed the ovary the latter was said to be *inferior*, while a *superior ovary* is one free from the calyx. These terms are still in common use.

Like the petals, the sepals assist in effecting pollination. They are often produced into spurs containing nectar and may also be of such shape and position as to aid in guiding the insect to the honey-glands. In apetalous flowers with brightly colored sepals they must also serve to attract insects in all of which they show their close relationship to petals.

THE EUCALYPTUS.

BY DR. WILLIAM WHITMAN BAILEY.

THE gigantic gum-trees or stringy barks, characteristic of Australian forests, belong to the genus *Eucalyptus* of the great family Myrtaceæ. Some 150 species of these, at least, have been described. The accounts, however, are most unsatisfactory and the specific discriminations often unreliable from the fact of the extreme variability of appearance assumed by individuals at different ages or periods of growth. Thus the stem, which in youth may be square, later become cylindric or columnar. The foliage, even on a particular tree, may show a variety as great as our sassafras. We may thus find on one plant oblong, elliptical, lanceolate or scythe-shaped leaves.

Australia is, so to speak, their capital; some are found

in Tasmania and a few extend as far as Timor and Moluca. The botanical name, literally translated, means "well covered with a lid," and refers to the box-like, hard, woody fruit, which in flower is covered by the calyx. This eventually falls off as a sort of lid.

The trees form vast forests and grow to an enormous height and proportionate thickness. There is little doubt that they dispute with the *Sequoias* of California, the proud title of King of Trees. Their leaves are of a thick and leathery quality, gray or silvery in color, at least in those we have seen, and thickly beset with resinous glands exhaling the peculiar agreeable and penetrating odor.

In the young plants these leaves are always opposite, but as the plant matures, they become alternate, and, by the tortion of their stalks, they present their edges to the sky. Some of my intelligent audience well-read in plant lore, no doubt, are aware that this peculiar feature is quite characteristic of Australian trees and shrubs of extremely various families. Thus, we find the phenomenon exhibited in the Laurels, Myrtles, Acacias, etc. The consequence is a most marked peculiarity in the appearance of Australian woods. Where, in our forests of equivalent density, one expects and finds broad and grateful shades, in these woods he sees but streaks of shade. It must be remembered that Australia is a mostly dry, hot country, and this is nature's manner of giving to her leaves the least sun-exposure, combined with surface expansion.

The flowers, comparatively inconspicuous as is mostly the case with large trees, are axillary, solitary or in clusters. As before remarked, the calyx is indurated and separates into two pieces, the upper forming the lid of the capsule. This drops off as a single piece when the flower opens, the corolla still adhering to it. The lower part persists and is fringed by a mass of uncountable stamens around its rim.

Lindley tells us that trees have been found 400 feet high, by 100 in girth at base. Mind is apalled by such figures. Apply them to our highest chimney or building

and see how nature dwarfs these works of man! The wood is very strong and durable and applied to a myriad useful purposes. One plank, forwarded to the National Exhibition in 1863, measured 230 feet in length.

Through the beneficent and persevering efforts of Baron VonMueller, Australia's world-famous botanist, the trees have been widely distributed over the world, and planted in malarial regions with apparently great benefit. Thus we hear of them in the Roman Campagna, in parts of Algeria and Tunis, in California, and latterly, in our Southern States. There has been some dispute of the result of which we are not assured, as to the reason of their anti-malarial or prophylactic quality. Some attribute it to their balsamic exudations acting upon the poisoned air; others, to their extremely rapid growth, by which they absorb much of the super-abundant and pernicious moisture of the soil. In both these theories the mosquito appears to be ignored.

We often see Eucalyptus plants in conservatories, but with us, few of them are hardy. They do well, however, in California, and may be extended to Texas and the Gulf States.

Certainly so noble and useful a genus is worth our very serious attention from whatever view. If the trees can be successfully grown in any of our states or colonies, they are a distinct and most useful addition to our forest treasures.

Brown University, Providence, R. I.

THE WILD FLOWER GARDEN.

The writer of this article has always been a lover of native plants. Not simply because they are native, but because they are quite as beautiful as many of the plants brought here from foreign countries. This being the case, why should we not take pride in our home gardens?

Many otherwise intelligent persons are under the impression that we have few, if any, flowering plants and shrubs that are worthy of cultivation. They have come

to look upon them as "weeds," or "wild things," as if all plants were not weeds and wild things somewhere, and so unfamiliar are they with them that they cannot recognize them when they meet with them outside their native haunts. I remember that some years ago I transplanted a goldenrod from the fence corner of the pasture to a place in my garden. There it grew luxuriantly, and soon became a great plant that sent up scores of stalks as high as a man's head, each season, each one crowned with a great plume of brilliant flowers. It was a sight worth seeing when in full bloom—a mass of floral sunshine, that brightened the whole garden. One day, in the fall, an old neighbor came along and leaned over the fence where I was at work among my plants.

"That's a beauty," he said, looking at the goldenrod. "I never saw anything like it before. I s'pose, now, you paid a good deal o' money for that plant."

"How much do you think it cost me?" I asked.

"Oh, I don't know," he replied, looking at the plant admiringly, and then at some of foreign origin, growing near by. The price of these he knew something about, for he had bought some for his own garden. He seemed to be making a mental calculation, based on the relative beauty of the plants. Presently he said:

"I wouldn't wonder any if you paid out as much as two or three dollars for that plant. How near right am I?"

"That plant cost me nothing but the labor of bringing it from the pasture, where I found it growing," I answered. "Don't you know what it is? There's any quantity of it in your pasture, back of the barn."

"You don't mean to say that's yellow-weed?" exclaimed the old gentleman, with a disgusted look on his face. "I wouldn't have it about my house! There's weeds enough, as it is, 'thout settin' 'em out." And away he went, with a look in his face that made me think he felt as if he had been imposed upon.—*Home and Flowers.*

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 New Sugar Producer.—According to several of the agricultural papers a plant has been discovered in South America which produces a considerable quantity of saccharine matter. It is one of the thoroughworts and is known as *Eupatorium rebaudium*. From experiments made with it, it is said to yield a sugar many times as sweet as cane or beet sugar.

Acorns from the Charter Oak.—Mr. Charles D. Turnbull, 2 Park Terrace, Hartford, Conn., writes that he has recently gathered a lot of acorns from a tree whose parent was the famous Charter Oak of history and offers them to any of our readers who will send postage. Many will doubtless be glad to obtain such relics of this historic tree. The present tree was planted in Hartford in 1847 and is now a strong and sturdy specimen.

Tobacco and Nicotin.—The alkaloids of plants are usually considered in the nature of waste products, but an Italian scientist finds that this does not hold true of nicotin and some others, such as colchicin, an alkaloid of the autumn crocuses (*Colchium*). Nicotin is not found in the seeds of tobacco but a substance similar to it exists in them. It is found, however, that if one cuts off the flowering part of the tobacco plant, there is at once an increase of nicotin in the plant, and it is the scientists' belief that this nicotin is a substance nourishing to the seeds which was designed to be transformed by them into other substances. Cutting off the flowering parts stops the movement of nicotin in that direction and it therefore accumulates in the leaves o the plant.

THE CRANBERRY CROP.—More than a million bushels of cranberries are annually sent to American markets.

ROSE VARIETIES.—According to *The Gardening World*, 6,400 different varieties of roses have been produced by florists up to the present and new ones are still being offered at the rate of nearly a hundred a year.

HOOIBREUK FRUIT CULTURE.—The Hooibreuk system of fruit culture is so named from its discoverer, an ignorant peasant on the Danube. He is said to have ascertained that branches trained below the horizontal produce flowers and fruit in unusual quantity. French papers have recently asserted that in this position the branches act as siphons drawing an increase flow of sap downward resulting in greater productiveness. At this rate it will not be long before science will countenance the practice of the old farmer who hung weights to all the branches of his fruit trees upon the theory that the most heavily fruited branches always hung farthest downward.

NOMENCLATURE NOT SETTLED.—There are those who will tell you that the nomenclature question has been settled for all time, but how far this is from the truth may be judged from the fact that an international botanical congress will meet in Vienna in 1905 for the consideration of this very subject. At present there are three centers in which three different ideals of nomenclature prevail. The first includes the botanists of continental Europe, who hold varying ideas of the subject but seem willing to get together; the second includes British botanists who, with the usual British conservatism, hold to the nomenclature used at Kew and cannot understand why all the rest of the world do not subscribe to it; and the third consists of the radical Americans who insist that we must make a nomenclature of our own without regard to the others. Dr. Otto Kuntze has recently stated that the application of the so-called Rochester Code to the botany of the world would necessitate the changing of nearly thirty thousand names, and in view of this fact, the American idea is not likely to gain much headway. The charge that can be

sustained against the British view is that it is behind the times. It would seem, therefore, that the need for an international congress to conside the subject is great and it is to be hoped that the approaching meeting may result in definite good to the science. Dr. A. Zahlbruckner, Burgring 7, Vienna 1, Austria is the Secretary and circulars of the meeting may be obtained from him.

COMMERCIAL USE OF DEER TONGUE.—A Florida paper notes that during the past season a single dealer has shipped upwards of 25,000 pounds of deer tongue to New York where it is used to mix with tobacco for its pleasant aroma. The deer tongue referred to, is also called vanilla and is the *Liatris odoratissima* of botanists. It grows wild in many parts of Florida and may be had for the gathering. Following the Civil War large quantities of this plant were shipped north but the demand for it finally ceased, and has but lately revived. Among other wild products of Florida that are now finding a market are palmetto berries, prickly ash and the seed of Jerusalem Oak (*Chenopodium botrys*.)

THE CHILLICOTHE.—Once more the chillicothe is confronting us with its great problem, or so it seems to us, of plant intelligence sufficiently great to tell the time of year. There has been no rain for many months, and even if there had been, it would not penetrate the hard earth to the depth of three to six feet, to where the chillicothe keeps its root. Yet every year at the proper time, the great roots, which often weigh two hundred pounds, send up each their dozens of vines which grow with almost visible speed for a few weeks, mature the spring "cucumbers" and wither, the root then beginning to prepare for next season. Quite apart from the great mystery of plant life, the fact of growth is the particular mystery of how this huge, shapeless root buried so deeply can elaborate from its own substance the beautiful wonderful life of spreading vines of flowers and a perfect fruit and most incomprehensible of all, how it knows just when the right time of year comes. —*New Century Path.*

THE CHRISTMAS TREE CROP.—*American Gardening* estimates that five million Christmas trees were cut in the State of Maine this season.

THE FLOWERING OF THE LAKES.—In many of our northern lakes, about mid-summer, each year, the water becomes filled with small golden globules about the size of a pin head. This phenomenon is called by the guides the "working" or "flowering" of the lakes and in England is known as the "breaking of the meres." The appearance is due to a blue-green alga, *Rivularia echinulata* which rises toward the surface in such multitudes as to become very noticable. An account of the flowering of the lakes in the Adirondacks from which the above note is taken, was published in *Torreya* for October.

LATEX.—Many plants among which the rubber trees are prominent, have a milky juice technically called latex, whose use to the plant is still a matter for speculation. The solution of the problem is also a matter of some commercial importance, for not all rubber trees produce this latex, and of those that do, there is, of course, considerable variation in the amount yielded by different individuals. Rubber is obtained from this latex and if the cause of its production were known it would probably be possible to stimulate the plants to greater productiveness. The problems presented by the latex are discussed at some length in a recent Government publication on the culture of the Central American rubber tree by O. F. Cook. According to Prof. Cook, the rubber in the latex is of no use to the rubber tree, and in different parts of the tree, the rubber is often replaced by a substance that hardens upon exposure to the air into a non-elastic resin. Some botanists have believed that the latex tubes are reservoirs for the storage of elaborated food materials and others have insisted that the latex is simply a waste product. It has also been suggested that latex protects the tree from insects. A microscopical examination has shown that each tiny globule of rubber in the "milk" is surrounded by a thin coating of protoplasm which shows that the rubber

is not the mere product of chemical action. The latex also varies much with the season, being most abundant and richest during the months of March and April when the tree is flowering and fruiting. Turning from the rubber trees we find that the production of milky juice or gums is a common characteristic of desert plants and from this we may assume that protection from drouth is one of the functions of latex, though it may turn out to be one of lesser importance.

PERFUMES FROM ROOTS.—We usually think of scent as residing in the flowers of plants, as in the cases of roses, carnations and stocks," say *Gardening World*, "in other plants it resides in the foliage, as in thyme, balm, mint and various other well-known plants. We now proceed to speak of a very rare instance of the scent emanating from the roots of a plant. We refer to *Nardostachys Jatamansi* which is a native of the Himalayas and has been valued in India from a remote period as a perfume. Dr. Royle gave it as his opinion that it was the spikenard of the ancients." While this may be a rare instance in which roots furnish perfume of commercial value one must not overlook the orris-root (*Iris*) in the same connection. Other roots that produce agreeable odors are sweet flag (*Acorus calamus*), the ebony and maiden hair spleenworts (*Asplenium ebeneum* and *E. trichomanes*), certain dracænas, etc. A complete list of odorous roots would be interesting. Who can add others?

NAMES OF THE ELEPHANT'S EAR.—It seems necessary to attack the Editor's second attack on the names of the elephant's ear, or *Colocasia antiquorum esculenta*, and reiterate the previous statement that the eleplant's ear is not, never has been and never shall be, called "Bleeding Heart." The *Caladium* varieties which may have been listed in the States under the whimsical name as "bleeding heart" are known in Porto Rico as "Yautia del Jardin," for it must be remembered that this is still an old Spanish island belonging to the United States, where English is spoken by only a comparatively few individuals on the

coast. Therefore it was as real an error to say that the Porto Rican "Malanga" is called "Bleeding Heart" as it would be to assert that century plant is the name applied by the Mexicans to species of *Agave*. Verily, the perpetration of synonomy is fearfully and wonderfully done.—*O. W. Barrett, Mayaguez, Porto Rico.* [To all of which the editor is willing to agree. He only quoted a bulletin of the United States Government in the first place, and is glad to be shown the true status of the case.]

A False Violet.—A dainty little plant is *Dalibarda repens*, yet so little known that its generic title has to serve for a common name. It belongs to the Rosaceæ, but has the aspect of a stemless violet. The flowers, which open about July 7, are white, and are usually borne singly on scape-like peduncles. Its habitat is damp, mossy woods.—*Guelph Herald.*

Dalea Saundersii.—The wanderings of Mr. C. F. Saunders in California have added to the attractiveness of our pages by affording material for various interesting notes and articles, but they have results of greater importance. Following upon the news of his return to the East comes the announcement that he has been honored by having a new *Dalea* named for him by Mr. Parish. The plant was found by Mr. Saunders in the Mojave desert, and to judge from the illustration is a namesake worth having.

Planning the Garden.—But never set anything in rows. Nature never does that, and Nature is the only gardener who never makes a mistake. Go into the fields and the forests and see how shrubs and plants are arranged there. Here a group, there a group, a result that seems to have no plan back of it, and yet who can say that Nature did not plan out every one of these clumps and combinations before they came into existence? Try to make your garden look as much like a real wild garden as possible, and the closer you follow after Nature the nearer you will come to success.—*Home and Flowers.*

FERNS AS WEEDS.—Accorning to *The Gardening World* the directors of the Highland Agricultural Society in an endeavor to eradicate the common bracken (*Pteris auqilina*) from grazing lands, has offered prizes of $100 for the best horse-power machine designed for cutting the fern, and $50 for the best hand implement for the same purpose.

WATER-CRESSES AND DISEASE.—Two recent outbreaks of typhoid in Great Britain have been directly traceable to the use of water-cresses from streams polluted by sewage. Water-cresses can be grown in moist soil instead of in water, but the plant has been so abundantly naturalized in waste places in America that almost the entire supply for American markets comes from these naturalized plants. Those with a fondness for this plant would do well to ascertain where it was grown before purchasing.

HYBRID LOBELIAS.—Mr. Oakes Ames describes in *Rhodora* for December certain hybrids between the great blue lobelia (*L. syphilitica*) and the cardinal flower (*L. cardinalis*) produced by cross-pollination at North Easton. Similar hybrids have been reported as growing wild in localities inhabited by the parent species. It is probable that when our flora is better known many other plants now considered species will turn out to be hybrids.

SEED DISPERSAL IN THE BASSWOOD.—An interesting method of seed dispersion is exhibited in the case of *Tilia Americana*, the basswood. Attached to the peduncle (stem of the flower-cluster and later fruit-cluster) at its base is a membranaceous bract in the shape of an elongated wing. While many of the fruits drop off the peduncle early in the season, many remain long after the leaves have fallen. When a strong wind blows, the peduncles are broken off at the base and away goes the cluster of fruit and its attached bract. But instead of falling to the ground at the foot of, or near the parent tree, the bract revolving rapidly round and round keeps the cluster suspended in the air while the wind carries it away, often to distances of two hundred feet and over.—*Guelph Herald.*

Editorial.

The tardy appearance of several recent numbers of THE AMERICAN BOTANIST can scarcely be more annoying to our readers than it is to us. The removal of the editor to new fields and the delays incident to getting our work adjusted to the new order of things is entirely responsible; but now that we have at last got running smoothly we expect to soon catch up again. It would be easier to do this by issuing one or two double numbers, but in our fifteen years experience as publishers we have never issued a "double number" and shall not begin the practice now. Readers may be assured that a magazine will be issued for every month in the year and that we will overtake our dates as rapidly as possible.

* * *

It is said that tea drinking is rapidly on the increase in America, but information regarding teas and tea making seems to be very meagre. Through the courtesy of *Indian Planting and Gardening*, Mr. Charles Judge, of Calcutta, has sent us a very complete account of the subject from which we make the following extracts.

* * *

The tea plant is a native of sub-tropical countries and grows wild in parts of India. Up to about 25 years ago, most of the teas used in the world came from China and Japan, but when the coffee plantation failed in Ceylon, the planters there took up tea culture and since then, owing to the persistence with which they have advertised their wares, Ceylon tea has become known throughout the civilized world. The tea bushes were introduced from India into Ceylon, and though the Indian teas, grown in the native haunts of the plant, are said to be superior, Ceylon advertisers have thus far prevented the fact from being generally known. An acre of tea will give from 420 to 460 pounds of marketable tea annually. The best flav-

ored India teas come from the hill districts of Darjeeling, the strongest teas from Assam and the sub-Himalayan districts called the Dooars. The teas produced in the region east of Bengal are of less value and chiefly used for blending with others.

* * *

There is an idea prevalent that the difference between black and green teas is due to artificial coloring. While it is not infrequently the case that partly spoiled or off-color teas are thus "doctored" by the unscrupulous, pure teas that are either black or green are made from the same leaves by different processes. Green tea is the tea-leaf cured and rolled before fermentation sets in; black tea is allowed to ferment slightly before drying, which process makes certain changes in the juices of the leaf and gives the tea a different flavor. Indian and Ceylon teas are all made by machinery which ensures a bright even and clean grade of teas; China and Japan teas, on the contrary, are mostly made by hand and if below the standard, are brought up by the addition of gypsum, indigo, Chinese pink, Prussian blue and various other ingredients best known to the wily Celestial.

* * *

As in the case of most plants, the greatest amount of the desired principle is found in the young leaves. These are handled separately and known as Orange Pekoe. The next larger leaves are called Pekoe and those still larger, Pekoe-Souchong and so on. The wholesalers know the teas by these names but before they reach the consumer they are blended, each blend being a mixture of various sorts and thus the teas loose their distinctive names. In some blends there may be as many as eight or ten teas. Tea blenders assert that blended teas will give better satisfaction than even the best grade alone because the variations in different lots is not so noticable. In England, blenders are said to be so careful of their blends as to make a study of the water in the districts in which they are to be sold, so that the two will harmonize.

The twist given to the leaf in rolling plays an absurdly important part in its taking qualities with the public. It is said that Americans are somewhat disinclined to buy machine rolled teas even of superior quality, preferring the shapes rolled by hand to which they are accustomed. Gun-powder tea is simply green tea rolled into little balls and is a Chinese product. Indian growers are told that they may pay less attention to the quality of the leaf if they will pay more attention to the shape! It is surprising that anyone should prefer tea made by hand by perspiring Mongols to machine-made tea, no matter what its shape. The broken leaf is considered to be stronger and therefore cheaper for the money than the entire leaf, but here again, the American refuses to take it on account of its appearance. In England broken Pekoes are said to command a slightly higher price than the whole leaf.

* * *

The Indian method of making tea is to take two spoonfuls of dry tea for each cup of tea wanted, and upon it pour boiling water letting it stand from half to one minute. In no other way can one obtain so much of the aromatic principle and so little of the bitter and astringent elements in a single cup of tea. In the usual way of making tea, the water is allowed to stand upon the leaves too long. A stronger tea is obtained by this method, but it has much more of the tannins in it.

Witch Hazel Valuable.—According to the Hartford *Courant*, a witch hazel still has been set up at Essex, and the farmers are afforded a market for witch hazel brush. The price received is about $1 a ton if standing, or $3.50 a ton if carried to the mill. One man has contracted to furnish 300 tons of brush. The brush is chopped up into convenient lengths by powerful machinery and is then ready for distillery. In other parts of the country the witch hazel is also being utilized. In Binghamton one extract maker has contracted with a near-by distiller for two hundred barrels of the witch hazel extract.

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CONTENTS.

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THE AMERICAN BOTANIST.

VOL. V. BINGHAMTON, N. Y., DECEMBER, 1903. No. 6

THE ORCHIDS OF WELLINGTON COUNTY, ONTARIO.

BY A. B. KLUGH.

AMONG the floral inhabitants of our bogs, swamps and woods there are none more interesting or beautiful than those belonging to the Orchidaceæ. During the past summer I paid considerable attention to those plants with the result that I am able to list nineteen species, which while not representing the total orchid-flora of the county gives us a foundation on which to build. To me one of the chief attractions of these plants is the habitat which they affect. It is nearly always the most secluded place in the locality, and on account of the spahagnum through which one sinks to the knees in water, the heat and the mosquitoes it is not the kid-glove botanist or the closet naturalist who is successful in an orchid-hunt.

The first orchid to be found was *Corallorhiza innata*, the coral-root, which was in bloom in a cedar swamp on May 11. It is a peculiar little plant and inconspicuous enough to be easily overlooked. That it is parasitic upon the roots of trees can be at once seen by its lack of chlorophyll. It had finished flowering by June 16 and the seed was ripe by July 23.

On May 23 the first *Cypripedium parvifiorum*, the smaller yellow lady's slipper was found in bloom. This orchid is not as common here as its relative *pubescens* from which it may be distinguished by the labellum being flattish above instead of convex, or more easily perhaps by its beautiful scent. It inhabits swamps and damp woods, and has finished blooming by about June 1. *Cypripedium pubescens*, the larger yellow lady's slipper is an inhabitant

of half-shady sphagnum bogs, where it appeared in bloom on May 30 and flowered until June 20. In the deep sphagnum in the shade of larches may be found the beautiful *Cypripedium acaule*, the stemless lady's slipper, with its large rose-purple drooping labellum cleft down the centre. They were in flower by May 30 and bloomed until June 18. The seeds were ripe by September 22.

The commonest and perhaps the most beautiful of our *Cypripediums* is *C. spectabile*, the showy lady's slipper. The half-shady sphagnum bog is its chosen haunt and in some such places it may be found in great abundance. The flowers on plants growing in shady situations are likely to be pale in color while those in sunny spots are apt to be white, strongly marked above with rose-purple. This species flowered from June 15 to July 15 and the seeds ripened about September 25.

One of the most deliciously fragrant of our Orchidaceæ is *Habenaria dilatata*, the tall white bog orchis. Its habitat is the half-shady bog where it blooms from June 17 to July 17 and the seed is ripe about September 25. Though found in considerable quantities in certain localities this orchid cannot be called common here. *Habenaria hyperborea*, the tall leafy green orchis, is, as far as size is concerned, one of our most variable species as mature specimens range from 6 inches to 3 feet in height. Their habitat is the open bog, but some specimens here have chosen a very peculiar haunt as they grow in the crevices of damp rock. This species flowers from June 19 to July 15, and is one of our commonest orchids.

An exceedingly beautiful little plant is *Orchis rotundifolia*, the small round-leaved orchis, and its mauve flowers have a most delicate perfume. I found the first in flowers on June 20. This species is decidedly rare, and its haunt is the tamarac swamp with a sphagnum bottom, where it occupies rather a shady situation. *Pogonia ophioglossoides*, the rose pogonia, is a flower with a perfume which for sweetness and a strange strong delicacy, is not equalled by any plant with which I am acquainted. The odor is

essentially its own and like unto nothing else. This plant prefers the open bog, where it came into bloom about June 20, and flowered until July 25. The seed was ripe by September 23. So far only two stations are known in the county. At one of these it is very abundant, growing in thousands. Another showy plant of the open bog is *Calopogon pulchellus*. The most peculiar feature of this orchid is the position of the labellum which is uppermost. This is due to there being no twist in the ovary as there is in most orchids. The position of the labellum at once made me curious to witness the pollination of this species, and after much watching succeeded in doing so.

The following is the process:—The bee alights upon the labellum, which bends over near the base (three bracket-like ridges prevent it doing so elsewhere) until the back of the bee is in contact with the column. The bee (which is of course upside-down) sips the nectar secreted by the glands at the base of the column. As it withdraws, its back opens the operculum (lid) of the anther, and a pollinium (or several) adheres to its back. On visiting the next flower the pollinium slips past the convex surface of the closed operculum, but as the bee withdraws, the pollinium is caught by the slight beak of the stigma and adheres to it, the bee meanwhile receiving another pollinium from the anther of this flower. This species is fairly well distributed and at some stations is very abundant. It flowered from June 22 to July 20 and the seed was ripe by September 23.

Liparis loeselii, the tway-blade, is a little inconspicuous greenish orchid, which inhabits some of our swales and bogs. It bloomed from June 16 to July 1. In the open, quaking bog where *Pogonia* and *Calopogon* abound, another beautiful orchid *Arethusa bulbosa*, is to be found. It is not present in anything like the same quantities as the two other chief inhabitants of this attractive spot, but is quite common. It chooses the very wettest portion of the bog, where the covering of moss is so thin that as you walk you are always in the middle of a dell some two feet

deep. This bog I believe to be the basin of an old lake which is now filled with soft watery mud and covered over with a layer of sphagnum and grass. The perfume of arethusa is delicate and somewhat resembles a mixture of roses and spruce.

Habenaria lacera, the ragged fringed orchis, attains a great size in this locality, and the spurs are frequently 10 lines in length and longer than the ovary. The odor of this species is almond-like. Its habitat is open bogs where it blooms from June 26 to July 18.

A peculiar little orchid found growing parasitically on the roots of trees in dry woods is *Corallorhiza multiflora* the many-flowered coral-root. It is scarce in this locality. This species bloomed from June 28 to July 15, and the seeds ripened about September 22. In some of our marshes and lowlands grows *Habenaria psycodes*, the smaller purple fringed orchis. The flowers are very variable in color ranging from mauve, through lilac and violet, to purple. It comes into bloom about July 10. *Habenaria bracteata*, the long-bracted orchis, is apparently very rare here. It inhabits dryish woods, and appears in flower about July 1. In one open bog in this locality *Habenaria tridentata*, the small green orchis, is abundant. It blooms from July 15 to 30. This orchid appears to be self-fertilized as the pollinia, even in the bud, are never entire, and in some freshly-opened flowers will be found adhering to the labellum as if they had slipped from their sacs. Many of our inconspicuous greenish orchids appear to me to be capable of self-fertilization if the necessary insect does not visit them.

In some of our swales grows *Spiranthes romanzoffiana*, the hooded lady's tresses. The perfume of this species is strongly almondy. It blooms from about July 15 to August 5. A little plant with most attractive leaves is *Goodyera repens*, the rattle-snake plantain. It inhabits cedar swamps with a mossy bottom, and is apparently scarce here. It appeared in flower on July 20 and the seed was ripe by September 25.

There are three ways in which those who delight in orchids can help to maintain their local orchid-flora. One is by always directing people's attention away from the best orchid haunts; another by digging up such plants as grow in conspicuous situations and are likely to cause the basket-fiend to invade the station; and the third is by thoroughly disseminating the seed. In this latter proceeding I have had great success, sometimes causing a five-fold increase in a year.

Guelph, Ontario.

OUR HOT-HOUSES.

BY DR. WILLIAM WHITMAN BAILEY.

THOSE who really love flowers must have them at all seasons. Household plants, however, are a care that we cannot personally indulge in. Hot air, gas, the scaly bug and a legion of evils lie in wait for them. We prefer to let some one else do the worrying and are content to glory in the perfected result. We are on good terms with the florists, perhaps from a sort of fellow-feeling. They are often positive, but then, so are we. Most people who own to convictions are. They tell us a deal that we did not know, and could not, for they practically live with the plants. Generally they are modest and unpresuming. To be sure they misapply names in a way that sometimes gives us the fidgets, but any modern text-book is quite as trying.

A busy, hard-working set of men, up early and late they must learn things about these pets of ours that we see only on their good behavior. Maybe some of them reason in an unscientific way, but it is a good deal to reason at all. It is still more to have your eyes open to things about you. A man who acquaints himself with the life history of one plant, has learned a useful lesson. It is connected with the chronicle of all.

For professional reasons rather than æsthetic, we have for a long time had to visit the conservatories. This formerly even more the case than now. In winter we were dependent upon them for material. Once in a hot-house

we are obliged to linger. The tropical air, the warm fragrance, the lavish color or lush verdancy woo us to remain. It is good for one to step out of the sleet and slush into this atmosphere of perpetual summer. Look at those yellow trumpets of *Oxalis*. Have they not caught and held the glory of the sun. In it they revel, uncurling their delicate satiny petals only under its influence. See that shell full of Chinese primroses, each flower scalloped and fluted as by an artist. What beautiful leaves they have too! Indeed, enough attention is not paid to leaves, the most variable of plant organs, exquisite often in texture and outline, and veining. Flowers are, at best, evanescent; but the leaves, in a conservatory, we have ever with us, from the picturesque blades of calla, to the misty foliage of *Acacia*, or the dream of maiden-hair. We like to cut a lot of them, maybe drawing their details—or studying their details—or studying their structure. There can be no better models for nature sketching.

The gardener may tell you that just now there are but few flowers in bloom. Let us see. There are pinks, ranging from pure white through delicate salmon color to yellow and deep crimson. Some of them are deliciously perfumed. There are the long red, white or pink trumpets of *Bouvardia* a very wealth of bloom; the pure clusters of fragrant *Freesia*; the ever lovely and odorous *Daphne*; the umbels of *Pelargonum*, and the abundant bloom of *Azalea*.

Take a turn down this low chamber, where the snow is sliding on the roof above. What is this odor of spring? Violets? Yes, there they are, nestling in a corner as on some April bank.

Nature must have smiled when she made a violet. She made Yankee ones and for some inscrutable reason omitted the perfume loved of Shakspeare. Otherwise their graces are incomparable. What are those bizarre-looking plants airily perched on "Coignes of vantage?" Our guide tells us they are orchids, a family renowned for its odd forms, superb and diverse coloring and marvelous

mechanisms for securing cross-pollination. Indeed, some look themselves like insects or birds. Occasionally we meet with some rare or unusual flower. Such are always turning up in these days of national expansion. Here we can look at them without fear of the playful Moro of tricky Tagalog.

Be gentle with the florists, reader, for they are *gentle* men from their trade. No one can live among flowers and not imbibe some of their purity. Approach these guardians quietly—not with ostentation and you will find they can teach you much.

Brown University, Providence, R. I.

NEW WORK.

BY M. F. BRADSHAW.

SEEDS are never out of season in this part of the world and collecting goes on, though not so rapidly as in the summer and fall. They do not lose their interest for me in the least and I am getting more and more impressed with the amount of knowledge hidden among them which perhaps I never should have gained otherwise.

Still new work seems to be one of the wants of the new year, so for me, while leaving out nothing of the old work, I have begun another—if indeed, it is not rather play. A blank book 7½ x 10 inches has been procured and I mean to take one family of plants and make as thorough a study of it as I can, beginning with the seedling plants and going on to the matured seeds. I shall write it all out even the most common and conspicuous aspects and illustrate with water color and pen and ink drawings every step of the way.

This ought to make a beautiful book and that depends on my skill; as to the usefulness of it, who knows?

At least *I* shall remember the arrangement of every part of every genus and species. My choice of family for this year is the geranium represented here by only four genera: *Geranium* with two species, with only one of which I am acquainted; *Erodium* with three, all familiar;

Limanthes one species with one variety, unknown to me; *Oxalis* with two species, only one of which I have seen. Not much of a family to work on, but there are many varieties in the garden differing widely.

Orange, California.

DESTROYING THE FERNS.

Those who patronize the florists have no doubt been impressed with the important part ferns play in the make-up of bouquets and other decorations, and have perhaps imagined that the fern fronds were grown in the greenhouses with the flowers. Such, however, is not the case. The thrifty cultivator uses all his space for flowers and depends upon Nature for his ferns. Orchids, carnations and roses must be grown under glass but the hillsides of the northern States are covered with fern, that, up to the present, could be had for the gathering. This has resulted in the development of an extensive traffic in fronds of our native ferns, which is beginning to threaten their existence in the regions from which the supply comes.

To prevent the total extinction of the ferns in the Berkshires a measure has been introduced into the Massachusetts Legislature requiring that each fern-gatherer in that state have a license and making other regulations for restricting the collecting. This, of course, has aroused the strong opposition of the dealers. From the Pittsfield *Evening Journal* of Jan. 20, we take the following which sets forth the collector's side of the case.

"Hinsdale is aroused over the bill that Representative Allen T. Treadway of Stockbridge has introduced into the House of Representatives relating to the fern industry in this country. If this bill passes the House the industry will be killed in Berkshire so say the dealers and they are going to put up a stiff fight to defeat it. Not more than $50,000 worth of ferns are harvested in Berkshire every year and if the business is killed it means that the chief source of income for scores of families will be abolished. As showing the extent of the industry John Abbott of

Hinsdale buys more than $10,000 worth each year. L. B. Brague does an equally large business and there are several more in and about Hinsdale.

It is estimated that more than 100,000,000 ferns are gather each year and put in cold storage at Springfield to be sent broadcast over the country. From all over the country come in the farmers with their great loads of ferns, some of which bring as high a price as $2.50 a load. For the past twenty years dealers in Hinsdale have been in the fern business and they say there has not been the slightest diminution in the supply.

All the year up to the time of frost in the autumn, farmers have their entire families out getting ferns; ferns of all descriptions from the delicate maiden-hair to the austere brakes. The roots are always saved and in many cases land that is of no value for other purposes brings in a good revenue from the ferns.

The bill provides that the pickers must have a licence to conduct their business and that a certificate must follow each lot of ferns from the time they are gathered in the woods of Berkshire until they reach the final purchaser in some large city.

This red tape would kill the business entirely, the dealers say. It is said that Mr. Treadway has been prompted in this measure by summer residents of Stockbridge and vicinity. It is said that Italians coming up to Stockbridge have raised havoc with the beauty of woods in southern Berkshire and hence his wish to save them. A man interested in fern gathering said to-day that at least one-fourth of the people of Berkshire are directly interested in the fern business."

When a man owning a piece of land chooses to market the ferns upon it, or to allow others to do so, no one can object for a man may do as he will with his own. If he decided to cut down his woodland, plow up the ferns and sow other crops upon the land, no one would criticise him. But the gathering of ferns from the lands of another without permission is quite another matter and the sooner the

people of Massachusetts and other New England States put a stop to such practices, the better.

It is a mistake to think that removing the fronds, even in autumn, does no harm to the plants. Gathering the fronds late in the year injures the plants less than at other seasons, but it may be safely assumed that so long as the fronds are green the plant has use for them. Here seems to be a good opportunity for the Plant Protection societies to do some missionary work. Any person willing to exterminate our ferns at $2.50 a wagon load ought to be converted.

PLANT HAIRS.

So great and numerous are the dangers that beset all living plants that they have adopted special means—many of them extremely wonderful—whereby they are enabled the more easily to ward off enemies and grow and propogate in safety. Amongst the various natural contrivances to bring about this end there is no doubt that the production of hairy appendages or outgrowths on the different plant organs certainly plays an important part. Nothing is without its use in Nature, not even the smallest hair or the smallest most tender, most humble plant, each has its own specific duty to perform, its part to play in some definite vital labor.

And so we find that there are special reasons why hairs are produced on roots and stems, leaves and flowers, fruits and seeds, whether the outgrowths are dense or sparse, whether conspicuous to the human eye or otherwise. The uses for which they are created are indeed numerous, varied, wonderful and extremely interesting.

The presence of a hairy covering protects many a delicate leaf of flower-bud from excessive damp or cold as it does also many a matured organ; whilst in other cases or even in the same, it protects from the too excessive heat of a burning sun by checking rapid evaporation of moisture through the stomata or breathing pores thus preventing flagging or even death. The beautiful mountain Edel-

weiss with its dense, white, woolly coat is so formed in order that mists or cold may not penetrate or clog the stomata nor the burning sun's rays do any harm during daylight hours; and in our own land there are interesting and pretty examples of a similar kind of growth in the case of the wild filago and various species of cud-weed, dwellers in spots where the sun strikes fiercely in the heat of the day. Many climbing plants, such as runner bean, hop and wild cleavers, show curious hooked hairs; these act as grappling irons and greatly assist the structure to grow on foreign supports; while a vast number of other species, in order to ward off browsing animals, clothe themselves with a felt or web or hair so dense that to anything attempting to eat it the effect would be most unpleasant and choking. The beautiful great mullein is a good example of this. It has been proved, too, that hairy plants are far less frequently attacked by aphis or plant lice than those that are smooth textured. Browsing animals for the great part, as well as most insects (except snails and a few caterpillars) are kept a bay by means of stinging hairs in the nettles, the burning acrid juice secreted by the latter proving extremely disagreeable to anything or anyone who carelessly bruises the plants.

When hairs are found actually on, or within the flower itself, the fact may be recognized that they are invariably formed there in order to exclude unbidden guests, as ants —small creeping insects being of no use whatever in the great work of cross fertilization, but rather, indeed, injurious in so far as they rob the blossom of its pollen, but fail to convey it safely to any other. Frequently these hairy guards are very dense, forming such an impenetrable barrier that certain (and these are the non-welcomed) insects cannot enter, while they offer no hindrance at all to others whose long, thin proboscides can easily thrust themselves between the hairs or deliberately push open the apparently closed doorway.

If hairs be carefully examined they will be found to be outgrowths of the epidermal cells and may occur on

almost any part of the plant. Their structure varies considerably but they may be classified as simple (unbranched) or compound (branched) each of which groups may again be divided according to whether the hairs be composed of one or more cells (unicellular or multicellular). A good example of a simple unicellular hair may be seen on the leaf of the geranium and a curious branched multicellular one is found on the deadly nightshade. Sometimes the branching forms quite a miniature tree as in the great mullein.—*From an article in Nature Study, (England)*.

CHRISTMAS TREES AND PLANT PROTECTION.

We commend the following from an editoral in *Forestry and Irrigation*, to all who are concerned for the safety of our forests on account of the cutting of Christmas trees. The publication mentioned is the official organ of the American Forestry Association, and certainly would not countenance anything likely to injure the forests.

"This year complaint was heard, especially from the northern cities, that Christmas trees are too expensive to be used as generally as in years gone by. The supply is decreasing. This is a matter for regret. The Christmas tree is a strong accessory to a good home. It is a part of the birthright of childhood and its enjoyment should not be limited to the homes of the wealthy.

Undoubtedly there are enough young evergreen trees in the north to furnish us indefinitely with Christmas trees if we use them wisely and eke out the supply. The rise in prices means only that the well shaped trees which grew conveniently near shipping points have been exhausted, and that the dealers now have to bear the expense of longer hauls.

Here is an opening for thrifty northern farmers. A few pounds of spruce and balsam seed each spring scratched into the ground on the shady side of the fences, or in the open places in the farm woodlot would yield enough Christmas trees after a few years to buy a hand-

some gift for each one of the family. They are already raised at a profit by nurserymen.

But the attitude of the sentimentalists who would cut no tree, even for Christmas purposes is equally mistaken. Such persons are a serious hindrance to the progress of real forestry for they antagonize the very men they would like to convert. Let every home that needs a Christmas tree have one by all means for this legitimate use, but cry down indiscriminate cutting and waste in the woodlands, and prepare for 1914, if you are in a position to do so, by planting a few spruces or firs.

DODGE'S FERN.

The person who is continually using scientific names and who understands their meaning, is apt to decry the use of "popular" names for plants; and indeed it is a question if the amateur who uses them is not robbing himself, for he will often find plants that have no common names and he will be unable to speak of them intelligently. There is no good reason why the Latin names of ferns should not become as "popular" as Dahlia, Fuchsia and hosts of others that are in every day use. The writer of popular books is often hard pressed to supply this demand for "easy" names, and frequently complies by coining a word. An instance of this is seen in a recent work on ferns where *Nephrodium simulatum* Dav. is spoken of as the "Massachusetts fern." It strikes me this name is particularly unfortunate; first, because it was not discovered in Massachusetts, but at Seabrook, N. H.; secondly, it was brought to notice, as was the hybrid shield-fern, by Raynal Dodge, a close student of New England fern life, compiler of a manual of our New England Pteridophytes, and a good collector and observer, a man who has added much to our knowledge of plants in the little time allowed from the busy life of a machinist, and it should rightly bear his name. It is to be hoped that in future this will be spoken of not as the "Massachusetts," but as "Dodge's" fern.—*A. A. Eaton, Ames Botanical Laboratory, N. Easton, Mass.*

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.

CORN PRODUCTS.—Indian corn or maize, the last discovered of the edible grains, bids fair to become of more value than all the others combined. In addition to its use as food for man and beast, it is the source of alcohol, whiskey, glucose, sugar, starch, dextrine, syrup, glycerine, corn oil and a valuable substitute for rubber.

POLLEN AS FOOD.—In Baluchistan, according to *Indian Planting and Gardening*, the narrow-leaved cat-tail (*Typha angustifolia*) is known as elephant grass, and the pollen is gathered and used like flour in making bread by the inhabitants of Sind and Bombay. A recent analysis showed it to have a high food value as it contained about 47 per cent. of carbohydrates and 20 per cent. of albuminoids.

THE LITCHEE.—Occasionally one may find at the fruit stores a certain round nut similar in external appearance to the fruit of the button-wood (*Platanus occidentalis*). The shell is thin and upon being broken reveals, within, a dark kernel like a raisin in taste and appearance, which encloses a large dark colored seed. This nut is often called the Chinese nut, but is more properly the litchee (*Nephelium litchi*). Those who have tasted the fresh fruit say that there is no comparison between it and the shrivelled specimens in the stores. When fresh the outer shell is tinged with pink and the interior is full of the jelly-like pulp, whitish and almost transparent. The litchee is a member of the Sapindaceæ and therefore a not distant relative of the bitter-sweet (*Celastrus*) and the burning bush (*Euonymus*). The pulp of the litchee is really an aril comparable to the scarlet pulp of its relatives above mentioned.

Poisonous Yams.—Yams (*Dioscorea*) are among the chief foods of the tropics and it is a matter of interest to learn that every variety contains a poisonous alkaloid called dioscorine which acts as a paralyzant of the nervous system. Fortunately this alkaloid is removed by boiling, and as yams are not eaten raw, no ill effects are experienced.

The Citrange, Tangelo and Plumcot.—Recent experimenters, not content with simply hybridizing their plants, have insisted on hybridizing their names also. Thus we now have the plumcot, a cross between the apricot and plum, the tangelo, a cross between the tangerine orange and the pomelo or grape fruit, and the citrange a cross between the orange and an inedible species called the trifoliate orange (*Citrus*). It is well known that squashes and pumpkins planted too near together form natural hybrids. Now, the question is, would the hybridizers call these fruits squakins?

Pollination of Water Plants.—Field botanists are familiar with the general method of pollination in water plants like the eel-grass (*Vallisneria*) but the details do not seem to be so well known. In the *Botanical Gagette* for January, R. B. Wylie in discussing the morphology of the ditch moss (*Elodea Canadensis*) describes its method of pollination very fully. This plant grows under water and its pistillate flowers reach the surface by means of a greatly elongated floral tube, the ovaries being sessile and some distance under water. The staminate flowers have no lengthened tube and at maturity break loose from the plant and rise to the surface where they shed their pollen. The special interest that attaches to this feature is the fact that just as the pollen is ripe, the plant gives off oxygen in sufficient quantities to fill the flower and keep the water away from the pollen. Even before the flower rises to the surface the pollen may begin to be shed in the bubble of oxygen. The gas also aids the flower to rise to the surface. At the surface the bubble at once disappears, the sepals snap backward, forming a three-parted float. At

the same time the rest of the pollen is discharged. The pollen grains are covered with minute spines with enlarged tips and these enable them to float. The recurved stigmas of the pistillate flowers form little hollows in the surface film of the water, and the floating pollen grains, drifting into these depressions, effect pollination.

Pine Trees and Moisture.—We are only beginning to understand the causes that determine the distribution of species. An illustration of this is furnished by Prof. B. E. Livingston, who recently stated that in Michigan, if the water content of the soil be 50 per cent. or more, the forest is white pine, but if the moisture was but 35 per cent. Jack pine replaced the white pine.

Effect of Shade on Plants.—At the recent meeting of the Society of Horticultural Science at St. Louis, Dr. B. M. Duggar stated that shade makes the stems of plants longer but weaker, and the leaves larger, thinner and softer. It increases the amount of acid in plants, but greatly decreases their content of starch, sugar and dry matter. It does not interfere with the manufacture of protein and shading is, therefore, especially adapted to such crops as asparagus and rhubarb.

Utility Weeds.—I have been told, by one who has cooked and eaten them, that the young leaves and shoots of the milkweed (*Asclepias*) furnish a most delicious dish of greens, tasting much like asparagus. Also, I recently read that the young seed vessels of shepherd's purse (*Capsella*) scattered over a salad, added piquancy to its taste; and that gathered and eaten, as often is agreeable, are a sure cure for indigestion. Will some one try the remedy and report?—*C. E. P.* [Milkweed is only one of the weeds utilized in suburban districts as a pot-herb. The list includes nettle, dock, marsh marigold, horse radish, pigweed, poke, mustard, solomon's-seal and probably others. The wild pepper-grass, (*Lepidium*) is excellent for salads while the winter cress (*Barbarea*) is so frequently used in spring that it has gained the name of "poor man's cabbage."—Ed.]

"PAINTING THE LILY."—It is interesting to observe how some dealers attempt to improve upon Nature in the matter of the evergreens used for holiday decorations. We have recently noticed in the markets quantities of ground pine (*Lycopodium*) that had been dyed a most brilliant and poisonous looking green, quite unlike the color the plant has in life. The query arises, were these dyed specimens recently collected or is this a scheme to work off old material from which the original color has faded?

LEGUMINOUS PLANTS AND NITROGEN.—It has been but a comparatively short time since botanists discovered that the tiny nodules on the roots of leguminous plants contain bacteria able to withdraw nitrogen from the air; but the fact that leguminous crops, like clover, plowed under, greatly enrich the soil has been a matter of common knowledge for centuries. In fact, Pliny (about A. D. 80) speaks of it. What the moderns have discovered is simply the means by which the plants enrich the soil.

A DANGEROUS STATEMENT.—Prof. Conway MacMillan in his "Minnesota Plant Life" states that "the ordinary innocuous sumacs are, from their brilliant autumnal tints, very beautiful shrubs of the Minnesota copses and hillsides. The poisonous varieties do not show the rich hues of their harmless relatives." This statement struck me as peculiarly dangerous, for here in eastern Massachusetts the leaves of the poisonous sumac (*Rhus venenata*) turn in autumn the most brilliant scarlet. I have known of several instances of serious poisoning by persons gathering the leaves for household decoration, ignorant of the deadly poison larking beneath their vivid beauty. I warn my friends not having any botanical knowledge, never to gather scarlet sumac leaves growing in swamps, as so far as I know, the poison species is never found elsewhere.—*C. E. P.* [Our correspondent is quite riglet about the color of the poison sumac, but the poison ivy (*Rhus toxicodendron*) usually turns a clear yellow, a color, however, that is fairly attractive. Fortunately neither species is as poisonous late in autumn as it is earlier in the year, though at any season it may affect those most susceptible.—ED.]

Editorial.

As this is being written, it is very apparent that the present number cannot be issued on time; but as this is not a newspaper the fact that it does not appear on a certain date, should not annoy anyone. Readers may be assured of receiving twelve numbers for their dollar and of receiving those numbers on time just as soon as the overworked printer can catch up. It is our aim to put out the kind of matter that is of permanent value—the kind that does not lose in interest when a day old—and this allows us some latitude in the date of issue. Since we began publication three prominent botanical publications have advanced their subscription price, but our price has remained the same, though we have several times added to the amount of matter presented, and it will continue to be the same. Under these circumstances we trust that all of our subscribers will renew for the coming year. With this issue bills are sent to all whose subscriptions are not paid in advance and attention is called to the very liberal conditions of subscription printed thereon. Attention is also called to the combination rates offered elsewhere. If you are going to buy a new book this spring, order the book and subscription at the same time and save money.

* * *

While attending the meeting of the American Association for the Advancement of Science at St. Louis, the editor dropped into a section in which a large number of eminent botanists from all parts of the Union were discussing papers relating to Ecology and was interested in the way references to nomenclature were received. Any mention of the subject was sure to cause a smile. One speaker said of a species, "We used to call it——(mentioning a scientific name) I don't know what it is called at present," and another said, "The summit is covered with the plant which we call —— (another scientific name) but

systematists call what they please." Most botanists who are not actually engaged in naming plants begin to realize the folly of changing names merely for the sake of "priority" and to appreciate the great burden such changes have placed upon all other branches of botanical activity. Botanical works in the past have used the terms which some nomenclaturists are now doing their best to discredit; should they succeed in this, future students will be obliged to master two nomenclatures, one for the present, and another for the past, for these old books must continue to be consulted.

* * *

We have several times had occasion to refer to the appetite for the marvelous evinced by the average newspaper reporter who can transform the most ordinary fact into a piece of wonderful fiction by a few deft strokes of his pen. No doubt we shall continue to have these romances until the editors all have a botanical education or are willing to submit botanical articles to some botanist for correction. One of the most interesting of these fictions has recently been brought to light by *Forestry and Irrigation*. It was originally published by the *Saturday Evening Post* and deals with that interesting tree, the Eucalyptus. Among other things it says: Five years from planting, groves raised from seedlings will yield 75 cords of stove wood an acre. Three to five years from the time of cutting, sprouts that spring from the stumps mature into trees that produce more cords to an acre than the original growth. Continuing in the same strain it is stated that "some varieties thrive in tropical swamps and others flourish in the mountain snows *far above the timber line*." Commenting on this *Forestry and Irrigation* remarks, "Just think of the points brought out. According to the voracious not to say veracious space writer we have in the Eucalyptus the first and only tree to grow above timber line and we begin to wonder what the timber line was ever invented for. Consider the fact of saw logs grown while you wait and the prolific sprouting which

puts to shame the succulent asparagus." It is said that for some weeks after the publication of the *Post* article, the clerks in the U. S. Bureau of Forestry were overworked in opening letters from people asking for more information about such a wonderful tree.

* * *

To those looking for other botanical worlds to conquer, we cannot too highly recommend the plan for new work outlined by Mrs. Bradshaw in this issue. What plant do any of us really know? The systematist may tell you its name and the physiological botanist may have an idea of the tissues that compose it, but each knows only a part—and a very small part at that—of its life history. But when one has drawn all parts of a plant and watched it long enough to obtain all its phases, he cannot fail to have a very intimate knowledge of it. Especial stress is to be laid upon the drawing. It is not enough to carefully examine the plant even with a microscope, for one may easily overlook important points, but in drawing he must see everything and its relation to all else. Educators have recently found this out, hence the great importance now attached to drawing in laboratory work. There are doubtless many who will be inclined to say that they cannot draw; but it should be remembered that botanical drawing is not primarily to make a pretty picture, though this also is desirable. Accuracy is the first requirement and this can be attained by all who care to try for it.

* * *

With the beginning of its Seventh volume, *The Plant World* will advance its price to $1.50 a year. Although it will remain as heretofore the organ of the Wild-flower Preservation Society, it will not be sent free to members. The dues of the society, however, have been reduced in consequence.

Addresses Wanted.—Dr. R. J. Smith, Mentone, San Bernardino, Co., California, is interested in studying the ferns of his state and asks for the address of any resident of California interested in the same subject.

THE AMERICAN BOTANIST

DEVOTED TO ECONOMIC
AND ECOLOGICAL BOTANY

EDITED BY WILLARD N. CLUTE

Volume VI

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STONE-WALLS OF NEW ENGLAND.

BY DR. WILLIAM WHITMAN BAILEY.

IT would be quite possible to determine the region in which one found himself by the character of the fences or means of demarcation. In lower California, Arizona and Mexico, one finds estates separated by close-growing prickly and impenetrable cactuses; our central States show the familiar zig-zag, snake or Virginia rail fence; old England is marked by it's verdant hedges of hawthorn; Mauritius by flaming palisades of scarlet *Poinsettia*; Ceylon by *Lantanas*, and our own New England by stone-walls. We might perhaps add the cruel barbed wire fence in Cuba.

Our ancestors builded better than they knew. Their primal purpose was to rid themselves of the superflous stones left by the glacial drift. They thought little of the æsthetic. Often the walls are loosely constructed, and they may follow the trend of the land. Frequently they are much broader than high. Their possible semi-ruinous condition adds an excitement to the attempt to surmount them and lends somewhat to their charm. The stones are quite irregular in form, and Nature early incrusts them with yellow and gray lichens.

Often one finds either side of a wooded way bordered by these primitive monuments to the god Terminus. All sorts of plants like to nestle against them. Hard-hack and meadow-sweet cluster at their bases. Sombre junipers watch beside them like sentries; the woodbine, in scarlet skirmish line, scrambles over the shones and places its banner in triumph on the outer wall. Here, too, grows the pretty and odorous ground-nut, scenting the

air as with violets. In June the wild grape pours out its ravishing fragrance, and in autumn offers its amethystine beads. Here, too, the *Clethra*, one of the last shrubs to flower in August, shows us its pretty white blossoms. Indeed, a New England stone-wall is often a perfect flower garden, where fern and blossom contend for mastery. Bitter-sweet and Roxbury wax-work tangle about it; golden-rods and asters make it gay with bloom, and tall *Osmundas* raise beside it their plumy fronds.

It is always refreshing to leave the beaten track or dust-lined highway for a grassy lane, overarched by trees and wall protected. These roads possess wonderful possibilities; they may lead any or no where. Their intentions are usually good, but they may "end in a squirrel-track and run up a tree." All the better; let us follow and explore.

> "This solitude may shrine the haunted wood,
> Storied so sweetly in romance and rhyme,
> Secure from human ill, and rarely peopled still,
> By fawns and dryads of the olden time."

We may meet some of these queer people and need no introduction.

Yes, our stone-walls are poems. We could no more dispense with them than with the maple or pine. They are outgrowths of the soil. They take the place of ruins in our landscape; they are the settlers' unconscious contribution to the beauty of the scene.

Providence, R. I.

THE YOUNG FRINGED GENTIAN.

BY J. FORD SEMPERS.

IN addition to what has appeared in THE AMERICAN BOTANIST concerning the biennial habit of the fringed gentian, a further description of some experiments with the plant in its first year of life, and the results that followed may also be of interest. Many thanks are first due to Mr. Plitt who very kindly supplied the seed from his station near Baltimore, Md., for making the tests.

Our plants were all necessarily reared in a more or less

artificial way, yet quite likely their behavior varied but little from that of the wild plants. I suspect that the gentian is one of those wild flowers which must have its own way, and that it will not readily become adapted to uncongenial surroundings.

Over three years ago (Dec. 14, 1900) I made several experimental sowings. The shallow boxes containing the seeds were placed under glass where the temperature usually ranged from 40° Fahrenheit at night and 60° Fahrenheit in the daytime. In four weeks germination began, but very sparingly. Subsequent plantings made nearer spring gave an abundance of plantlets when the night temperature was increased.

The growth of the young plants was extremely slow. At intervals of several weeks a small leaf would be added to the cotyledons, which persisted until the time for transplanting in the open air. This last operation resulted in killing nearly all of the seedlings. However, some few survived, but made the merest perceptible growth. Midsummer found me with less than a half a dozen plants, and these continued to drop off one by one. In spite of adverse conditions one plant held on to life and by September had acquired seven small leaves. So low and depauperate a specimen was it that it could really be hidden under a twenty-five cent piece. As the cool October weather advanced the outer edges of the leaves assumed a reddish hue, a color commonly noticed in the leaves of other winter resisting herbaceous plants. At this stage the little gentian might have been likened to the small first year's growth of some biennial cultivated pink.

During the winter the large outer leaves died following several severe freezings to which the plant was subjected. The inner leaves, forming the center of the whorl, folded over one another as in a bud and scarcely larger than a very small pea remained alive.

At the end of March, 1902, the little bud suddenly became vividly green and began increasing in size. Early in April one long tapering leaf thrust itself from the now

somewhat enlarged bud. Others soon followed having the usual shape of those found on the flowering plant. By May the stem had started skyward. In June it threw off lateral branches, these again branching in July, and by the middle of August the flower buds began forming.

In experimenting with the seedlings, their marked preference for lime could hardly be overlooked. Possibly the soil used was deficient in this ingredient. However, that may be I find in looking up the few stations for this plant with which I am acquainted that all are either located in, or not far removed from limestone formations. Mr. Plitt tells me that he also finds the plants more robust in calcareous soil. It would be interesting to hear from others respecting the character of the soil in which the plant is found, and to know if the preference noted in the seedlings was simply accidental, or if it really has any bearing on the distribution of the plant.

Aikin, Maryland.

BOTANY FOR BEGINNERS—IX.

FLOWER CLUSTERS.

If each flower grew on a simple stem, like the bloodroot, hepatica, trillium, violet, water lily, lady's slipper and a host of others, we would escape the infliction of certain technical words which otherwise seems unavoidable. Fortunately most of these are in common use, though they are often applied rather loosely. Let us begin with the *spike*, a word which, among florists and gardeners, does duty for any assemblage of flowers along a stem. Botanically, however, a spike is a stem upon which the flowers are *sessile*, that is the flowers do not have separate stems of their own. The plantain, common mullein, willow-herb (*Epilobium*) the blue vervain and common evening primrose are good examples of this. Next to the spike comes the *raceme* and differs from it only in that the separate flowers have short stalks of their own. It is perhaps the commonest form of inflorescence and illustrations may be found among the *Lobelias* represented by the cardinal

flower, the *Pyrolas* or false wintergreens, the common locust, the *Wistaria*, the moth mullein and most of the Borage family which includes the lungwort and forget-me-not. In certain plants the flowers at the base of the raceme may have their stems lengthened enough to bring all the flowers on a general level, such as the hawthorn, apple and pear. Such clusters are called *corymbs*. If, instead of each flower being borne on a short stem of its own springing from the main stem, the flower-stems are themselves branched, the inflorescence is a *panicle*. The *Hydrangea*, wild grape, catalpa, lilac and swamp saxifrage bear panicles. Another form of flower-cluster is so characteristic that it has given a name to an entire order of plants—the Umbelliferæ. The *umbel* is the form in which the individual flower stems spring from the top of a common stem, and are about of equal length. The carrot, parsley, celery, fennel, dill and caraway are members of the umbelliferæ, and the same form of inflorescence may be found in the milkweeds (*Asclepias*), the onion and in the ginseng family. The *head* may be considered a modification of the umbel in which the flowers are sessile or stemless. The button-bush, button-wood and clover are examples. The *cyme* is a general term for a sort of flattened panicle typified by the elder and the viburnum.

BRACTS AND THEIR MODIFICATIONS.

The term *bract* is used to designate certain small green leaflike organs in the vicinity of the flower. We know they are not sepals for the sepals are borne in a single whorl on the outside of the flower while the bracts are scattered here and there on the stems and branches near the flowering parts. Without doubt bracts are reduced leaves. In some cases they are quite like the leaves in everything except size but in others there is little resemblance. Moreover, there are many plants which show a complete gradation from leaves to bracts.

It is the modifications of these bracts that most interest the flower-lover. Often we find them taking a prominent place in the flower. For instance, the three green

sepal-like leaves in the flower of hepatica are supposed to be bracts. What many believe to be four white petals in the blossom of the flowering dogwood (*Cornus florida*) are really bracts. Still more, the "corolla" of the calla lily, and the hood of the skunk's cabbage are simply modified bracts. The real flowers are the comparatively insignificant parts in the centre. This is easier to believe when one has seen that odd plant, the golden club (*Orontium*) which flourishes in many cold sphagnum bogs. The golden club is closely related to the stately calla lily, but as its name indicates the flowers are on slender club-like spikes quite like the organ in the centre of the calla. As the plant often grows there is no sign of a bract, but if one is careful to pull up the flowering parts entire, he will find a papery affair near the base that corresponds to the white part of the calla. It must be added, however, that when bracts are so transformed as in these latter instances, they are more properly called *spathes*. The spathes of Jack-in-the-pulpit are well known to most collectors. Other curious modified bracts form the cup of the oak and the *involucre* of the spurges (*Euphorbia*) and of the great composite family which indudes the sunflowers, asters, thistles and a great number of others.

HERCULE'S CLUB.

BY A. S. FOSTER.

RANGING from Southern Oregon up to the Arctic Circle grows a peculiar member of the Aralia family, named by the "timber cruiser" devil's club or devil's walking stick. However, it is generally conceeded that his satanic majesty is not yet sufficiently decrepit to need any kind of staff for support but may be frequently in need of most any kind of weapon to further his purposes. *Echinopanax horridum* of Descaine and Planchet and *Fatsia horrida* of Bentham and Hooker seems to be the same plant. There are very few trees or shrubs in our western development that are common to both sides of the continent, yet there are close resemblances. To all appearances *E. horridum*

is the western analogne of *Aralia spinosa*, the hercule's club of my boyhood days in southern Indiana, where the school-boys were wont to dig ginseng the *Panax* of Linæus, and carry it in their pockets for the agreeable aroma.

Ours is a densely prickled shrub of five to ten feet in height, seldom branching having but one apical bud which sends out five to eight broad palmately lobed leaves on stout petioles. The shrub makes but six to ten inches of growth yearly, therefore the leaves are crowded close together, giving the appearance of a palm to a cluster of clubs. Every part of the plant is densely spinescent, leaves, midrib, petiole as well as the stem and in place of an auxillary bud the spines grow more thickly. To give them the more space, the attachment of the petiole is narrow but it grows well up and around on the sides in order to support the heavy leaves. As the petiole stands at an angle of 35° and the prickles at that of 90° for the first season they are very much appressed, but eventually assume the same position as the others.

The inflorescence is terminal in densely paniculate umbels of white flowers. The fruit is a laterally compressed drupe of a beautiful red color resembling a coral bead. Since the growth is from an apical bud or rather within the bud of leaves a flower bud developes late in the flowering season, and when the seasonal growth is closed, next year's bud forms under the peduncle; as it developes, it pushes the old peduncle "off the stool," as it were.

Several plants of this order belong to tropical countries,—one beautiful specimen from Japan—but they must be cared for under glass. None of them are prickly; so what is the use of the abattis of spines where there are no ants or other thieves? The flowers have a strong odor and are fertilized by flies. *Aralia Californica* is a coarse herb of the southern coast countries of California. It is strongly armatic herb dearly prized by the native Spanish mother in her domestic ministrations under the name of *Chu-cha-pa'-za*. The earlier settlers of Minnesota dug enough "sang" from their claims to pay for the land at

the government price; the chief market at that time was China. Indeed, we now see glaring advertisements about "how to get rich raising ginseng." With us it is given a secondary place in the pharmacopœa, but the Chinese value it highly. But of what earthly use is the devil's club that does not adapt itself to any condition of environment? At best, it is a costly and dangerous ornament.

Nasel, Washington.

PECULIAR PLANT NAMES.

There are many familiar plants bearing a number of names with which the reader may be unacquainted, because in many instances the names are local. Some of these names are most curious, sufficiently so to make one wonder how they were originated, as there is not always anything in the growth or appearance of the plant or flower to suggest a cause for so naming it. For example, in the bone-flower, apes-on-horseback, how many would recognize the common double daisy—*Bellis perennis?* Then the pretty and easily grown *Saxifraga sarmentosa*, so useful for a hanging basket, is known also as creeping sailor, Kenilworth ivy, mother-o'-thousands and the wandering Jew.

In *Linaria vulgaris* some will recognize the toad flax, eggs-and-bacon, and buttered haycocks. Another well-known plant having a number of curious names is *Phalaris arundinacea variegata*. It is to be found in almost every garden; in fact, one can hardly pass a cottage in the country without finding a border of this pretty grass in front, it grows so profusely. It will force easily and will be found most useful for cutting when other foliage is scarce. Almost everyone will recognize it under one of the following names, viz.: ribbon grass, sword grass, bride's laces, French grass, painted grass, lady's laces, lady's garters, silver grass, lady grass or gardener's garters.

Love-in-a-Mist, lady-in-a-bower, love-in-a-puzzle, or devil-in-a-bush are no doubt suggested by the form of the flower of *Nigella damascena*. One would think his satanic

majesty had quite a large acquaintance with our garden subjects, judging by the number of plants coupled with his name, the most prominent among them being the devil's apple or mandrake, a poisonous hardy perennial herb, rarely grown, and having curiously shaped roots. The devil's candlestick or catmint (*Nepeta Glechoma*) is a hardy herbaceous trailing perennial, suitable for borders, edgings, rockies, or baskets. Devil's fig (*Argemone Mexicana*), known also as the Mexican poppy, thistle oil plant, infernal fig, yellow thistle and prickly poppy, is a very pretty hardy annual bearing large pale yellow flowers, somewhat like poppies, as some of its names imply. The devil's garter (*Convolvulus sepium*) is the common garden bindweed. It is sometimes recommended for quickly covering trellises, old tree stumps, &c., but for myself I prefer to do without it rather than run the risk of this weed getting out of bounds. Among other names we have devil's wood, (*Osmanthus Americanus*); devil's bean, (*Capparis cynophallophora*); devil's bit, (*Scabiosa succisa*); devil's herb, (*Plumbago scandens*); devil's milk, (*Euphorbia helioscopia*); and devil's trumpet, (*Datura Stramonium*).

Countryman's treacle sounds peculiar, a name given to *Ruta graveolens*, the common rue, used for medicinal purposes. *Viola tricolor*, heartsease, or pansy is also named three-faces-under-a-hood, kiss me, kiss-me-at-the-garden-gate, kiss-me-ere-I-rise, and jump-up-and-kiss-me. How a dwarf-growing plant like the pansy came by the latter name is a puzzle.

Lady's fingers and foxgloves everyone is acquainted with, but I fail to see what there is in *Digitalis purpurea* to suggest dead men's bells. *Jatropa gossypifolia*, a stove flowering plant, has the suggestive name of belly-ache bush, and is also called the physic nut. *Pulmonaria officinalis*, a useful little rockery plant having prettily marbled foliage, has a number of peculiar names, of which perhaps the beggar's basket is the most curious. Other names for it are the sea bugloss, Jerusalem cowslip, bedlam cowslip, and the Virgin Mary's honeysuckle. *Colchicum*

autumnale, or autumn crocus, fog crocus, Michaelmas crocus and meadow saffron is also called naked ladies, no doubt from the flowers appearing without any foliage.

There are many other quaint and curious names I could mention, but the foregoing should be sufficient, for the present at any rate, to show that a lot of interesting and amusing information concerning the beauties of Nature in our gardens may be derived from a study of plants and their various names.—*Journal of Horticulture.*

THE STUDY OF BOTANY.

BY TINNIE WHEELER.

TO the true lover of wild flowers, the study of botany means far more than a mere knowledge of the technical terms used in text books. Such students

"Love not the flower they pluck, and know it not,
And all their botany is Latin names."

It means a personal acquaintance with the flowers, visiting them in their own homes, studying their growth, their life, their environments—it means getting into a closer touch with the beautiful, which leads us to look from Nature up to Nature's God, who created the smallest flower that springs unnoticed from the ground.

Such knowledge as this makes us feel at home in the world. Even a speaking acquaintance, as it were, with the flowers enables us to recognize them as old friends wherever we meet them. The study of botany furnishes one of the purest sources of enjoyment which the world affords. To me no pleasure is comparable with a delightful ramble through woods and fields with botany and microscope in hand, in keen anticipation of finding new specimens and the delicious thrill of pleasure experienced on beholding them for the first time.

By the student in school, botany is too often considered a dry, uninteresting study simply because analysis is confined to wilted or dried specimens which recall no pleasant rambles through fragrant woodland paths or sunny meadows to find them in their natural habitats.

It is only by studying the open book of Nature that an interest can be aroused in the indifferent observer, for I regret to say, there are still some who, like Wordsworth's Peter Bell, see nothing to admire in all this world of beauty. Like him it can be said of them,

"In vain, through every changeful year,
Did Nature lead him as before;
A primrose by the river's brim
A yellow primrose was to him
And it was nothing more."

While, on the other hand, we, to whom these wildlings have always more strongly appealed than their more pretentious sisters of the hot-house and garden, may by a closer intimacy be enabled to say,

"To me the meanest flower that grows can give
Thoughts that do often lie too deep for tears."

Again the study of botany opens our eyes to what is about us. There is a possibility of becoming so familiar with an object that it may entirely escape our notice. "Having eyes, we see not." An experience of my own to illustrate: Several years ago while visiting in a Maine town my attention was called to a large tree of *Populus grandidentata* and I was delighted to secure a specimen at the expense of a considerable tramp, only to find on returning home, a tree growing within a few rods of the house. Nothing that springs from the ground now escapes my notice; indeed, I am a poor companion on a walk or drive to non-botanists, who are often free to express their disgust at my exclamations of pleasure and admiration at some bedraggled weed.

An interest in this study also serves to act as a balm for many of the ills and woes of life. Emerson says,

—"A woodland walk,
A quest of river-grapes, a mocking thrush,
A wild-rose or rock-loving columbine,
Salve my worst wounds."

Some years ago, being out of health from overwork in teaching, my physician prescribed an out-door life and

suggested this particular study as an incentive, and many a time when life has seemed to hold nothing worth living for, has the exciting pleasure of this pursuit led me to lose sight of self in awe and admiration of the wonderful works of God. Longfellow says,

"If thou art worn and hard beset
With sorrows, that thou wouldst forget,
If thou wouldst read a lesson, that will keep
Thy heart from fainting and thy soul from sleep.
Go to the woods and hills! No tears
Dim the sweet look that Nature wears."

Many express a willingness to take up the study but plead lack of time as an excuse. It does take time, I admit; but I also contend that people will *find* time for whatever interests them most—whether it be scientific researches or pouring over the latest novel; whether domestic pursuits or filling the demands of social functions.

To you who have not yet made the acquaintance of the wild flowers, let me say that I can assure you that you have a great pleasure in store and one which I hope you will enjoy before the floral procession of another year passes.

Berlin, N. H.

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.

Freezing and Plant Growth.—Those who have taken up tubers, bulbs and rootstocks of our native plants in autumn intending to make them bloom indoors during the winter, know that they do not readily respond to warmth and moisture. And yet, the same plants taken from the earth during a "January thaw" or even during the first thawing days of spring, push up at once and

flower in a few days. The problem that confronts the the nurseryman, therefore, is whether these plants need the freezing they get, in order to produce their flower or whether they only need the rest which winter brings. If freezing, only, is necessary this can be accomplished at any time of year. Several growers have recently been discussing this subject in *American Gardening* in connection with lily-of-the-valley without coming to any agreement. The experience of the majority indicate that freezing is necessary but others maintain that the root-stocks will put up the usual amount of bloom if they have had their proper rest.

Life History of the Rusts.—The individual rusts are so small that the average botanist pays little attention to them so long as they do not affect the particular plants he is after. He recognizes them, of course, as the cause of various spots and blemishes upon leaves and stems, but probably never examines them unless he possesses a compound microscope and a desire to use it. No plants, however, possess a more remarkable life history. Each species not only has two or three different forms but produces as many different kinds of spores. The wheat rust is one of the best known, and usually serves as an example. The first form appears on the leaves of the barberry forming minute cup-like objects full of spores on the outside of the leaves. These spores germinate on the wheat and soon produce another kind of spore called the summer spore. Later in the season heavier or winter spores are formed. Although the polymorphic nature of the rusts have long been known, it is only in comparatively recent years that systematic efforts have been made to discover the relations of the various forms. At present great progress is being made by collecting the spores of the various forms and sowing them upon the plants supposed to nourish other forms of the same species. Often there is no infection, but occasionally a different, though perhaps well-known, form appears showing conclusively the relationship. In this way rusts and

smuts on different plants that were once thought to be different species are now proven to be the same. In the *Journal of Mycology* for January, Prof. J. C. Arthur records his experiments for 1903. Among others he has found a rust on the leaves of the popular to have its early form on the leaves of the larch. Another on a grass occurs in different forms on the false toad flax (*Comandra*) and another with summer spores on certain grasses has its beginning on the leaves of the leatherwood (*Dirca*).

Early Blooming Skunk's Cabbage.—At a meeting of the Germantown (Pa.) Horticultural Society held February 8, Mr. Edwin C. Jellett exhibited specimens of skunk's cabbage in full bloom for which he received special mention in the Society's Report. He writes that he has never failed to find these plants in flower even in January, when he has looked for them. This year the temperature in his locality ranged from below zero to twenty degrees above and yet on February 7 he found numerous flowers shedding their pollen. The skunk's cabbage's claim to being the earliest spring flower in the North seems well established.

St. John's Bread.—In the markets of our larger cities one may often find offered for sale certain large flat pods called locusts. These are the the fruits of *Ceratonia siliqua* a tree native to the Mediterranean region and are often called St. John's bread from a supposition that they were the "locusts" that, with wild honey, formed the food of John the Baptist in the wilderness. The locust tree is also called carob-tree in some parts of the world. Unlike the fruits of our common locust (*Robinia pseudacacia*) the pods of this species are edible. They have a sweetish taste quite agreeable to some palates, and are in great favor with our foreign-born population. The American honey-locust (*Gleditschia triacanthos*) has a streak of this edible quality in its composition, the mature pod containing a row of seeds down one edge and a deposit of sweet material down the other. This is often gathered and eaten by children. The question that perplexes us is, of what use to the trees is this sweet secretion? Who can answer?

New Use for Fern Rhizomes.—After trying various compositions for potting orchids, growers have settled upon "osmunda root fibre" as the best material for the purpose. This is made from the rootstocks of the cinnamon fern (*Osmunda cinnamomea*) and the royal fern (*O. regalis*). It is said to be almost indestructable and to form a sweet and healthy rooting medium. It may be noted in this connection that in the tropics sections of tree fern trunks, which are comparable to the *Osmunda* rootstock, are commonly used for the same purpose.

Origin of a Violet-berry.—One of the foremost of the violet species makers has been caught napping. He describes a structure in *V. Dicksonii* which he assumes to be the underground fruit "converted into a berry. It is evidently globose (as large as an ordinary wild gooseberry or middle-sized pea) absolutely indehiscent, the pressed and dried pericarp being unbroken, translucent and showing the seeds that lie within, just as, in the herbarium, the seeds of many a berry-like fruit are seen through their fleshy covering in its dried state." Now Mr. Ezra Brainerd demolishes this interesting story by showing that the "berry" is due simply to the sting of a gall-fly and that similar structures are found in at least four other species.

A Tree Morning Glory.—The committee that investigated various parts of the Southwest previous to the establishment there of a desert botanical Laboratory of the Carnagie Institution report that in certain parts the tree morning glory (*Ipomea arborescens*) was common. It is described as follows: "The morning glory is a tree 20 to 30 feet high, with smooth chalky gray trunk and branches, leafless at this season [January] throughout, its large white flowers opening one by one on the ends of the naked branches. From its white bark the tree is sometimes known as palo blanco, and from the gum or resin which exudes from incisions made in it for the purpose and which is used as incense in religious ceremonies it is called also palo santo."

Vitality of Tree Seeds.—Few gardeners have any experience in seed sowing and do not know how short-lived the seeds and nuts of many trees are when kept in a dry state like garden, vegetable and flower seeds. Even the pips of apples and pears keep but a short time and when allowed to become dry may never plump up again nor germinate. The secret is that seeds and nuts fall to the ground in autumn and winter and being covered by grass or fallen leaves are kept moist till spring, when they commence to sprout soon after the temperature has risen sufficiently to wake them into fresh life.—*Gardening World.*

Violet Species.—Mr. Ezra Brainerd, of Middlebury College has been studying the New England violets and in his notes on New England violets published in the January *Rhodora* does not agree with those who have split violets into almost as many species as there are individuals. It will surprise many to learn that the early petaliferous flowers are nearly all fertile; they are usually thought to rarely set seed. Nor are the cleistogamous flowers the earth-loving structures that some have considered them. The mature capsules are all aerial. Mr. Brainerd asserts that the differences in the shape, size and color of the capsules of cleistogamous flowers, and in the form of their sepals prove to be excellent characters for distinguishing the species. He recognizes but ten New England species of the stemless blue violets, thereby placing a large number of others in the ranks of "extinct species." Even some of the species recognized by the author are so close together that he seems in some doubt as to whether to call them species or sub-species. For instance *V. sororia*, *V. palmata* and *V. septemloba* are chiefly distinguished by the lobing of the leaves and pubescence, features that are inconstant and productive of many intergrades. The author observes that some of the marks of distinction are "elusive, if not illusory," and concludes that "more than one of the many new species recently proposed, based on plants from a single station, seen only in petaliferous flower, may prove on more extended observation to be hybrids."

Sparrows and Mistletoe.—According to Wm. L. Moore, the English sparrow is responsible for the rapid increase of mistletoe in some of the Southern cities. The pulp covering the seeds is extremely sticky, and often adhere to the bird's beak, and in cleaning its beak by rubbing it against a twig, the seeds are left in the proper position for growth.

Uses of the Blue Gum.—The Australian gums are exceedingly useful trees and almost justify some of the wonderful stories in circulation about them. In the milder parts of the United States they grow well and are planted in increasing numbers both for fuel and lumber. From *Forestry and Irrigation* we learn that in California there are about 2,800 acres planted to the blue gum (*Eucalyptus globulus*) and it is now the principal fuel. An acre of these trees will produce 500 cubic feet of new wood each year. The wood of this species is difficult to split on account of the twisted grain and when dry is difficult to work. It is, however, nearly as serviceable as ash and used for wagons, plow-beams and similar articles.

Variation in British Ferns.—In Great Britain there are less than fifty different species of ferns. British fern collectors, however, have not been discouraged by the paucity of species, but have turned their attention to cultivating the varieties of the common forms. With a considerable number of people on the lookout for abnormal ferns, they have been reported in increasing numbers until the record has reached the astounding number of more than two thousand different varieties. Of these our common lady fern (*Athyrium filix fœmina*) has furnished no less than 313, but this is quite put into the shade by the harts-tongue's record of 450 varieties. *Polystichum angulare*, a relative of our Christmas fern (*P. acrostichoides*) is credited with 384 varieties, while five other species have each more than fifty. These aberrant forms often throw an instructive light upon the origin of species, but one might be pardoned for thinking a collection of 450 harts-tongues a trifle monotonous.

Editorial.

The great mortality among youthful scientific journals continues unabated. The latest to give up the struggle is the *Journal of Microscopy* published for six years by the Bausch & Lomb Optical Co. *The Gamophyllous* also came to an untimely end recently after a life of nearly three years. It is scandalous but true that much more than half the scientific literature issued in America appears in journals that could not exist but for subsidies from some scientific club or educational institution. Independent publications are exceedingly rare. Lest these latter leave the field entirely, it behooves the scientifically inclined to do his share toward keeping deserving publications going. If you value any of the botanical magazines, subscribe for them if only to encourage the editors. To be sure they are in the business more for the love of botany than for the money there is in it, though the occasional sight of the coin of the realm is a wonderful stimulus toward more and better work.

* * *

A while ago a botanical correspondent in a confiding mood wrote, "If a man could only live and support himself on compliments, I should fare first rate. Even magazines of high grade will accept my contributions, cover me with flattery, but own up that they are too poor to pay. It never seems to occur to them that I, too, may need a dollar." The reason editors pay in compliments instead of cash is because the one is so much more easily obtained than the other. No doubt the compliments are all deserved—the contributor who writes without pay comes next to the editor of a botanical publication in the matter of deserving compliments—but all of us know that cash is more acceptable.

* * *

It is said that more than sixty thousand copies of a popular guide to the wild flowers have been sold. The botanical editor ruminating on this fact is constantly ask-

ing himself where those sixty thousand people are. Certainly they are not on his lists. The reason they are not, however, is that there are really very few botanists as yet in America. The people who buy the popular books are interested only in learning the names of the plants. Until we can induce them to take a deeper interest in botany, the road of the botanical publication is likely to be a rough one. Those who would help matters along must not only subscribe to the publications themselves, but advise others to do so. THE AMERICAN BOTANIST at least, stands committed to a policy of increasing the number of pages with each material increase of its subscription list. Under these circumstances we have no hesitation in asking for the subscription of every botanist and botanizer in America. If we do not get them we shall not cease publication, but we can make a better journal if we do. Now is the time to subscribe!

* * *

With the January issue, our other journal *The Fern Bulletin* begins its twelfth year of uninterrupted publication. In the matter of age it yields only to the *Torrey Bulletin* and the *Botanical Gazette*, all the other strictly botanical publications in this country having been founded since it began publication. During its existence it has witnessed the demise of many deserving periodicals including *Garden and Forest*, *Meehan's Monthly*, *Erythea*, *Asa Gray Bulletin* and others. The many changes that have taken place in the comparatively short period of its existence all point to the transitory nature of the botanical publishing interests.

* * *

Readers interested in the phenomena of early spring will find the following papers, published in the AMERICAN BOTANIST, worth another reading: "The Advent of Spring," in Vol. 4; "Plants in Winter" and "Climate and Vegetation," in Vol. 3; "The Beginnings of a Southern Spring" and "Spring in the South," in Vol. 2. Many other shorter notes are also of interest in this connection.

BOOKS AND WRITERS.

Upon the appearance of a new magazine devoted to any of the sciences, the prospective subscribers are wont to wait and see whether the publication is likely to live before sending in their money. The newly issued *Amateur Naturalist*, of Binghamton, N. Y., is exempted from this by the fact that the editor and owner is a practical printer able to issue the magazine as long as he pleases without necessarily worrying about the size of his subscription list, though he will doubtless look after this part of the venture, also. The first issue compares very well with other first issues and points toward a long and successful career.

Mr. C. F. Saunders has written a book—not, as readers of this magazine may assume, a botanical work albeit the title is "In a Poppy Garden," but a book of verse which shows the same original view-point, lively imagery, and delicate touch so noticeable in his prose articles. In one sense, too, it is a botanical work for the flowers have inspired a good share of the contents and are woven into the fabric of the others. The eighteen poems are not untried ventures into the realms of song but most of them have previously appeared in such magazines as *Harper's*, *McClure's* and the *Churchman*. A unique interest is added to the volume by the illustrations specially drawn for each poem by the author's talented wife. These are in unusual accord with the spirit of the text and excellent examples of decorative work. (Boston, The Gorham Press).

A series of letters from a dweller in the fields and woods to a resident of the town comes to us under the title of "Mountain Walks of a Recluse." The author, Rev. E. Chrysostom Burr, writes most charmingly of the birds, flowers and seasons of the Hudson Valley and the thoughts they have suggested to him during his saunterings in the uplands. His vocation of priest moreover, has brought him into intimate touch with his people and has also taken him out at hours when many of us are sleeping and shown him the less familiar phases of Nature as well as afforded him leisure to later chronicle his meditations. The book faithfully mirrors the peaceful contemplative life of the author spent when not occupied with religious duties among his loved birds and flowers. (New York, the Broadway Publishing Co.)

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CONTENTS.

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SOUTHERN CALIFORNIA SOLANUMS.

BY M. F. BRADSHAW.

THIS family is represented here by five genera, the largest of which is *Solanum*. The best known species, *S. nigra*, is the common nightshade of the roadside. *S. umbelliferum* and *S. xanti* are both beautiful, similar to the nightshade but with fine clusters of purple flowers. They are found in the mountains and the finest ones I have seen grew near the beach where the hills come close to the ocean.

Datura has two species. *D. tatula*, sometimes called Jimson weed is quite distinct from the Jimson weed of the Middle States. Here it grows low and broad and bears immense numbers of great white flowers several inches in diameter. They bloom the latter part of summer and fall, the very dryest and hottest season, yet they are every morning as fresh and dewy as if it were early spring. They have a fine fragrance and make one of the grandest of decorations as cut flowers. The root is large and stores water, making the plant independent of rain. The foliage, stems, buds and young growth are more or less purplish and distinguish it at once from *D. stramonium* which is green and bears a pure white flower with a longer tube. There is a small difference also in the capsules.

Nicotiana glauca is a shrub not native but very securely naturalized in this country as it is hard to find a place where it has not obtained a foothold. The leaves are rather scattered, smooth and somewhat bluish, and the flowers are in racemes, tubular and yellow. Not in the least a handsome bush though clean and so enterprising and determined to make its way in the world, one respects

it if one cannot admire. *N. Bigelovii* is a visced ill smelling herb growing in waste places near the dry creek bed and even occasionally on the sides of the hills The flowers are white with an inch long tube and rotate corolla an inch in diameter.

One of the most curious of our native plants is *Lycium Californicum*. It looks like anything but a *Solanum* for it is a thorny, low-growing bush with branches and long slender spines so closely interlaced as to form an impenetrable thicket. Most of the year this bush is leafless and appears to be dead, and it is my opinion that it does continue year after year in this nude state.

But one spring I found a bush with a few leaves and flowers; leaves fleshy and about the size and shape of a grain of wheat, flowers small, white with four lobes to the rotate corolla instead of five. It grows on the edge of the cliff overhanging the sea, and I have never seen it elsewhere.

Last and least is *Petunia parviflora*. I had been told to watch for this wee flower but had no idea where to look or in what season. One day in late summer last year I sat for a whole afternoon on the dry and yellow grass under an elder tree sketching. It was in a rather wide part of a canon and near a small pond, yet so dry that even the pond had dried up. It was only when I was gathering up my things to go home that I saw close to the earth a tiny plant with crimson flowers. I hastily gathered a handful as it was nearly night, and not until next day gave them another look. Then they were badly withered but patience was rewarded presently in my discovering I had not one but two rare plants: *Petunia parviflora* and *Verbena bracteosa*. The blossoms were minute and neither plant had branches over three inches long, both growing prostrate.

Orange, California.

WILLOWS; "PUSSY" AND OTHER.

BY DR. WILLIAM WHITMAN BAILEY.

NATURE is especially fond of tassels. With them she clothes many of her noblest trees. In late May we see sturdy oaks decked out with pendant catkins; in July the grand chestnut bursts forth into jets and fountains of creamy bloom. Birches, hazels, alders, poplars, hornbeams, willows—all have tassels.

The amentaceous trees usually have the two kinds of flowers separated either on different parts of the same plant, as in alders, or on perfectly distinct plants, as with willows. In other words, willows are distinctly male and female. When in bloom we learn to know them apart even at a distance; the female trees bear more greenish catkins. Close examination shows, too, the flask-like pistils standing in the axils of silky scales. These compose the cluster. If now, we look at the male flowers on another shoot, we find each flower to comprise a scale and two stamens. Neither kind has either calyx or corolla, but both develop abundant honey, and bees come for it from afar.

The term "pussy" does not apply *par excellence*, to any particular willow. Several produce the silky clusters so suggestive of little kittens. As harbingers of spring they are loved by everybody. They will vary much in size according to the species. Sometimes they are large and dark, and when about to bloom, are shot through with flashes of deep red and gold.

Scott sings of the "wild and willowed shore," and he associates willows with stream and river banks; perhaps, also, with grave-yards and old fashioned tomb-stones. The weeping willow, (*Salix Babylonica*) has long been a symbol of continuous grief. Dr. Gray used to say that if this was the Babylon willow, it "must have been a Jew's-harp that was hung upon it." The branches are, indeed, extremely brittle.

We recall here the death scene of Ophelia, and the willow which "grows aslant a brook, that shows his hoar leaves in the glassy stream." What close observation

here! It is only the under sides of these leaves that are hoary.

Willows are so numerous that if it were possible to grow them all together, a specimen of each, they would alone form a forest, the individuals showing marked peculiarities of height, habit and foliage. Some high mountain species are very small, and spread out flat, hugging the rocks. Again, a willow may be a large and handsome tree. The limit of range, then may be, from a few inches to sixty or more feet. They are north temperate plants more particularly. One is said to grow nearer the North Pole than any other woody plant. The willows of Scripture some consider to be the oleander, which, of course, is not a willow at all. Either there have been faults in translation, or one term covers quite diverse objects.

Willow bark is stringy and tough, and has a bitter taste imparted by the alkaloid salicin. The wood is soft, smooth and light, and used for many purposes. Some species are employed in basket making, and in Lapland and Norway the leaves are even cured and used for fodder. They are smoked, too, at times, as a very poor substitute for tobacco. Salicin has been employed in ague to replace quinine. It is also used in rheumatism. All the species contain it, a good thing to know, perhaps, in malarial regions. The common name of Sallow, better known abroad, is a corruption of the Latin *Salix*. The poplars, including the cotton-wood and Balm-o'-Gilead, are near relatives of the willows.

Brown University, Providence, R. I.

BOTANY FOR BEGINNERS—X.

LEAVES.

The leaves of plants are so familiar that it would be useless to describe them. It may be said in passing, however, that they are the most useful organs the plant possesses for they are both lungs and stomach to it. While the plant gets water by means of its roots, the great bulk of its food is obtained by the leaves from the gases of the

atmosphere and by means of sunlight combined to form the substances found in its tissues. These combinations are effected in the green substance of the leaf, therefore all plants that elaborate their own food must have either green leaves or something to take their place. This is plain in the cacti and scouring rushes (*Equisetum*) both of which have functionless leaves and so must rely upon the green in the stems for elaborating their food.

It must not be supposed, however, that the leaf is merely the expanded green portion, or *blade*. This is the most important part, it is true, but there is also frequently to be seen a leaf-stalk or *petiole* and at the base of the petiole where it joins the stem two little leafy or scale-like objects called *stipules*. In many plants the stipules are not present and in some they are so changed as to scarcely be recognizable. In the smartweed family (*Polygonum*), the papery sheaths that encircle the stem where the leaves join it are derived from stipules. Sometimes the petioles, also, are wanting in which case the leaves are said to be *sessile*.

The shape of the leaves and their arrangement on the stem plays an important part in the identification of species. Fortunately the terms used in describing leaves are in common use. Such words as round, oblong, ovate, lanceolate and linear mean the same when applied to leaves as they do applied to other objects. *Oblanceolate* and *obovate* mean simply the reverse of lanceolate and ovate; that is, in ovate or lanceolate leaves the blade is broadest near the base where it joins the petiole, while in the others it is broadest at the apex. If the tip of the leaf is rounded it is *obtuse*; if pointed, it is *acute*; if the tip is long and suddenly narrowed, it is *acuminate*; if it ends in a hard point it is *cuspidate* or *mucronate*. The base of the leaf also has names to distinguish its outlines. If the margins curve inward to join the petiole the base is *cordate* as in the morning glory; if these basal lobes are long and pointed it is *sagittate* as in the arrow-head (*Sagittaria*); if the lobes are at right angles to the rest of the

blade it is *hastate* as in the tear thumb (*Polygonum*). If the margins of the leaves are without notches of any kind it is *entire*; if notched like the teeth of a saw it is *serrate*; if the teeth are rounded it is *crenate*. There are a large number of terms to indicate other slight variations from the forms above named, but as they are all defined in any good dictionary and in every botanical glossary, the beginner need not bother his memory with them. It is time enough to hunt them up when he needs them. A few weeks in the work of identifying plants will make him familiar with all the terms in common use.

The texture of the leaf has a special terminology scarcely less extensive than that of the outline. If it is perfectly smooth it is *glabrous;* if it is covered with fine soft hairs it is *pubescent;* if the hairs are longer and stiffer it is *hirsute;* if the hairs are very thick and matted as in the common mullein it is *tomentose*. Very thick leaves are *coriaceous* or leathery; thin ones are *membranaceous* or membrane-like; *papyraceous* leaves are about like ordinary paper. Here again the novice need not borrow trouble by learning the many other terms.

A large number of plants have leaves composed of many smaller blades called *leaflets*. Examples may be found in the wistaria, bean, pea, strawberry, potentilla, etc. These are called *compound* leaves. When the leaflets are arranged along the main stalk or *rachis* the leaf is said to be *pinnate* as in the locust (*Robinia*) and the rose. When arranged as in the clover they are *ternate* or *trifoliate*. In the parsley and ginseng families the leaflets are often again sub-divided. Ranging from the *tri-pinnate* leaves of Hercule's club (*Aralia spinosa*) to the entire leaves of the heaths there are all sorts of gradations. If the leaves are very deeply divided but not quite pinnate, they are *pinnatifid* or if less deeply divided they may be only *lobed* as in the maples. In addition to the pinnately compound leaves, there are others in which the leaflets are all arranged at the top of the common stem, instead of along the side. Such leaves are *palmately compound*.

Among good examples may be mentioned the horse-chestnut and the lupine.

SOME SHAMROCK FOLKLORE.

"The sweet little, green little shamrock of Ireland" is perhaps next to

"Sublime potatoes that from Antrim's shore
To famous Kerry form the poor man's store,"

the most universally popular plant in the world to-day, for while the latter may be the more widely known and most useful to all nations, the former holds an unique place in the realms of sentiment; and among people of Celtic and Saxon origin is regarded with the warmest affection as emblematic of all that is charming and lovable in the Irish character—a character which blends

"Three God-like friends
Love, valor, wit, forever."

A great deal has been written as to what is the real plant meant by the shamrock and as a rule most of the commentators start out with St. Patrick who used a three-leaved plant satisfactorily to explain to the early converts of Christianity the trinity in unity. The trefoil plant, however, was held sacred long before that, as can readily be gathered from the fact that shamroc and shamrakh is Arabic for the trefoil and the plant was held sacred in Iran and was emblematic of the Persian triad long before St. Patrick's day. Mr. Bicheno and others have held that the wood sorrel (*Oxalis acetosella*) is the true shamrock while Dr. Withering and Professor Rennie named the white clover (*Trifolium repens*) and London claimed the black medic (*Medicago lupulina*) as the true Irish emblem. Mr. Croker (not he of Tammany) points out, however, that as far back as 1689 the Irish themselves considered sorrel and shamrocks as entirely distinct. The "Irish Hudibras" printed in 1689 says,

"Springs, happy springs adorned with sallets,
Which Nature purpos'd for their palats;
Shamrogs and watercress he shews
Which was both meat and drink and clothes."

And again the Irish are there represented as

"Without a rag, trouses or brogues
Picking of sorrel and sham-rogues."

In another ancient Irish poem, the "Hesperi-neso-graphia" the following passage occurs:

"Besides all this, vast bundles came
Of sorrel more than I can name,
And many sheaves, I hear there was
Of shamrocks and of water grass
Which there for curious salads pass."

Keough, Threlkeld and other Irish botanists assert that *Trifolium repens* or white clover is the true Irish shamrock and will have nothing to do with "that little, sour, puny plant, the wood sorrel." On the whole the weight of evidence seems to be with the white clover and it may not be out of place to whisper here to those conscientious deacons and other experts that the seeds of *Trifolium repens* that are for sale at any seed store in America at 25 cents a pound are just the same as the humorous Irishman charges them $2.00 a pound for.—*From an Article by Geo. C. Watson in Gardening.*

ON THE PRESENT CONFUSION IN THE NAMES OF AMERICAN PLANTS.

Every person seriously interested in botany has suffered inconvenience from the confusion now prevailing in the nomenclature of American plants, It arises from the existence in this country of two schools of nomenclature employing different systems in their treatment of the older names of plants. If one compares representative books of the two schools he will find that, aside from other differences, upwards of one-third of the names are different in the two works. Some changes of names represent real scientific advances and hence are unavoidable, but the great majority of changes made in recent years result merely from a difference of system, and hence would be avoided if the workers in this field could come to an agree-

ment. It is difficult for those not specialists in classification to understand the merits of so complicated a question, and most persons, having in mind the wonderful advances being made in science, are apt to suppose that anything new represents an advance, and hence they accept it without further inquiry. It is true that the newest things in science usually are the best, but this is by no means necessarily or always so; and in the present case, I, for one, am firmly convinced that the newer system is not the best, and that it will not prevail. I shall try to present the subject very briefly as I understand it.

Of the two American schools of nomenclature, the older is that of Asa Gray (and hence well-termed the Grayan School) and of his successors at Harvard. The widely-used Gray's Manual, with nearly all American botanical literature prior to ten years ago, and much of it since, is in accord with its principles, which, moreover, are for the most part those in use in the principal botanical centres of England and continental Europe. The newer, or Neo-American School, originated ten years ago with the adoption of a set of rules by a group of American botanists, since which time great industry and skill have been devoted to its propaganda. It is led by the botanists of the New York Botanical Garden, and is most familiar through the Illustrated Flora and the Manual of Dr. Britton, but its distinguishing tenets have not found acceptance outside of America. There are differences between the two schools other than those of nomenclature, but I shall confine myself to this one subject.

Nearly all botanists agree upon the general principle that nomenclature shall be based upon priority of publication beginning with the "Species Plantarum" of Linnæus, of 1753, the first work to use binomial or double names in the modern scientific sense; that is, the first published name for a plant accompanied by a description, in or subsequent to that work shall be recognized as its name. Now if this principle, universally observed for all recent names, could have been rigidly and uniformly acted upon

from the beginning, there would now be no nomenclature question to vex us; but unfortunately it was not, and as a result there arose a great body of nomenclature based rather upon usage than upon strict priority. The real issue between the two schools is this: Shall this great quantity of nomenclature be retained, despite the technical flaws in this title, (Grayan School) or shall we now abandon it and attempt to bring all nomenclature into conformity with the principle of priority (Neo-American School)? The reasons for each position, so far as they concern the two most important points involved, are very briefly as follows:

First, it happened often in the past that certain plants were given more than one specific name, and, through misunderstanding of their affinities or other causes, bore one or more generic names before being transferred to the genus now recognized as scientifically correct. The ques- now arises, shall we adopt as the name of that plant (a) the first combination of generic and specific names the plant bore when finally placed in its correct genus, or (b) an addition of the very earliest discoverable specific name applied to the species to the name of its correct genus? The former can be justified in principle on the ground that a scientific name is primarily a *combination* of generic and specific names, and that hence the first *correct combination* is the true prior name of that plant, while in practice it has the advantage of giving a more definite and readily traceable starting point for the names, and it helps to retain a large part of the existent nomenclature of American plants. This is the position of the Grayan School, and of the workers at Kew in England; in practice it is known as the Kew rule. The other school acts on the principle that a scientific name is not primarily a combination of generic and specific names but rather a specific plus a generic name, and that the first specific name ever given to a plant should be retained for it no matter what its subsequent fate as to transfer from genus to genus. It must be admitted that there is much theoretical reason-

ableness in this position; and it is taken not only by the Neo-American School, but has long been acted upon by most of the botanists of Continental Europe. Its practical disadvantage in this country is that it both entails marked changes in the existent nomenclature of American plants, and also, as will be noted later, is impossible of exact application. It is a fact, however, that the Neo-Americans give this principle an extension far beyond that followed by any of the continental botanists.

Second, it happened in early Post-Linnæan days that the names first given to Genera very often became replaced by others, either because the later botanists did not know of the earlier names, or because they thought the earlier names not well considered or properly published, or for various other reasons; and thus the later generic names very often became firmly fixed in botanical nomenclature. The Grayan School holds that in such cases the well-established name is to be retained, even though of later date, and in this they are in agreement with all the leading botanical workers of England and Continental Europe. Since many puzzling questions have arisen as to just where the line should be drawn between those names which should be displaced for earlier ones and those which should not, the Berlin botanists adopted a rule, known as the Berlin rule, now followed by most botanists except the Neo-Americans, that any generic name which failed to achieve acceptance for fifty years after its publication should not now be revived to displace a name which has become well fixed. The practical effect of this rule is to retain the great body of existent nomenclature. The Neo-American School, on the contrary, holds that the very earliest name given to a genus should be restored, regardless of whether or not they have been used in the meantime. The application of this rule necessitates an immense number of changes, and to it more than to any other cause is the present confusion in nomenclature due. The Neo-Americans, however, have not been able to win the support of any of the English or Continental botanists, and they stand quite alone in their application of it.

The difference between the two schools then lies primarily in this, that while both accept priority as the basal principle, the one school maintains that, so far as the past is concerned, this is to be applied with judgment, and in such a way as to cause a minimum of inconvenience by retaining the great body of existent nomenclature; the other school holds that priority should be applied rigidly and absolutely to all names, judgment being allowed no place in the system. In defence of their position the Neo-Americans hold that finality in nomenclature is not possible under the Grayan system, because, where judgment is given a place, there will be differences of opinion and hence instability, while they claim that under the absolute priority system final stability is possible. They admit that the application of absolute priority will cause much inconvenience through the abandonment of so much of the existent nomenclature, but they hold that the final advantage of stability will more than compensate for the temporary inconvenience. Now as to these positions two things are to be said. First, the Grayan School has met the difficulties as to instability due to individual difference of opinion by the adoption of the Kew and Berlin rules, which give as absolute and definite a basis for their system as absolute priority gives to that of the Neo-Americans, while their system retains most of the existent nomenclature where the Neo-American system abandons it. Second, priority applied absolutely, and excluding the instability due to differences of opinion or judgment, is proving impossible of application. In many cases it is impossible to tell which of two names for a given plant is the oldest, since early publications are often not dated or bear dates known to be wrong; in other cases it is impossible to tell to which of several species or genera a given early very generalized description applies; and in other cases it is impossible to say whether certain names are not inadmissable through the brevity, indefiniteness, errors or obscurity of their publication. In all these and many other cases, judgment does come into play, and with it differ-

ences of opinion and instability. That this is the case is shown by the fact that the members of the Neo-American School do not always agree among themselves as to the names which should be chosen under their own system. Furthermore, the Neo-Americans do not make all the changes in nomenclature which their system requires, which indeed they admit, but confess in explanation that the number of changes thus entailed would be too appalling. Now the Neo-American School has but a sole claim to consideration as compensation for the immense inconvenience to which it is putting the public by its many changes, and that is, that it will give finally an automatically stable system. But this they are not succeeding in doing, and there appears to me no prospect that the nature of the subject will ever permit them to do so. Further, they cannot possibly secure stability by themselves, for there can be no stability as long as the other botanists of the world persist in using a different system. During the ten years of their propoganda, they have not been able to secure a single convert among the prominent workers of other countries. Their system promises no greater stability than the Grayan system, while it causes immense confusion by overturning the great body of existent nomenclature which the Grayan system conserves. This is why I believe all disinterested persons should give their support to the Grayan system.—*W. F. Ganong in Educational Review for January.*

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.

EUCALYPTUS IN MEDICINE.—According to the *Medical Annual* an infusion of the fresh leaves of one of the blue gums—*Eucalyptus globulus*—is an almost certain cure for diabetes if administered in the first stages of the disease.

PIPPINS.—In the beginning of its history the word pippin meant simply an apple raised from the pip or seed.

EXPENSIVE POTATOES.—British cultivators are suffering from a mild form of mania in regard to potatoes that reminds one of the tulip mania that once spread through Holland. According to the horticultural papers certain fine strains of potatoes are now selling in England at the rate of $500 to $800 a pound! Of course such tubers are too expensive for the table. Their owners would as soon think of eating them as the Dutch would have thought of eating their tulips at the acute stage of the tulip craze. They are reputed to be almost immune from disease and very prolific, hence the great price.

GEMMÆ IN THE LIVERWORTS.—Many liverworts, in addition to the usual method of reproduction by spores, develop large numbers of tiny plantlets, called gemmæ, that fall off and become new plants. Specimens of these can usually be found in any greenhouse. In *Marchantia* the gemmæ are borne in little cups on the upper surface of the plant, while in *Lunularia* they are in crescent-shaped receptacles. When blown from the plant by the wind or washed away by rains, it makes no difference to the young plantlets upon which surface they alight. The surface next to the soil begins to send out rhizoids and thus the plant gradually acquires its dorsi-ventral thallus.

THE STERILE FLOWER IN WILD CARROT.—I have often wondered that in the popular descriptions of wild carrot, (*Daucus carota*) no mention is made of the dark purple sterile flower found in every perfect head of blossoms. Rarely this is lacking, and sometimes it is subdivided into three or four less perfectly formed florets. But usually it may be seen of regular form and as large as or larger than the surrounding perfect florets. I have looked in vain among authorities for the use of this unique variation. Is it not to lure insects to the plant and thus aid in cross-pollination? Certainly a casual glance would not be likely to detect that the abnormal almost black floret was not an insect feasting on sweets.—*Bessie L. Putnam.*

EDIBLE NASTURTIUMS.—Some species of the garden nasturtium (*Tropæolum*) produce edible seeds which are often used when young in salads and pickles. It has recently been discovered that the tubers produced by *Tropæolum tuberosum* are edible also, though the one who did the experimenting reports that he cannot recommend them as palatable.

LATEX AS PROTECTION FROM INSECTS.—In many botanical works it is intimated that the milky juice of plants protect them from the depredations of ants and other crawling insects by exuding from punctures made by their claws and thus holding them fast. The originator of this story evidently imagined that ants are equipped with spurs, and climb the weed stalks much as electric linemen ascend telegraph and telephone poles. Possibly in a very few cases the epidermis may be punctured by insects crawling over it, but one only need watch for a short time, such plants as milkweed, dog's-bane and dandelion, to know that they are not so punctured. It is said that the prickly lettuce is protected in the way indicated. Will someone investigate and report?

RARE OHIO GRAPE FERNS.—Mr. Almon N. Rood reports the finding of both the matricary grape fern (*Botrychium matricariæfolium*) and the lance-leaved grape fern (*B. lanceolatum*), near Garrettsville, Ohio, last summer. The species are not new to the State flora, but both are so rare in Ohio as to make their discovery important, especially as this is the limit of their southern range in the Central States. Thus far specimens have been found only in Portage county. It is a remarkable fact in connection with these two species that one is seldom found without the other. No theory to explain this has been advanced unless the suggestion regarding the two principal forms of the common grape fern (*Botrychium ternatum*) is applicable. By some it is believed that the one called *obliquum* and the one called *dissectum* are but two phases of the same species and that spores from a single sporangium may reproduce either one.

Autumn Flowering Arbutus.—In *Torreya* for February, S. H. Burnham notes the finding of a patch of trailing arbutus (*Epigæa repens*) that habitually flowers in autumn. The plants were found in 1895 and have since exhibited flowers in September, October or November of every year save three. The arbutus forms its next year's flower-buds in late August, and like many of our other spring flowers, a few of these may open in Autumn instead of spring. To find a large number of plants with a fixed habit in this direction is indeed unique.

Fruiting Season of the Hair-cap Moss.—The hair-cap mosses (*Polytrichum*) are among our largest moss species and this fact together with their abundance has gained them several common names. In some sections they are known as bear's grass or pigeon wheat. They are very noticable in spring when the spore-capsules are maturing, looking like diminutive pine trees with the capsule on a slender stalk at the top. The question when these spore-cases begin to grow has interested several students and an investigation showed that this moss is most deliberate in producing its spores. According to the *Bryologist* it begins its spore capsules in March or April slowly develops them during the summer, autumn and winter and does not shed its spores until the next August, fully sixteen months after the growth of the capsule began.

Medicinal Weeds.—It will be a surprise to many to learn that the people of the United States annually import millions of pounds of some of our most noxious weeds. These are used in medicine, but it would seem fitting that we "kill two birds with one stone" by using our own naturalized weeds as medicine and at the same time rid the country of them. With the idea of encouraging this the Government has issued "Farmers' Bulletin No. 188," in which some of these weeds are described, with an account of the parts used, manner of collecting and drying and the price paid. The prices are very low, seldom going above eight cents a pound, but when the farmer is digging weeds he can afford to sell them at this price. Of the

weeds mentioned in this list the black and white mustards are first, being imported to the amount of more than 5,000,000 pounds annually. Then comes burdock with 50,000 pounds of the root; dandelion 115,000 pounds; couch grass (*Triticum repens*) rhizomes 250,000 pounds; hoarhound 125,000 pounds of leaves; jimson weed (*Stramonium*) 150,000 pounds of leaves, 10,000 pounds of seeds; poison hemlock (*Conium maculatum*) 20,000 pounds of seed and nearly as much leaves. Some of the weeds of which great quantities are used, the supply coming from domestic sources, are mullein, lobelia, poke, boneset, Canada fleabane, catnip and yarrow.

Ballast Ground Plants.—*The Gardening World* says that nearly 300 species of alien plants were collected in Edinburgh, Scotland, last year mostly along the docks where the seeds had lodged from the sweeping of foreign vessels visiting that port.

A New Botanical Garden.—According to *Gardening* a botanical garden is to be established at the University of Chicago in which will be tested DeVries' new theory of the origin of species. The new garden is said to have received seeds from DeVries for this purpose.

Identifying the Violets.—It is only in recent years that students of our violets have paid attention to the development of the plant during the summer months. In the Synoptical Flora (1895) the specific characters are taken almost exclusively from the plants as they appear when flowering in spring, though the existence of later cleistogamous flowers "abundant and short peduncled" is stated. Even Mr. Pollard, who has distinctly urged the importance of studying the mature plant, is, in his treatment of *Viola* in the recent manuals of Dr. Britton and of Dr. Small, quite vague in his account of the apetalous flowers and their mature capsules. Yet right here are to be found the most marked and constant characters on which to divide the acaulescent blue violets into species. These plants are best understood, as are the cruciferæ and umbelliferæ, *when in fruit.—Ezra Brainard in Rhodora.*

Editorial.

It is with great pleasure that we reprint in this issue Prof. Ganong's article on Nomenclature. After reading this lucid account of the differences between the old and new nomenclatures, our readers may judge whether the preposterous new proposition is worth adopting. It is a significant fact that many who at first were to be numbered among the supporters of the new order of things have since returned to the established nomenclature.

* * *

Although an invitation to readers to send in short notes is kept standing in our Note and Comment department, the number of such notes received is far below the number we would like to receive. We deplore this, not because we need such articles to fill up the magazine, but because the silence of those who can write is depriving all of us of much entertaining information. It is not necessary that your notes are sent to us. Send them to any publication you like; if they are of the right kind, we will promptly reprint them. The main thing is that you write. The trouble with most botanists is that the short notes are usually laid up in the memory in the hope that some day enough others will be secured to make a long article. It will be noticed, however, that when one botanist visits another, neither is likely to talk in long articles. Questions, facts, fancies and opinions are rapidly exchanged and both have a good time. It is the same way in print. Do you not always read the short articles in the botanical magazines first? Indeed this trait is so well known that a certain magazine that begins with long articles and ends with short ones, is said to be always read backward like a Japanese book. The value that attaches to these short notes, then, is sufficient excuse for urging that more of them be written. A postal card gives just about room enough for such a note. When next an interesting fact comes to mind seize the opportunity to record it.

Those who, during the past severe winter, have let their thoughts dwell longingly on the warmth and sunshine of California, Florida and the West Indies, may be advised that the dwellers in these apparently favored regions are not to be thought of with unalloyed envy. They miss the disagreeable weather of winter it is true, but they also miss that most delightful of seasons—the beginning of a Northern spring. And winter itself is not all disagreeable weather. Spring in warm climates is but a deepening of the universal green with an almost imperceptible increase in the number of flowers. The floral year has neither beginning nor end. Anticipation, however, is generally held to be better than realization and this accounts for much of the pleasure gained from the return of spring in the North. Long before a flower is in bloom we may ramble through leafless thicket and plashy pasture and find a myriad indications of the return of a milder season. The Northern spring is not a mere continuation of a blooming season, but the real beginning of a new year. The advent of winter puts an end to all plant growth and aids in making spring the brighter by contrast. By close attention we may discover almost the exact instant when the turning point is reached and thereafter follow every development until the floral riches of April and May are lost in the leafiness of June.

* * *

If you are accustomed to think that you know the flowers you may test the extent of your knowledge in this way: Select the spring flower that you know best and without again examining it, answer the following questions: Is it an annual, biennial or perennial? Does it store up food against the blooming season? How? How is it protected against the cold? Since the seed fall on the surface of the earth, how do the underground parts get so deep in the soil? When are the flower buds formed? How protected? Is the flower pollinated by wind or insects? Does it secrete nectar? Where? What insects visit it? For what purpose do they visit it? What part do the

petals and sepals play in pollination? How have they been modified for this purpose? When are the seeds ripe? Of what shape and color are they? How are they disseminated? In what kind of seed vessels are they borne? How does the color of the flower aid in the struggle for existence? The fruit? How does the plant secure a proper amount of light for its leaves? How does it avoid too much light or heat? How is the pollen protected from cold, wet and from pilfering insects? How—but what's the use. Do you really know any of the wild-flowers?

* * *

Some time ago, the editor took occasion to criticise the statement made in a horticultural journal that the grape-fruit gets its name from being borne in "grapose clusters," whereupon a subscriber in the home of the grape-fruit, wrote to say that the grape-fruit *does* grow in clusters, and that this fact is the distinguishing point between shaddock and grape-fruit. We do not contend, however, that there never are several grape-fruits near together on a branch, but that they do not grow in clusters like grapes. The tree that bears these fruits, seldom attains the size of a small apple tree, and as single fruits average as large as the largest oranges, a "grapose cluster" would be rather out of the question. Although this fruit is not so well known as either the orange, lemon or lime, it seems to have acquired more than its share of common names. Among American cultivators it is usually called the pomelo. The original species was named shaddock after a Captain Shaddock who introduced it into the West Indies early in the eighteenth century. The real shaddock is pear-shaped and is sometimes called bell grape-fruit. Another variety is called forbidden fruit. Single specimens of the shaddock sometimes weigh as much as fifteen pounds.

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CONTENTS.

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AN ODD DISTRIBUTION OF COMMON PLANTS.

BY DR. WILLIAM WHITMAN BAILEY.

READERS of books of travel are no longer surprised to note the wide distribution of familiar alpine plants. The causes have been long ago discussed by Gray, Hooker and others. We expect to see *Loiseluria procumbens*, *Rhododendron Lapponicum*, *Diapensia Lapponica*, *Silene acaulis* and many others on high mountains all over the Northern Hemisphere. When, after the retreat of the ice toward the Pole, the climate in the lowlands became too warm for them, some were forced up the mountain sides to congenial habitats, while others maybe simply recognized that they were all right and stayed where they were. At any rate, on the Scotch Alps, on the Swiss Mountains, the Pyrenees and the Himalayas, we find some of our own New England alpines repeated.

Any one interested in their peculiar distribution should consult Dr. Asa Gray's "Sequoia" in "Darwiniana," page 205, "Forest Archæology" in same volume, and Hooker's masterly "Introduction to the Flora of Tasmania." In an article published years ago, Dr. Gray also gives (American Academy of Arts and Sciences Report) a discussion and list of our alpines, and Schimper, in his Classical Plant Geography, dwells more or less upon such matters.

I have lately, during convalescence, been indulging in a Himalayan debauch, reading all books I could find that were something more than politics. The stupendous peaks, the highest of which, of those certainly known, is over 29,000 feet, first became familiar to me years ago through Sir Joseph Hooker's "Himalaya Journals," published in 1855. I am cruel enough to excite the envy of my confreres, by saying I paid only two shillings for my copy!

Later, in fact, just now, I have been reading Waddell's "Climbing in the Himalaya," which embraces the Cashmir region. Here peaks are described up to 26,000 feet altitude. I have also read the later explorations in the Vinchenjunga region—the highest of all,—and Mrs. Bird Bishop's "The Yangtse and Beyond" in which she approaches Thibet from the Chinese side. Her accounts of the flora on those upper waters among the mountains are calculated to drive a plant-lover crazy.

In all these books, but Waddell's more especially, I am surprised to find among a list of unfamiliar species, some common lowland weeds that we all know. With us they are adventive from Europe. They can hardly be so there, as the mountains have been very infrequently visited. Remember that they are found at 10,000 feet and upwards. Some of the surrounding peaks, of course snow-covered, attain an altitude of 26,000 to 29,000 feet and are in a constant state of rapid disintegration.

Among the familiar plants noted are *Fragaria vesca*, *Oxyria digyna* (alpine even with us), *Draba incana* (also alpine), *Viola canina* a variety of *Primula farinosa*, *Potentilla anserina* (abundant on certain river-bottom lands here in Rhode Island), *Hippuris vulgaris*, *Potentilla fruticosa*, var, the dandelion, etc. Indeed we could add many more.

It seems odd to see these weeds sandwiched in among a lot of unfamiliar species. But here again, most of the genera, like *Veronica*, *Primula*, *Luzula*, *Myosotis*, are old friends. To be sure, some, like *Saussurea*, are not of our acquaintance. Edelweiss (*Leontopodium alpinum*) turns up as in Switzerland.

In conclusion, I will say that to me natural history travel, written by the intelligent and open-eyed and devoid of politics and talk of "spheres of influence," has always been a delight. For over thirty years I have kept notes on such reading, and often find them of sudden use in lectures or talks.

If one cannot himself journey, he escapes sea-sickness,

boredom, custom-houses, poor meals, bad nights, land-leeches, rope-bridges and numberless horrors. He can, however, in the cosy seclusion of his study, avail himself of the travels and adventures of others. In these ecological days he will in this manner greatly broaden his horizen.

Brown University, Providence, R. I.

THE DWARF WHITE TRILLIUM.

BY H. A. GLEASON.

ONE of the rarest plants in Illinois is the dwarf white trillium (*Trillium nivale*). It is fairly well distributed over the central and northern parts of the state, but it is nowhere common or abundant, and the diminutive size of the plant make it very easily overlooked except at flowering time. And since it blooms in March, long before any other flowers are out except hepaticas and a few of the trees, it is only the early botanist that finds it.

In my high school days I lived near a hillside on which the trillium grew, and every spring I gathered a few of the plants for my collection; for the high school student was accounted very fortunate who could secure this plant. In 1902 I found a few specimens at a second station, growing with their constant associate, the hepatica.

On April 2 of this year three of us from the University went again to visit the trillium. A ride of thirty miles brought us to Danville, and from there four miles on an interurban and two miles across the fields, with some high school boys as guides, brought us to the steep wooded hillsides where our plants were growing. The country around Danville is generally level, but the Vermillion river and its tributaries have cut ravines one hundred and fifty feet deep and with very steep sides, while the land between them is as level and flat as a prairie. One may start down a diminutive ravine and in less than a quarter of a mile be in a dark canyon a hundred or more feet deep. These hillsides are covered with a dense growth of timber, principally sugar maple and red oak, and the ground is buried

under dead leaves and leaf mould. There is a little undergrowth of elder, sassafras, hydrangea, dogwood and a few other shrubs or small trees, and later in the year there is a luxuriant growth of tall summer and autumn blooming herbs. At this time of year the trees are bare and there is no herbaceous vegetation except such vernal plants as blood-root and dutchman's breeches, or the persistent leaves of hepatica and sword-fern. Only hepaticas and trilliums were in bloom during our visit. The dead logs are covered with mosses and shelf-fungi, and *Conocephalus* grows on an occasional rock out-crop.

The trilliums were more adundant than I had ever before seen them. They grew scattered along the hillside for a mile or more, at the base of trees, under fallen brush, or by prostrate logs, but always on the steepest part of the hillside. Hepaticas were always growing with them, but they were less choice in their surroundings, for they would grow also on the level terraces of the hill, and even on the sunny south sides, while the trilliums were most abundant on the northern and eastern slopes, and never extended around to the south side of the hill. They grow singly or in groups, but are never truly gregarious. Each stem arises from a short thick rootstock about three-fourths of an inch long, lying an inch or two under the surface. The stems are short and reach little above the leaf mould, the leaves sometimes even resting flat upon it. The single pure white flower is an inch across, and quite conspicuous against its background of the three green leaves.

The trillium apparently seldom or never sets seed in this vicinity. In my experience with it I have never seen a fruit produced naturally, although I have several times produced them by artificial pollination. Other species of trillium are either visited by pollen-eating insects or are self-pollinated, but there are no recorded observations on the pollination of *Trillium nivale*. Without seed production a very few botany classes could destroy all the plants in their neighborhood, by digging up the entire plant and thus preventing the further growth of the rootstock. The

leaves persist some time after the flower season, but like many other vernal flowering plants, die down early in the summer.

Urbana, Illinois.

BOTANY FOR BEGINNERS—XI.

MODIFICATIONS OF THE LEAVES.

If asked to define a leaf, most people would say that it is a flat green affair growing from the stem of a plant. In ordinary cases this might be sufficient but there are many leaves that are neither green nor flat, while all the flat green expansions of the stem are not leaves.

One of the most curious of the leaves that are not flat is found in the common pitcher-plant (*Sarracenia*) which is to be found in almost every sphagnum bog. In this case the leaves are hollow cylinders filled with water for the purpose of drowning unwary insects whose decaying bodies will thus afford food for the plant. In this leaf the hollow part is regarded as representing the petiole, while the free portion around the mouth of the well represents the blade. In some of the exotic pitcher-plants especially the genus *Nepenthes* there is a sessile leaf, beyond which the midrib projects as a coiling tendril and at the tip of this is a small pitcher. Here the leaf is a fly-trap, foliage-leaf and tendril all in one. The sundew's leaves are more like ordinary leaves but they also act as fly-traps, secreting a glistening sticky fluid which holds fast any insect that may touch them while the leaf margins slowly enfolds and digests it.

In these instances it is easy to see that the structures for insect catching are modified leaves, but there are other forms of leaves in which their identity is not so plain. For instances, bud scales are but leaves dwarfed for a special purpose and many plants show this by developing the inner bud scales into leaf-like organs in spring. The sharp spines of the barberry are transformed leaves and so are said to be the tendrils of the grape though these latter are perhaps of the nature of stems. In the pea one may see

an example of a compound leaf, part of which has changed to a tendril while the part nearest the stem still functions as a foliage leaf. The bracts, mentioned in a previous article are also considered to be of leafy origin.

VERNATION AND VENATION.

These two words so much alike in spelling are far apart in meaning. The first refers to the way the new foliage leaves are packed in the bud. When folded like a fan (in the maple, for example) they are *plicate;* when rolled up from one margin to the other they are *convolute*, and when the two margins are rolled up to the mid-rib they are *involute*. *Revolute* indicates that the leaf-margins are rolled backward toward the middle of the under surface.

Venation has reference to the way the woody tissues or veins are distributed through the leaf. If all the main veins extend from base to apex or from midrib to margin at equal distances apart they are *parallel* veined; if there are several main veins in the leaf and these give off smaller veins that again divide and connect with the veinlets of other veins, they are said to be *reticulated* or net-veined. The net-veined leaves are further distinguished as being *pinnately* veined or *palmately* veined. In the first there is a strong *midrib* reaching from base to apex and this gives off veins that go to the margin; in the second, several of the basal veins are nearly as strong as the midrib and extending through the leaf give off veins. An excellent illustration is found in the maple.

POSITION ON THE STEM.

Anyone who examines a stem will notice that the leaves are not arranged along it hap-hazard but that they grow from definite regions called joints. Thus in some plants with two leaves at each joint they are *opposite* on the stem, in others there is but one leaf at a joint and the leaves are *alternate*, while in still others there may be a circle of leaves at the joint in which case they are *whorled*. When these opposite leaves are sessile, that is, without a petiole, their bases often grow together and the two leaves

form one piece when they are said to be *connate*. In the common teasel the leaves are connate and in the hollow thus formed there is nearly always a little rain water and this forms a perfect barrier to any creeping insect that would ascend the stem. Occasionally the base of a single leaf of the alternate type may grow together around the stem in which case the leaf is described as *perfoliate*. One of the bellworts (*Uvularia perfoliata*) is a good example of such leaves.

SHITTIMWOOD.

BY A. S. FOSTER.

LAST year the market for the bark of this tree was brisk; now the dealers are engaging all that can be put on the market and the demand is very active. The state still owns considerable land and the bark will be removed from the trees on these tracts upon a royalty basis, perhaps.

It appears that all the Rhamnals of the Pacific Coast have strong medicinal qualities. The extract of the bark is used in a number of "blood purifiers." It is the active cathartic in the "Cascarets" so widely advertised, and so called from the Spanish name *Cascara sagrada*, sacred bark, applied to *Rhamnus Californicus*. This is a beautiful evergreen shrub with small silvery leaves and somewhat tomentose young branches which is often used in domestic medicine. Our tree *Rhamnus Purshianus* grows from ten to thirty feet high through Washington and Oregon west of the Cascade Mountains. The bark is smooth and the tree is comparatively free from the usual mosses and lichens which infest most forest trees of this region. It grows upright and symmetrically like all self-respecting trees should grow, and prefers an open side-hill exposure rather than a lower level. It resembles in winter aspect a young yellow poplar (*Liriodendron tulipifera*).

On this tree nearly all the buds are terminal and but few axillary, they are naked and the flower clusters develop with the leaves, appearing in small umbellate cymes. The leaves are eliptical, five inches long by two inches broad and denticulate. The fruit is a black berry

with a small amount of rich pulp enclosing the three seeds. The wild pigeons of the coast (*Columba fasciata*) are very fond of these. It forms their principal diet while in season. It is grotesquely amusing to watch Mr. Jay (Seller's) try to scold them off his preserves. They being migratory and marauders in their habits while he is a permanent citizen one feels inclined to decide with him for once. Mr. Howell locates *Rhamnus occidentalis*, a small shrub with yellowish green leaves, in the southern part of Oregon.

Apropos of the article on names in the January number, here is appended the names of our plant from the check-list of Sudworth: Buckthorn, bayberry, bearberry, bearwood, Oregon bearwood, pigeon-berry, yellow wood, wild coffee, California coffee, western coffee-bush and the one at the head of this article.

Nasel, Washington.

PLANTS WITH EXTRA-FLORAL NECTARIES AND OTHER GLANDS.

The existence of glands and nectaries outside of the flower or inflorescence has been a subject of much interest to biologists. Delpino, Darwin, Trelease and many others have given a large amount of information in regard to the occurence and nature of these organs; yet much is still obscure and any one so inclined may at least obtain considerable pleasure by making observations along this line.

Various views have been held as to the cause and use of extra-floral glands and their secretions. Delpino considered that the power to secrete nectar by any extra-floral organ has been specially gained in every case for the sake of attracting ants and wasps as a body-guard, or as defenders of the plant against enemies. Darwin while admitting that this may be the case in some plants did not think that all such glands originated in this way. He held that the saccharine matter in nectar was excreted as a waste product of chemical changes in the sap and that this product might then become useful for accomplishing cross-fertilization or for attracting a body-guard, and

thus the nectary would become an object for selection. He cites the case of the leaves of certain trees where a saccharine fluid, often called honey-dew, is excreted without the aid of special glands. By some, the special use of extra-floral nectar is supposed to be to divert ants and other insects from visiting flowers which they might otherwise injure. But many plants have nectar long before and long after the flowering period. On *Viburnum opulus*, for example, nectar is still present and abundantly used by ants late in October. Another view has been that certain of these glands act as absorptive cups and surfaces for the absorption of rain and dew. In *Euphorbia pulcherrima*, commonly cultivated in green houses, there are very large cup-shaped nectar glands, one on the involucre of each cyathium. There are also stipular glands and glands on top of the petiole at the base of the blade. Ants visit the large glands very extensively and one might be inclined to believe that in such cases the foliar glands are guides to the more abundant sweets to be found higher up when the plant is in bloom. In the case of submerged water plants, as for example in certain species of *Potamogeton* with glands on the leaves, the entire question of a relationship between insects and glands in general is eliminated.

Besides nectar there are various other secretions; important among which are those with a digestive function and those of a sticky nature to prevent crawling insects from passing certain parts or for holding them fast while they die and decay.

During the past summer, the writer spent some time in studying the glands which appear on the blades, petioles, stipules and other parts of our native and cultivated plants. The mode of occurrence and the character of these organs is quite erratic. A species may have highly developed glands while its near relatives have none whatever. Even on a given individual some leaves may have the glands while others have none and rarely is the number constant.

Very common among plants is the presence of gladular hairs or pubescence, like on *Petunia violacea*, *Martynia Louisiana*, *Polanisia graveolens*, *Silene Virginica* and *Cypripedium acaule*. Punctate glands in the leaf blade and other parts are also abundant as in *Xanthoxylum Americanum*, *Polygonum punctatum*, *Amorpha fruticosa*, *Hypericum perforatum* and *Boebera papposa*. The latter has comparatively large, yellow, oval glands which are very conspicuous under a hand lens. Various plants also have glutinous leaves especially when young, but these will not be considered here.

Of plants which have glandular surfaces with digestive secretions especially concerned in capturing and absorbing other organisms as food, we have the following:

1. Sarracenia purpurea.
2. Drosera rotundifolia.
3. Drosera intermedia.
4. Utricularia cornuta.
5. Utricularia vulgaris.
6. Utricularia intermedia.
7. Utricularia minor.
8. Utricularia gibba.
9. Dipsacus sylvestris.
10. Silphium perfoliatum.

In this group probably belong such plants like *Silene antirrhina* with glutinous bands around the stem and *Carduus undulatus*, a western species, in which the outer surface of the involucral bracts are very glutinous and catch large numbers of ants which attempt to reach the flowers above, as well as small flying insects. It seems reasonable to suppose that the debris from these decaying insects may serve as food to the captor. Some of the Ohio thistles also have glandular involucral bracts.

Various plants have gland tipped teeth or serrations, as species of *Salix*, *Populus*, *Prunus* and other genera. In some plants the stipules have prominent nectar glands or are reduced to nectaries. Other gland-like stipules, however, do not appear to secrete nectar. Among the genera which contain species with glandular or gland-like stipules, the following may be mentioned: *Reseda*, *Linum*, *Euphorbia*, *Isnardia* and *Circæa*.

The more important glands of special interest are those which secrete nectar or those which have attained

considerable morphological development. Although it is not easy to make a classification of extra-floral glands because of the indefiniteness of these structures, an arbitrary arrangement will be given below to indicate in a general way their origin and position. Some of the special types I have not yet found on Ohio plants, as for example the pit-like nectar glands on the lower surface of the midribs of the leaves of *Gossypium herbaceum* and other plants. The following types are known to occur in Ohio:

1. Glands which appear on the margin at the base of the blade or on the top or the sides of the petiole and evidently representing highly specialized glandular teeth or serrations; as in *Populus* and *Amygdalus*.

2. Highly developed glands under the lobes or teeth of the blade; as in *Ailanthus*.

3. Special patches of tooth-like glands appearing like modified hairs or eruptions either at the upper or lower end of the petiole or at both; as in *Asclepiodora* and *Asclepias*.

4. Patches of pit-like nectaries on the upper side at the lower end of the petiole; as in *Tecoma*.

5. Single or few nectaries on the petiole not apparently originating from hairs, serration, leaflets or stipules; as is *Cassia* and *Ricinus*.

6. A series of nectaries on the rachis between the successive pairs of leaflets or divisions; as in *Acuan*.

7. Glands on the under side of the leaf in the axils of the veins or on the rachis at the base of the divisions; as in *Catalpa* and *Pteridium*.

8. Glands on the rachis apparently representing modified leaflets or stipels; as in *Sambucus*.

9. Glands on the stipules or representing highly modified stipules; as in *Vicia* and *Circæa*.

10. Glands on the calyx or peduncle not showing any evident relation to pollination; as in *Tecoma*, *Pæonia* and *Ricinus*.

11. Gland on submerged water plants; as in certain species of *Potamogeton* which have two glands at the base of the leaf blade.

Extra-floral nectaries make an interesting object lesson well suited for advanced nature study and for elementary botany. The subject is no less important because the reason for the phenomenon is not so very evident and because the teacher is not able to give a conclusive answer so easily. In winter one may readily obtain material for study by sprouting sweet potatoes (*Ipomoea batatas*) in a dish with moist sphagum and sawdust. The large foliar glands of the first leaves secrete an abundance of nectar.—*John H. Schaffner in The Ohio Naturalist.*

THE CALIFORNIA BIG TREES.

In 1900 Professor Dudley made an extensive study of the California big trees. He obtained data by counting the concentric rings of growth on the cross sections of the felled trunks. The oldest tree that he examined began its existence in 525 B. C. His most interesting discovery, however, relates to the remarkable recuperative properties of these gigantic trees. The trunk of one tree that he studied was 2,171 years old. Here is its history as detailed by Prof. Dudley:

"271 B. C., it began its existence.

"The first year of the Christian era it was about four feet in diameter above the base.

"245 A. D., at 516 years of age, occured a burning on the trunk three feet wide. One hundred and five years were occupied in covering this wound with new tissue. For 1,196 years no further injuries were registered.

"1441 A. D., at 1,712 years of age, the tree was burned a second time in two long grooves one and two feet wide, respectively. Each had its own system of repair.

"One hundred and thirty-nine years of growth followed, including the time occupied in covering the wounds.

"1580 A. D., at 1,851 years of age, occured another fire, causing a burn on the trunk two feet wide, which it took fifty-six years to cover with new tissue.

"Two hundred and seventeen years of growth followed this burn.

"1797 A. D., when the tree was 2,068 years old, a tremendous fire attached it, burning a great scar eighteen feet wide.

"One hundred and three years, between 1797 and 1900, had enabled the tree to reduce the exposed area of the burn to about fourteen feet in width.

"It is to be noted that in each of the three older burns there was a tiny cavity occupied by the charcoal of the burned surface, but the wounds were finally fully covered and the new tissue above was full, even, continuous and showed no sign of distortion or of the old wound."

Professor Dudley says that if these trees where protected from fire and from the lumbermen they would live many hundred of years longer, but so long as they are not in charge of the government they are not safe. "We ask for their protection," concludes Prof. Dudley, "because the Calaveras trees are historically by far the most interesting of the big trees, because their preservation will afford the highest and most innocent gratification to the thousands of people who will visit them, and, lastly, we believe their preservation will be most useful to the scientific observer of the future in his work on problems in the origin and history of species, in climatology, in the laws of growth. All this work has a bearing on the problem how to treat our forests so as to equalize the varying amounts of precipitation of moisture in the semi-arid region to the best advantage of our water supply."—*Vick's Magazine.*

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.

BAGASSE AS PAPER STOCK.—After the juice is pressed from the sugar cane there is left a large amount of woody matter called bagasse. This, in some mills, is used as fuel under the boilers but according to the *Sugar Planters'*

Journal a new process for turning bagasse into paper has been invented and it may turn out to be more valuable for paper than for fuel. It is known that bagasse will make good fibre board and it is suggested that barrels might be made from it in which to send the molasses to market. It would seem very appropriate that the tissues that held the juice during the plant's life, should also carry the syrup to market afterward.

Bacteria Given Away.—The Government has gone into the business of supplying farmers with bacteria, not, however, disease producing kinds. The farmer usually accumulates a sufficiency of the latter without effort. The bacteria that the Government purposes giving to the farmers are certain nitrogen-producing kinds which, sown in sterile soil, will produce to make it rich in nitrogen. It is said that unlimited millions of these bacteria can be carried in a thimble but so rapidly do they multiply that no farmer needs half a thimbleful to begin operations. All these bacteria, of course, are very minute plants allied to the mushrooms and moulds.

Storing Pollen.—We ordinarily think of pollen as very short-lived, needing to reach the stigma and germinate at once or not at all. Hybridizers of orchids, however, have found exceptions to this assumption. According to the *Orchid Review* orchid pollen, at least, can be kept for long periods if simply removed from the flower wrapper in tissue paper put in a tin box. In the matter of pollination even our terrestrial American orchids have some peculiar traits. They are practically incapable of self-pollination and as they must often wait some time for the proper insects to appear and pollinate them, the flowers usually remain fresh for long periods. Probably the individual flowers of orchids remain open longer than those of any other family. But although orchid flowers apparently abhor self-pollination, they can be pollinated with their own pollen. This is sometimes brought about by cultivators of orchids but the flowers show their disapproval of such proceedings by making few and weak seeds.

FLOWERS THAT AFFORD LIGHT.—According to a writer in the *Gardening Chronicle* the flowers of *Dictamnus fraxinella* secrete an inflammable resin. On a still calm evening when the plant is in full bloom a lighted match may be applied to the flower stem when the resin will ignite and flare up without injuring the flowers and giving off a strong perfume as it burns.

HONEY SICKNESS.—There are certain plants from which the bees are reputed to gather poisonous honey, but this idea does not pass unchallenged. Many scientists assert that the bees do not gather poisonous honey but that even perfectly pure honey has a very toxic effect on certain persons. On this point Chas. T. Druery, writing to the *Gardener's Chronicle*, notes that in his own case the slightest taste of honey is sufficient to produce nausea, vomiting and great pain which often lasts for a week or more. Even when the honey is taken in confections, cakes, etc., the effects is equally violent. The editor of THE AMERICAN BOTANIST can vouch for a similar case in his own family. It would be interesting to know how prevalent this susceptibility to honey is.

VITALITY OF SEEDS.—If every seed produced should grow into a new plant, each annual plant would have to produce but one seed a year, and each perennial but one seed in a lifetime to keep up the original stock. We know from observation, however, that of the many plants that spring up, few come to maturity. But after counting every seed that germinates, the number is very small in comparison with the vast numbers that are ripened annually. What becomes of the others? Many are, of course, eaten by birds and insects, but a far greater number do not germinate for the simple reason that they possess too little vitality to survive the winter, while others, often thirty per cent. of the whole crop, to all outward appearances sound and good, are abortive. Nature selects her seeds with marvellous judgement and ensures that every new crop shall be as good, or a little better than the preceeding one.

THE SANDALWOOD.—The sandalwood is a member of the family to which our false toad-flax (*Comandra umbellata*) belongs and like it is a parasite. To look at either of these plants one would not suspect them of being parasites for unlike the less crafty dodder (*Cuscuta*) they commit their thefts underground, stealing from the roots just as the dodder does from the stems. In most cases the sandal is very successful in its underground operations, but occasionally it makes a mistake. In parts of India the sandal trees are rapidly dying from a disease called "spike" which is thought to be due to one of these mistakes. It is supposed that its roots in ramifying through the soil fasten upon the roots of the first species they meet. If this happens to be a deep rooted species well and good, but if it happens to be one less extensively rooted, it soon uses up its substance and then dies. In regions where the *Lantana* is plentiful the sandal soon dies and it is thought to be due to the fact that it depends upon the *Lantana* for food.

BEES AND THE CATTLE-MEN.—Out in Nevada, according to the *Rural Californian*, the ranchers are making a funny complaint against the bees. Every year carload after carload of fine alfalfa honey is shipped from this state, and the growers of alfalfa say that these tons of sweetness belong to them, being just so much saccharine matter stolen from their crops by the bees. It is actually proposed to have a bill passed at the next session of the legislature prohibiting the location of any apiary within reaching distance of alfalfa fields. It is well known, however, that if it were not for the bees visiting the alfalfa for honey, the blossoms would not be pollinated and therefore no seeds or pods be formed which would cause a decrease in the weight of the hay. It is therefore in order for the bee keepers to get a bill passed obliging the stockmen to pay them for the services of the bees in pollinating and thus increasing the tonnage of the alfalfa crop. This will even matters up. It never occurs to the rancher that the honey is paid by the alfalfa for the bees' services and belongs to the bee just as truly as the alfalfa belongs to the rancher.

NITRIFICATION OF SOILS —Although plants are able to take up the ammonia dissolved in soil water, they seldom do so under normal conditions. The principal reason for this is that a host of organisms in the soil are constantly turning the ammonia into a more readily assimilated form of plant food. These organisms are known as bacteria and two different kinds are required to complete the process. The first by combining the ammonia and chalk or lime in the soil with the oxygen of the air, forms as products calcium nitrite, carbon dioxide and water. The organisms that perform this part of the work belong to a group called *Nitrosococcus*. At this juncture a new set of organisms called *Nitrobacter*, about one tenth the size of the others, take up the nitrite of lime and by the addition of more oxygen turn it into a *nitrate* of lime which the plant readily uses. Until we know why these organisms work so steadily at nitrification they seem the most philanthropic of bacteria. It turns out, however, as one might expect, that they are doing this work without reference to any but themselves. The higher plants absorb carbon dioxide from the atmosphere, and splitting it up in the interior of the leaf, retain the carbon and give off the oxygen. The energy necessary to do this is obtained from sunlight by the green coloring matter in the plant. The nitrifying bacteria also need carbon dioxide, but as they have no green coloring matter, can not make use of the energy from the sun's rays in splitting this gas into its component elements and in fact the process of nitrification goes on *only in the dark*. To obtain their energy, then, these organisms have resorted to oxidizing ammonia and using the energy set free in the process. Experiments have shown that these organisms are able to assimilate one part of carbon for every 42 parts of ammonia oxidized to nitrite. Nitrification proceeds most rapidly in a warm moist soil. The important part that lime and chalk play in this process is significant and may throw new light upon the liking which certain plants, especially ferns, have for a limestone soil.

Editorial.

A short time ago, a prominent educator in Chicago characterized Nature study as a fad and classed it with roller-skating, ping-pong, bicycling and golf. After any particular pastime or fashion has had its day, it is easy enough to decide how much of it was or was not fad, but of those that are still with us, it is almost impossible to make a proper estimate. There is no doubt that to a great many, bicycling was a fad, and now that it has ceased to be the leader in outdoor sports, wheels that once whirled merrily along boulevard and country lane lie rusting in cellar or attic, not because they are out of date or out of repair but because they are out of fashion. But there is still a great army that finds the bicycle absolutely indispensable. It not only fits into the working-man's life as a shortener of distance which allows him to live further from his work and therefore in better surroundings, but the student, the scientist and the Nature-lover is by its use enabled to reach fields of study that before were unattainable because of distance or lack of proper conveyance.

* * *

It may be questioned whether the interest in Nature study, following so closely upon the vogue of the wheel may not have been stimulated in great measure by it. Even those who bicycled for pleasure almost invariably turned their faces countryward and if they kept their eyes open, as all did who were not bent on making a "record," must have found many objects in nature to excite their curiosity or interest. From this it was but a step to the desire to find out more about them, and thus Nature study gained new votaries. If wheeling is not the natural parent of Nature study it is certainly not less than its godfather.

* * *

When the editor was a boy—not so long ago, either, as measured by ordinary standards—there were no books

of a popular nature on any branch of Natural History to be had. The best thing the market afforded was that well-known volume, "Wood's Natural History," a British work which he vainly tried to fit to the fauna and flora of Eastern America. Any book from which could have been learned merely the names of the animals and plants in his vicinity would have been hailed with joy. To be sure, even at that date there were various text-books or manuals, but the average boy, without a teacher, stands little show of success with text-books.

* * *

Looking now at the great array of popular books on every subject from mushrooms to wildflowers, butterflies, birds and trees, it seems impossible that the first of these was issued scarcely more than ten years ago. When once the current set in this direction, however, they appeared in a way that well made up for lost time. Whether an interest in Nature has demanded the books, or the publication of so many books has increased the interest in Nature is hard to decide. The principal point is, that never more will the boy or girl who really wants to know, be obliged to go without that knowledge.

* * *

The spring announcements of various publishers indicate that a lull has come in the publishing of Nature books. This, however, need not be taken as an indication that a lull has come in the interest in Nature, nor give grounds for assuming that nature study is a fad. There are those who have "taken up" nature in a patronizing way, who will later turn to other ways of amusing themselves, but Nature study is likely never to go into the decline that sooner or later overtakes all fads. The richness that an acquaintance with our surroundings adds to life will be sufficient reason for the spread of the study. Nature study differs from all things that have been dubbed fads, in that it has for its foundation a desire for useful knowledge. In such things the American people do not go backward.

The Colleges and Universities, recognizing the demand for Nature study, have many of them established summer courses in Nature study, but these are mainly for the instruction of teachers who later expect to pass the information on in the schools. The Bigelow School of Nature study, which begins its second summer session July 13 in connection with the Connecticut Chautauqua Assembly, is a somewhat different institution since it is planned for anyone, young or old interested in out-door life. Dr. Bigelow, the director, formerly editor of the *Observer* and now in charge of the Nature and Science department of *St. Nicholas* is probably the foremost American in popularizing the study of Nature. The program for the coming session ranges from lectures by college professors to picnics, straw-rides, fox-fire parades and hayfield frolics. Dr. Bigelow will give two courses of eight lectures each, one on methods of teaching nature study, the other on various branches of the animal kingdom. The editor of THE AMERICAN BOTANIST expects to be present and in charge of the studies in cryptogams and flowering plants. Talks on a variety of subjects will be given. Further information about the course may be obtained by addressing The Connecticut Chautauqua Assembly, Hartford, Connecticut.

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CONTENTS.

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WILD ROSES.

BY DR. WILLIAM WHITMAN BAILEY.

NO one can think of wild roses without recalling the beauty and innocence of youth. They grow beside the highways of our childhood; they bloom throughout the literature of our race. The songs of minstrels and troubadours are gay with them; they gave their names to the wars in which Falstaff was a soldier; they ornament the verses of all the poets. The sweet moss-rose and the eglantine sing themselves into memory. Much as we love the queen of the gardens, it is the rustic rose, after all, that dwells in our hearts.

The nearer we approach the seashore, the larger and more showy do they become. Even cultivated roses succeed better near the coast. The swamp-rose (*Rosa Carolina*) is our most common kind. It has from five to nine dull green, finely toothed leaflets, usually narrowly oblong and acute at each end, dull green and soft hairy beneath. There are no resinous glands and but few scattered prickles. This shrub has a wide range, from Nova Scotia to Florida and west to Minnesota.

Another species, *Rosa lucida*, has coarsely toothed, dark green leaflets, smooth and often shining above; flowers either solitary or in clusters. It has short and more or less hooked spines. Our roses love to grow in copses and clumps. The time to see them in their glory is in the morning. If one wishes to have them bloom in the house, he must pluck them in the bud in the late afternoon. The open flowers are very evanescent.

"The rose that lives it's little hour
Is prized above the sculptured flower."

Rosa blanda is another species found in New England,

generally without thorns or prickles, though sometimes having them. It has from five to seven lanceolate leaflets, dilated stipules, and is non-resinous. The flowers are large, either alone or in clusters. The sepals are entire and hispid. Further north, on the borders of swamps, comes *Rosa nitida.* To these we can add the sweet-brier or eglantine, now quite naturalized and of wide distribution. All these species exhibit various shades of pink or rose color in their flowers.

The genus *Rosa* gives its name to a large and very important family of plants. In it we find our most useful fruit trees: cherries, plums, peaches, apricots, chokeberries, service berries, apples, pears and quinces. Among the smaller fruits we find the strawberry of which the old writer says: "Doubtless God might have made a better berry, but doubtless He never did."

Brown University, Providence, R. I.

IN PENNSYLVANIA WOODLANDS.

BY BESSIE L. PUTNAM.

TO the flower lover June may not be the ideal month if showy flowers is the criterion. For these May is unsurpassed. Yet there are on every side subjects of interest though they do not present themselves so plainly. Besides there is the wealth of ferns not found in full beauty earlier, yet so important in the general appearance of the landscape. *Osmundas* are just losing their fertile fronds and *Botrychiums* just gaining them. Never are maiden-hairs so attractive as when just reaching full size, their rich green and shining ebony stipes showing to the best advantage.

Trillums, Jack-in-the-pulpit and other flowers that were conspicuous a fortnight ago are now past their prime and almost concealed by the luxuriant growth of ferns which were then just uncoiling. Violets are still found in profusion. Some intense blue, rosy purple, or nearly white. The large flowered Canada violet, which is so well adapted to cultivation, still lingers. Why do not the

manuals mention the silvery markings on the halberd-leaved species? Or is it a local characteristic? Noticeable in early spring, they become more pronounced as the season advances and in midsummer the leaf is really ornamental. *Tiarella* and its near relative, bishop's-cap are, with us, May and June blossoms. Though to the casual observer the former is more attractive, the fringed petals of the latter are exquisite when viewed through a glass. They are close companions, following the banks of the brooks. The sweet-scented cleavers, "wild sweet clover" the children call it, is now in its prime, filling the woods with perfume. But like many other pleasures, distance lends enchantment to its charms. When plucked there is a rank odor quite unlike that wafted from the dewy leaves undisturbed.

The gleaming red of the partridge berry meets us at frequent intervals; and soon, as shown by the deep red twin-buds, the white plush florets will fill the air with their arbutus-like fragrance. Did you ever try heating sprays of the leaves and watching them swell out into little inflated puff-balls? This phenomenon plainly shows the nature of the two leaf layers, the air between them expanding.

The brookside along which all the above flowers were seen in a single day was once the home of the large yellow and pink *Cypripediums*, but flower gatherers and root diggers have nearly exterminated both. While they will live for a few years in cultivation, unnatural conditions as a rule are not conducive to their increase. And like most of our native orchids, their safety from extermination lies in protecting them in their native wilds. If you know a favored spot for them, keep your secret if you would keep your treasures.

Conneant Lake, Pa.

BOTANY FOR BEGINNERS—XII.

FRUITS.

It is a singular fact that plants during their flowering period extend a welcome to a host of bees, flies and other insects, but as soon as the blossoms fall, turn their attention toward other classes of animals. Insects are just the animals to most easily effect pollination but they are too small and weak to carry the seeds. The fruits, therefore, are fashioned with an eye to birds, mammals and other agencies.

By fruits we do not necessarily mean the juicy morsels that are borne by trees like the cherry, apple and orange. The fruit is the ripened ovary and is as likely to be a dry seed pod as it is to be the structure we more commonly call a fruit. Nor is it always the ovary and its contents alone, that forms the fruit. Often the calyx or receptacle, or both, may grow after the plant has blossomed and become a part of it.

Some of the more common forms of fruits may here be mentioned. The *achene* is a one-seeded fruit and by many is thought to be only a seed. What is usually considered to be the seed of the sunflower is a good example. Of seed vessels, the pod or *legume* is familiar as the fruit of the great pea family, while the *silique* is the name of the seed-pod in the cress family represented by the turnip, radish, mustard and the like. The *drupe* is the name of the stone fruits like the cherry, peach and sumac. The raspberry is therefore merely a collection of small drupes. The *berry* may be defined as a fleshy fruit with a soft rind and the seeds embedded in the pulp. Under this definition the strawberry is not a berry although the tomato is! The *capsule* is what we ordinarily call a seed-pod and good examples may be found among the pinks, poppies, primroses and many more. Other names to distinguish various fruits are abundant but the beginner will find them in any good glossary when he needs them.

To the student one of the most interesting things about fruits is their adaptations for being transported to a distance. It is the aim of all plants to extend the area

they occupy, but they would do this very slowly if the seeds fell straight downward to the earth from the parent plants. Since plants cannot move about to scatter their seeds, they have been obliged to make use of other agencies of transportation, and the wind, the water, the birds, the mammals, even man himself, have been called into service.

The wind is perhaps the principal carrier. To it are entrusted all the seeds with wings like those of maple, ash, hop-tree, elm, etc., as well as all those with feathery parachutes, such as are found in the dandelion, thistle, milkweed, cottonwood, willow, fireweed and a host of others. Many small seeds, too, that possess niether wings nor parachutes, are small enough to be blown some distances by the wind especially if they are not shed until the snow has spread a smooth covering over the fields. The tumbleweeds, instead of equipping their seeds with wings, secure seed dispersal by breaking off near the ground and then rolling and tumbling before the wind scattering their seeds as they go. A more perfect example of a plant traveling about to sow its seeds could scarcely be imagined. With regard to wind-sown seeds it is of interest to note that seeds with wings are always borne on trees or bushes from whence they are likely to be borne some distance by the wind before they reach the earth. Ballooning seeds like those of the dandelion may be borne near the earth since they rise with the least current of air.

Various heavy fruits may float long distances in the water, and others may be carried about by animals. Many of these latter get eaten, to be sure, but many are left or forgotten and some are pretty sure of a favorable situation for growth.

Another favorite trick of the plant is to enclose a hard seed in a juicy pulp. Such seeds are usually inedible and if swallowed pass through the digestive organs unharmed. The pulp, therefore, may be looked upon as the payment the plants make to birds and mammals for distributing the seeds. That this is a most successful method there can be little doubt. One of our wild cherries is called fire-

cherry because it is one of the first trees to spring up when a tract has been burned over. In no other way could its seeds be scattered as abundantly as this would indicate than by the birds. The mistletoe is a familiar example of how plants with sticky seeds may be disseminated. When birds eat the mistletoe berries, the extremely sticky seeds adhere to their bills and later in cleaning them by rubbing against twigs and branches the birds leave the seeds in the best places for growth.

Many plants, however, not only withhold payment for scattering their seeds, but actually demand, as much as plants can demand, that their seeds be carried free. Their seeds are armed with hooks and barbs and catch into the coats of animals at every opportunity. What is more persistent in clinging than the burdock, beggar-ticks and their ilk? When after walking through their haunts we pick them from our clothing and throw them on the ground miles away from where they started, the plants have been served exactly as they desired. In keeping with all this it is most curious to observe that fruits with hooks do not grow on trees or high bushes. If they did, their hooks would be useless, for no animals would come in contact with them.

Some other plants have various devices for shooting their seeds to a distance and need no outside aid. Most familiar of these is the witch-hazel that can shoot its seeds to distances of fifteen or twenty feet, and the jewel-weed or touch-me-not whose seed-pod flies into pieces at a touch, when ripe, scattering the seeds in all directions. Among others of this class may be named the violets and the New Jersey tea.

DECIDUOUS LEAVES.

Plants have alternating periods of rest and activity. In our latitude these periods usually correspond to the alternating conditions of day and night and to the seasons of the year. The active growing period usually occurs in the summer or the rainy season and the inactive one corresponds to the cold and dry season. Where the

seasons are so marked as in Ohio one takes it as quite natural that there should be a resting period in the winter. But many plants pass into a period of rest even if growing in an environment perennially favorable. Thus it is very common for complete defoliation to take place in many plants of the tropics. It is said that there are nearly two hundred species in Ceylon which become leafless at different times of the year. The statement is made that there is not a month when all the trees are in full leaf. It is evident, therefore, that in many cases the period of rest and the deciduous habit are independent of climatic conditions no difference how the character was originally acquired. In our own plants the influence of cold is no doubt predominant. The injuries of winter are not only due to the direct effect of cold upon the protoplasm, but also to the loss of water. With the approach of autumn, the chilled roots are unable to supply the necessary amount of water for the transpiration going on above; consequently there is a great advantage in reducing the transpiration surface by shedding the leaves. Thus we might say that the casting of the leaves is an adjustment to a more limited water supply. Plants may of course go into a period of rest without shedding their leaves, as in our common conifers. In most cases, however, there is a great change in the body of the plant or some of its parts to prepare for the severe conditions. The annuals die completely and the only resting period is in the seed. The biennials usually grow but little after the cold becomes severe. The greater number of geophilous plants die to the ground. The woody plants and a few herbs have mostly learned to endure the winter by especially developed stems, the leaf which represents the active transpiring and food manufacturing organ being usually shed.

The methods by which the leaves are separated from the stem are various. Some plants like the hemlock shed them after they are several years old. Others like the pines get rid of the foliage leaves by pruning off dwarf branches of a certain age. Some like the bald cypress and tamarix

drop the dwarf branches and smaller twigs with the leaves at the end of each growing season; so the plant has no leaves in the winter. But the common way is for the leaves alone to be separated from the branches. A cleavage plane is formed usually at the base of the petiole and the leaf then falls away. The separation layer is gradually developed between the vascular bundles and epidermis, and finally, when the cleavage is nearly complete the merest puff of wind will break the woody strands and carry the leaf away.

The casting of the leaf, however, is not a sudden process but preparatory changes are going on in its tissues for some time before it is detached. In many cases anthocyan and other coloring matter are developed to protect the chlorophyll and protoplasm while the food material is being transferred to the stem.

After the cleavage plane is formed a heavy frost will help to break away the fragile woody strands which still hold the leaf in place. This is very apparent in such trees as the white mulberry, which may put off its entire leaf dress in a single day after a frosty autumn night. There is much difference in the time of casting the leaf. The Ohio buckeye, juneberry, walnuts and hickories are among the first to shed their leaves. The cotton-wood and chestnut oak shed their leaves very gradually; and some of the oaks are among the last of the trees to be bare. The shingle oak drops few leaves before late in the winter, although they dry off, and it is not completely denuded until about the first of April.

It is interesting to note the several ways in which the cleavage planes are produced. In plants with simple leaves a separation layer is more commonly formed at the base of the petiole very close to the stem, as in the elm, maple, oak and catalpa. In some, however, two cleavage planes are produced, one at the base of the petiole and the other at the outer end just at the base of the blade. This is strikingly shown in *Ampelopsis tricuspidata* and *A. cordata*. The blade drops off some time before the petiole,

so that in certain years a vine of *A. tricuspidata* may shed nearly all of its blades before the petioles begin to fall making a rather unique appearance. The same adaptation is present in the various species of grape. There is probably considerable advantage to the plant in such an arrangement, for the food in the large petiole, which is in much less danger of freezing than the blade, may thus have a longer time to be withdrawn into the stem. In the catalpa, for instance, the blades often freeze and dry up in the fall while the petioles are still green and active. It would evidently be better if the useless blade were cut off by a cleavage plane so as not to hinder the work of the petiole.

In compound leaves the leaflets are usually shed singly. The leaflets of such palmate leaves as in the Virginia creeper and the various buckeyes are cut off some time before the petiole. Pinnately compound leaves have various peculiarities. In such forms as *Rhus glabra* the leaflets are separated by cleavage planes but no transverse cleavage joints are formed in the main rachis which persists for some time. In other forms, like in *Fraxinus quadrangulata* and *Staphylea*, not only are the leaflets cut off by cleavage planes but there is a series of cleavage joints formed in the rachis at the insertion of each pair of leaflets and thus the main rachis of the leaf drops off piece by piece. Decompound leaves often form an elaborate system of separation layers. A good example of this is shown in the leaf of the honey locust. First the numerous leaflets drop off, the main rachis and the side branchlets remaining on the tree for some time. Next the side branchlets begin to fall, and finally the whole rachis is separated. One may well ask the meaning of such an elaborate system of cleavage planes when one amputation at the base of the petiole would be sufficient. There is no doubt but that the green rachis and petiole may continue, to a limited extent at least, the process of photosynthesis; and as stated above, by means of a gradual cutting away of the large leaf surface the more exposed parts are removed first and there is a better opportunity for the withdrawal of the food present in the stem.

A very interesting condition is present in the green briers. The leaf of *Smilax hispida* has two tendrils near the base of the petiole and these, of course, hold the plant to its support. Evidently if the leaf were shed in the usual way the whole vine would fall to the ground in the winter. There is a more or less perfect brittle layer formed in the petiole just a little beyond the two tendrils where the leaf finally breaks off, leaving the petiole base with the tendrils intact. Most of the leaves hang on until after December 1, though usually frozen before this time. The development of a brittle layer in the petiole of this plant seems to be quite a modern adaptation. *Smilax glauca*, *S. rotundifolia* and *S. bona-nox* show the same peculiarity. The genus *Rubus* represents another group of plants which shed their leaves by a break in the petiole, leaving the base on the stem. In this case there are no tendrils and the only apparent advantage to the plant is the protection of the bud or tender part in the axil of the leaf. The adaptation, however, may have no other significance than one of the possible ways in which the plant was able to get rid of its leaves. Among the species which show this peculiarity well are *Rubus odoratus*, *R. strigosus*, *R. occidentalis*, *R. nigrobaccus* and *R. invisus*. In the common mock orange (*Philadelphus coronarius*) the cleavage plane is formed a little above the base of the petiole which remains as a protection to the axillary bud.

There are certain plants which have the habit of covering their axillary buds with the base of the petiole. The sycamore (*Platanus occidentalis*) presents a very perfect example of this adaptation. The reason for such a peculiarity is not easy to see. It may be for protection, or again as in *Rhus glabra* it may prevent the development of too many lateral buds into branches. But there may be no special advantage whatever. It may be a mere incident to the adjustment of the leaf to the surrounding tissues. Other plants which cover their lateral buds are *Cladrastis lutea*, *Rhus hirta*, *R. copallina*, *Acer negundo*, *Ptelea trifoliata*, *Gleditsia triacanthos*, *Robinia pseudaca-*

cia, *R. viscosa* and *R. hispida*. In *Gleditsia* and *Robinia* there are a number of superposed buds only part of which may be covered.—*J. H. Schaffner in Ohio Naturalist.*

FLOWERS THAT ARE NOT FLOWERS.

There is a great deal of difference between the botanist's definition of a flower and the definition that holds with the general public. The former, of course, is correct because his definition is exact, but the great army of florists, gardeners and flower-loving housewives persist in clinging to their own ideas of what constitutes a flower. Indeed, there is no reason why a word should not have two definitions, and the majority may, after all, be right in its opinion. For the sake of a little diversion, however, let us examine some of the cases in which botanist and flower grower do not agree.

We may start with the structures which are called flowers by scientist and gardener, alike. Without going much into details we will agree that a flower usually has sepals, petals, stamens and pistils, and name as examples buttercups, violets, orchids and such. The botanist is willing to forego the petals and sepals, and still maintain that he has a flower. The cultivator, however, will scarcely agree to this unless pistils and stamens are brightly colored, or otherwise conspicuous. But he often goes to the other extreme, and includes with the flowers many parts that do not belong to it and in this sense we speak of his blossoms as flowers that are not flowers.

One of the most familiar of these masquerading flowers is borne by the dandelion. The golden hemisphere at the top of the dandelion's hollow stem is really a cluster of many flowers each one with five petals, one pistil and five stamens, all of which are easily recognized. The petals are joined side by side making a strap-shaped corolla; but one who has any doubts as to their nature may examine the center of a daisy or sunflower where he will find five similar petals arranged in a regular tubular corolla. Even the sepals are not missing from the dandelion blossom,

but they are so disguised that we do not notice them until expanded into the feathery pappus by means of which each seed at the appointed time sails down the wind. "Flowers" like those of the dandelion and sunflower are typical of the great race of composites but as may now be seen, they are really not single flowers but clusters of flowers.

The blossom of the dogwood (*Cornus florida*) is another familiar example of a flower cluster. The four great white petal-like structures that give all the beauty to the dogwood flower—that gives the very name of flowering dogwood to the plant; as if other species did not flower—are not petals but bracts and more nearly allied to leaves than flowers. In fact, they do duty as bud scales all winter long. Perhaps their flower-like hue later is in payment for work well done. The small affairs that the great bracts have guarded so well are usually mistaken for the stamens and pistils, but are really separate flowers.

Something of a similar nature is found in the skunk's-cabbage, Jack-in-the-pulpit, wild calla, green dragon and, in fact, the whole arum family where the most noticeable part of the flower is in the nature of an enfolding bract. To find the true flowers of skunk's-cabbage examine the round head in the middle of the shell-like spathe; to find those of wild calla, search the cylindric object which the spathe tries to enfold.

The members of the great spurge family (*Euphorbia*) are worse off in the matter of flowers than most plants, for the male flowers consist of single stamens. The female flowers are somewhat more conspicuous but they are round little bodies at the top of a short stalk and are certainly not flowers in the popular sense. But when several male flowers are grouped about a female flower and surrounded by a calyx-like involucre it has not a little resemblance to a simple flower. Some species also add embellishments in the way of colored glands and bracts. In the plant known to florists as *Poinsettia* the bracts near the flowering parts are bright scarlet and by many are assumed to be petals. The tropics afford many more won-

derful instances of flowers that are not flowers, but our own fields have many that are not here mentioned.—*Willard N. Clute in The Amateur Naturalist.*

HOW MUSHROOMS GROW.

In all fungi the portion visible to the naked eye however varied its form or colour, represents only the reproductive portion; whereas the vegetative part is buried in the substance from which the fungus obtains its food. The popular belief that the mushroom and other fungi grow in a single night is not correct; it is quite true that when the mushroom has reached a certain stage of development, one or two days suffice for it to attain its full size after it appears above ground. Before this final spurt is reached, however, the baby mushroom has been growing for some weeks, and undergone various changes of structure and development before it emerges above ground. A little thought will recall to mind the fact that mushrooms do not spring up within two or three days after the formation of a mushroom bed, but several weeks elapse before the mushrooms are ready for the table.

The various methods of spore dispersion as occurring in the fungi are interesting; only a few of the most pronounced can be noticed here. By far the most universal agent in effecting the distribution of spores is wind, as may be observed when a ripe puff-ball is crushed under foot. Insects are also answerable for the extension of many fungus epidemics, by alternately feeding on, or visiting diseased and healthy plants, and in so doing unconsciously conveying spores from one plant to another. Perhaps the most interesting instance occurs in a group of fungi to which our stinkhorn belongs. Most of the species are tropical; in this country we have only three representatives. In this group the reproductive portion of the fungus often assumes most fantastic forms, and is generally brilliantly coloured. Over this framework is spread at maturity a dingy green, semi-fluid mass, intensely sweet to the taste, and, from the ordinary human standpoint,

intensely fœtid. The exceedingly minute spores are imbedded in this substance, which is greedily devoured by various kinds of insects, mostly flies, who thus unconsciously diffuse the spores, as it has been shown that these are not injured by passing through the alimentary tract of an insect. It is interesting to note that in certain of the fungi the same advertisements in the guise of colour, sweet taste and smell, are used for the purpose of unconscious dispersion of the spores by insects, as are used by many flowering plants for the purpose of securing cross-fertilization, also through the agency of insects.—*From an article by George Massee in Knowledge.*

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.

SQUASHES FED ON MILK.—Apropos of Dr. Bigelow's query in a recent number of this journal whether squashes can be fed on milk, it is of interest to quote a professional opinion on the subject by a grower of squashes who has tried it. The man who grew the mammoth squash that took first prize at the World's Fair in Chicago says that he has experimented with feeding squashes on milk and that, as might be supposed, there is nothing in it. His method of raising big squashes is this: He makes the ground very rich and digs it over several times before the seeds are planted. As soon as the vines are three feet long, the earth in a circle ten feet from the plant is heavily mulched, and the vines staked down partly to keep them from being blown about by the wind and partly to make them root at the joints. As fast as fertile blossoms appear they are cut off until the last of July when a few fertile blossoms are selected and carefully hand pollinated. When

the fruits have become several inches in diameter all but one on each vine are removed and thereafter the blossoms are constantly trimmed from the vines and the ends of the vines cut off. In this way the energies of the whole plant are bent toward the increase of the single fruit. Liquid manure is given once or twice a week and at all times plenty of water. It is stated that anybody can grow a 300 pound squash by this method.

THE ADDER'S TONGUES.—It is occasionally suggested that the white adder's tongue (*Erythronium albidum*) is only an albino form of the yellow species (*E. Americanum*). The two often grow intermixed, bloom at the same time and have blossoms very nearly alike in shape and size. There is a slight difference in the bulb and the leaves of the white form are usually paler and less mottled than the leaves of the other. There is one point, however, by which they may be distinguished even with the eyes shut, and that is the fragrance. In *Erythronium albidum* the fragrance is exactly like that of the lily-of-the-valley (*Convallaria*), while *E. Americanum* has what one observer describes as a "yellow" odor being similar to that of the dandelion and various other yellow flowers.

INSECTICIDES.—A former note on insecticides mentioned the method of dipping specimens in corrosive sublimate solution. A better plan, it seems to me, is that employed by Dr. Beal of the Michigan Agricultural College. The specimens are "painted" with a brush dipped in the solution, and then put into press for a day. This is much more easily done, takes less solution, does not allow the leaves to roll and if clean alcohol is used no discoloration is left. In fact, I have performed this operation upon mounted plants without the least effect upon the sheet. In view of the statement made by Dr. Millspaugh, of the Field Columbian Museum, to the effect that carbon bisulpide does not appear to affect the pests, it seems that the corrosive sublimate is the better of the two.—*H. C. Skeels, Joliet, Ill.* [The greatest drawback to the use of corrosive sublimate is the fact that after the lapse of years

it fails to keep out herbarium pests. Carbon bi-sulphide, however, while not able to keep out the insects, will kill any form of animal life that breathes. If the cases are given an occasional fumigation with this, plants will suffer very little from insect depredations. The United States Government, Gray Herbarium and the Herbarium of the New York Botanical Garden are among the prominent institutions that have discarded corrosive sublimate for fumigation.—Ed.]

Coralorhiza innata.—*Nature Notes* objects to the statement in a recent article in this journal that "*Coralorhiza innata* is parasitic on the roots of trees as can be at once seen by its lack of chlorophyll," and *Nature Notes* is undoubtedly correct. *Coralorhiza* is probably a saprophyte, living on decaying vegetable matter, but it may be noted in passing that our latest American "Manual" affirms that some of the coral-roots are root parasites. It is often a delicate matter to decide just where saprophytism leaves off and parasitism begins. This would be a good subject for our readers to investigate this coming summer.

Glandular Hairs in Teasel.—As is well known, the leaves of the teasel (*Dipsacus sylvestris*) are so arranged on the stem that the bases form little wells around it, to which the blades and petioles carry rain-water. Taking an analogy from the pitcher plant(*Sarracenia*), possibly, it has been suggested by various botanists that these little cisterns of rain-water might serve to drown insects, the juices of which might later be absorbed by the plant. Glandular hairs are present on the parts of the leaf forming these cisterns but a recent investigator has decided that these hairs do not absorb any nutriment from the water. It is a mistake to assume that every plant structure is a useful adaption. As has often been pointed out in this journal there are many structures that at present, at least, are useless, and still others that appear mere matters of convenience.

COMPOST FLOWER-POTS.—According to *Gardening* a machine has been invented for making flower-pots from ordinary garden soil and cow manure. Seedlings and cuttings started in such pots do not need to be transplanted, but are set into the ground pot and all, thus preventing any injury to the roots. The plants never know they have been moved.

EFFECT OF CHANGES IN NOMENCLATURE.—In *The Botanical Gazette* for March Dr. W. J. Beal tells of burying certain weed seeds twenty years ago with the idea of digging a few up each year to test their vitality. Such were the changes in nomenclature, however, that before the experiment ended he was digging up different species—at least the names they are now known by are different from those used when they were planted.

MILKWEED CHEWING GUM.—The boys of the prairies who pull off flower heads of rosin-weed, are matched by the children of Grand Rapids, Michigan. These children break the midribs of the leaves of the common milkweed (*Asclepias Cornuti*) and the milky juice oozes out. In a few minutes it hardens, is collected and used for gum. I cannot vouch for its flavor, not having tried it, but have the assurance of one who has that "it was good."—*H. C. Skeels, Joliet, Ill.*

MORNING-GLORY TREES.—The note in January BOTANIST recalls visions of old "palo blanco" clumps down in Southern Central Mexico. A thirty-foot *Ipomœa arborescens* is a regular mine for an entomologist; it is one of the trees preferred by *Morpho polyphemus*, the huge white butterfly so rare in collections, and many large and precious Scarabæid beetles delight to feast upon its succulent flowers. A smaller sister species occurs in the swamps down in lower Vera Cruz around Volcan de Tuxtla; it is an ugly looking coarse shrub or small tree. By the way, let us not forget that Lower Burmah boasts of a hundred foot fleabane (*Vernonia*).—*O. W. Barrett, Mayaguez, P. R.*

Editorial.

The greater share of whatever is attractive in the make-up of THE AMERICAN BOTANIST must be credited to those correspondents who take sufficient interest in the journal to criticise it and to suggest ways of improvement. Often there are reasons, unknown to the writers, why we cannot follow their suggestions, but we give each hint careful thought and do all we can to please. We look at the proposition somewhat like this: we do not consider that we are merely selling a certain number of printed pages for a dollar, but rather that we are investing the dollars of plant lovers in the way that will bring them the largest return for the money. If anyone can get more matter to his liking, elsewhere for his dollar, we ought not to expect that he will become one of our subscribers; but if he cannot, then we claim the money. This is one of the reasons why we are always willing to listen to the criticisms and suggestions of subscribers. In so far as the selection of matter for publication is concerned, we consider each subscriber a member of the company.

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In response to our request for more Note and Comment, a subscriber sends us the following: Allow me to make a suggestion. The public needs cheap publications. Why do the shilling "shocker" and the shilling (English) popular authors circulate so universally? Editors do not realise the fact that the world is more populous, that means of communication have multiplied and more subjects are required to be learned in the commonest affairs of life. Everything offered for mental pabulum must be illustrated no matter how roughly. The day of the three volume novel is past and biographies that begin with the life history of the hero's great grandfather will only be read by the interested few. Condensation is the secret of and cheap—say 25c or 50c—books containing good matter without moralizing and packing are in demand.

Who reads a book more than once and who accumulates a library now? Have you ever read Plutarch's Lives thoroughly, Shakspeare, Paradise Lost or if so ever re-read them? Life is too strenuous and the weary man whose daily toil only provides the necessities of life with consumption of phosphorus, cannot be wooed to thought—Remember the German proverb "Ohne Phosphor, keine gedinke."

* * *

Without doubt this expresses the opinion of a great number of plant collectors, but considered from the editor's view point some of it takes on a different appearance. For instance the matter of circulation is not always a matter of price. The 400,000 copies of "David Harum" sold at $1.50 is a greater circulation than any shilling "shocker" will ever attain. Novels and short stories are not in the same class with scientific publications. A demand for a work of fiction may be created by advertising, quite irrespective of the book's merits, but a scientific work cannot be boomed in the same way for by no chance could it possibly appeal to more than a limited number. How many in your own neighborhood are enough interested in botany to buy a book of any kind on the subject? Grant Allen was one of the most charming of writers on botanical subjects that ever lived, yet he abandoned this work to write novels because scientific writing did not pay.

* * *

We seriously doubt whether the botanical public cares for illustrations that do not illustrate. There are apparent exceptions to this, for there is a certain floral magazine issued in America with a circulation of 375,000 copies and it is illustrated exclusively with wood cuts taken from a seed catalogue. This circulation is probably by far the largest of any botanical publication in the world but we feel sure that if we began using the seed catalogue illustrations we would not only lose our present subscribers but fail to gain any others. On the other hand, the best illus-

trated botanical magazine in this country has recently advanced its price one half because the cost of illustrating it was not made up by increased subscriptions. Those who clamor for illustrations are often the first to condemn an illustrated number because "it has nothing in it." THE AMERICAN BOTANIST has less to do with plant structures than with ideas, opinions and facts about plants and therefore has less need of illustrations, but when we do need illustrations, there is no hesitancy about using them. Owing to the kind of paper in this journal, we cannot use photographs nor wash drawings, but line drawings on bristol board in India ink are always acceptable, *provided they illustrate*. It may be remarked in passing that we are at present negotiating for a colored plate in every issue of this journal, but if we use them we want something more than mere colored plates. They must illustrate!

* * *

As to cheapening botanical publications, the tendency seems to be in the other direction. *The Botanical Gazette* began long ago at $2.00 now costs $5.00. *Torrey Bulletin* began at $1.00 now costs $3.00. *The Fern Bulletin* has been increased from $.50 to $.75, *The Bryologist* from $.50 to $1.00, *The Plant World* from $1.00 to $1.50, *The Journal of Mycology* from $1.00 to $2.00. In the beginning the price of THE AMERICAN BOTANIST was placed at $1.00 and that is where it is going to remain. It is only fair to add, however, that the advance in cost of most of the publications mentioned is partly due to an increase in their number of pages. Nevertheless, there is no publication devoted to botany in America, selling for a dollar, that prints more pages in a year than this same AMERICAN BOTANIST.

* * *

On our exchange list are the names of several who have asked to have the magazine sent to them in return for press notices. In some cases, if the notices have been given, copies have not been received at this office. Those who are remiss in this will kindly take notice.

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CONTENTS.

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THE AMERICAN BOTANIST.

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POND LILIES.

BY DR. WILLIAM WHITMAN BAILEY.

IT has of late years become a custom to sell pond-lilies on the city streets. Nothing can be more refreshing to the parched and weary passenger than the cool, delicious fragrance of this flower. Then, too, how beautiful it is, with its spotless white, or blushing pink and the delicate yellow of the stamens. There is in these an interesting transition backwards to the leaf-like sepals. The choice red variety is a "sport" or variation and most of those one sees hail from Cape Cod. It is not at all certain what causes it, but once established it seems capable of perpetuation.

Yellow species are found in Florida; the blue ones come from the Nile region. The Egyptian lotus is the *Nymphæa lotus* of Linnæus. It has huge peltate, circular leaves, standing high above the water, and pink or white flowers. These stand erect. In parts of New Jersey this superb plant has been permanently established, and is a "joy forever."

A nearly related and very singular plant is the water-shield. The stems are covered with a peculiar jelly-like substance. It has small purplish flowers. Everybody knows the yellow pond lily or spatter-dock. There is little beauty to the mal-odorous flowers when gathered, but they are effective on the surface of a pond.

The queen of the family, if not of the whole empire of flowers, is the great lily of the Amazons—*Victoria regia*. It is said that when Sir Joseph Paxton was designing the roof of the crystal palace at Sydenham, he conceived an imitation of the extraordinary system of girders and supports shown by the veining of the Victoria's leaves. It is

a combination of lightness and strength quite marvellous to contemplate.

These leaves are of immense size, and are capable of supporting quite a large child. The edges turn up to form a sort of basin, and the surface has a curious, upholstered look. Like very many other water plants whose leaves are floating, the undersides of the leaves are red with anthocyanin a pigment which changes light into heat and thus helps to keep the leaves warm. The upper sides are green and exposed to the direct illumination and heat of the sun. The opening bud is a dream of Nirvana, the fully opened flower the perfection of grace and color.

The pond-lily is an inspiration. No one can look upon it without feeling soothed and ennobled. The Oriental nations, with the poetry which distinguishes them, take the flower as a symbol of deity. In its pure bosom reposes the great Buddha in his condition of perfection and rest: for a similar Nirvana all mortals are seeking. This sacred lotus is not identical with our pond-lily, but ours is quite as beautiful. The pure white petals are tinged with shell-like pink and its cool, delicious perfume suggests embowered ponds and breezy shade.

It is no easy matter to gather pond-lilies; indeed, it is proverbially difficult to obtain anything worth having. In the first place they always grow out of reach of land. To pluck them one has either to take a boat or play the modern Leander. It is better to embark in a boat, for swimming among the long, slippery and snake-like stems of pond-lilies is rather dangerous business. They enwrap themselves about one and threated to pull him under. But in a boat he is safe, and can sail among the floating stars in peace. The blossoms close in the afternoon and are drawn near to or beneath the water; they require to bathe their pretty faces before a reappearance.

Tournefort was as fine a poet as the Hindoos, when he named the genus *Nymphæa*, for what could be more sacred to the water nymphs than their lovely pond flower, rivalling the sweetness of their own breath. Perhaps it is itself

a naiad who disdaining the love of the gods, was changed into this transcedent flower and abides with us forever.

Brown University, Providence, R. I.

A FLOWER SHOW ON THE EAST SIDE, NEW YORK.

BY PAULINE KAUFMAN.

THE great spring opening took place at school No. 7, corner of Christie and Hester Streets, New York, from May 18th to the 21st, 1904. Every effort was made by the ladies of the National Fruit and Flower Guild to make it a great event. Being the first affair of the kind ever given in this populous neighborhood where a flower is indeed rare, was it a wonder that the thirty-five hundred children should become frantic with delight, for did not their elders, accustomed to seeing masses of flowers, get just a little wild too?

The play ground was turned into a bower of beauty. Stairways, windows, pillars and doors lost their identity in palms and branches of dogwood. Every spot was in bloom. One corner was filled by a beautiful tree, reaching the ceiling and spreading on all sides branches bearing chimes of the daintiest white bells with long clappers of greenish white and red. Aptly was this named the snow-drop tree (*Halesia*). Very interesting, too, was a small model of a maple sugar outfit, and the explanation of the process of making the sugar, given by Mr. Parsons, delighted all the children.

On the table representing a swamp, grew various mosses, hepatics, equisetums, ferns, (royal, cinnamon and interrupted, maidenhair, sensitive, rattlesnake, oak and many others), marsh marigold, buttercups, *Clintonia borealis*, Jack-in-the-pulpit which were naturally great favorities and the resurrection and pitcher plants. Every group of children asked, why is that called resurrection plant, and listened eagerly when told that the plant curled up into a dark brown dry ball when deprived of water, to uncurl, flatten out and become gradually green as the water was supplied and that this proceeding could be re-

peated as often as desired, and that the pitcher plant invites flies and other insects into its pretty red parlor, where all that enter leave hope behind, losing their lives by drowning in the water with which the pitcher is filled.

A division of the swamp table was devoted to the native orchids. Having received what I considered an abnormally large blossom of *Cypripedium pubescens* from the Virginia Hot Springs, I took it to the school to exhibit. Imagine my chagrin at finding a vase containing a dozen of equally large blossoms which had been gathered quite near the city. The showy orchis, the smaller yellow *Cypripedium* and the stemless pink one completed the list. The pupils were told that the cypripediums were fairy slippers or Indian moccasins, but indeed they were large enough to make the name ladies' slipper seem almost appropriate.

Central and Bronx Parks sent a cartload of flowering trees and shrubs, dogwood, sassafras, pussy willow, slippery elm, sycamore, maple with immense keys, also red, swamp and silver maple, spice bush, tulip, red oak, Japanese plum, wild cherry, chestnut, poplar, birch, beech, apple, pear, alder, horse chestnut, walnut, butternut, hazel, ailanthus, plum-leaved viburnum, staghorn sumac, forsythia and wild grape. These plants cover two tables.

Among the wild flowers were all of the trilliums (wake robin, the large white, the nodding and the painted one), violets (purple, white and yellow), the first filling many small tubs. Strange as it may appear, these were several times taken for roses by the children. Azalea, rock and moss pink, columbine, various cresses, baneberry with its odor of rhubarb, dandelion, bluets, celandine, rue and true anemones, spring beauty, early everlasting, cinquefoil, the sessile and perfoliate bellwort, wild ginger, sweet cicely, several of the buttercups, white, pink and yellow clovers, wood betony, Solomon's seal of unusual size with large green tipped bells, saxifrage, golden ragwort, Mayapple, and golden parsnip, false Solomon seal, Indian cucumber, pink corydalis, blue cohosh, robin's plantain, wild gera-

nium and hosts of others. In fact there were one hundred and eight varieties, omitting the cultivated flowers.

On the table devoted to cultivated flowers were to be seen nearly every species then in bloom. The fragrant, pretty *Daphne mezereum* was among the cases sent by J. Pierpont Morgan. About twenty years ago, I saw this plant for the first time in an old garden in Harlem, and not again until last week when I met it at the florists near the cemetery, under the name of pink candytuft. By comparing the two plants, the florist finally became convinced that the candytuft was quite another plant. Finding it again at the flower show made me hope that it will remain in the line of vision for some years to come. With this plant was the *Calycanthus*, strawberry or pineapple shrub, so named from the odor of the chocolate colored flowers which the children love. Here also were the flowering currant, raspberry, strawberry, all of the blue berries, Japanese maple, while overtowering all was a fine copper beech.

Several classes were allowed in the playground at one time, going from table to table and taking notes which were turned into compositions when the classroom was reached. Very creditable was one on the pansy, read by a mite of a boy with a large voice, who rejoiced in the name of Sam Weingart. After school hours, pupils of other schools visited the exhibition. Friday was mothers' day. How these women must have enjoyed it! Doubtless most of them "could greet a friend from home, half the world away." The great supply was so generously distributed that every home was cheered. While at first one felt a little sad because of the quantities that had been gathered, the thought that four thousand people had received great pleasure and some knowledge, soon overcame the regret. Then, too, many were picked by children in the country, who looked forward with truest delight to the giving of this joy to their city cousins. Mrs. John I. Northrup had charge of the show, being assisted by Mrs. Horace See, Miss E. L. Tuckerman, Mrs. J.

Ricketts, Miss E. M. Isaacs, Miss Long, Mrs. J. W. Stewart, Mrs. U. A. Budd, Mrs. J. H. Cohen, Miss M. E. Strassburger, the teachers of school No. 7 and the principals, Mr. Wm. H. Kottman and Miss C. N. Davis.

New York City, N. Y.

BOTANY FOR BEGINNERS—XIII.

EVOLUTION OF THE FLOWER.

The little *Lemnas* or duckmeats found floating on the surface of quiet waters are among the smallest of flowering plants; but there are *flowerless* plants so small that they consist of a single cell and to be seen must be viewed through a microscope. It is a long stretch from these tiny one-celled plants to the giants of the forest with uncounted billions of cells, but it is well known that the gap between is bridged by a multitude of plant forms that show a gradual increase in the complexity of their structure and indicate that even the most highly developed of plants have gradually been evolved from the lowly microscopic forms.

At this point we need not be concerned about the evolution of the first flowering plants, but may give some attention to the way in which the highest flowers have become specialized from these primitive types. It is certain that the first flowers were far less perfect and beautiful than those to be found at present. Indeed, since the early flowers were wind pollinated, it is likely that they were mere assemblages of pistils and stamens, such as we now see in the oaks, walnuts and others. Petals seem to have been an after-thought developed when the flowers found pollination by bees and other insects desirable.

There are several lines along which the flower has been evolved and it will be found most interesting to interrogate even the common flowers as to their position in the world as shown by their structure. Since *entomophilous* or insect pollinated flowers appeared later than *anemophilous* or wind-pollinated ones, and since entomophilous flowers are noted for their display of color, the very fact

that a plant has a colored corolla is usually an indication that it is higher in the scale of life than one without; but there are other items to be taken into consideration before we can be sure, for some plants that once had a corolla appear to have since lost it.

In the primitive flower, all the parts of each whorl are believed to have been separate: that is, the pistils or stamens were not joined together, and when calyx and corolla appeared, these consisted of distinct petals and sepals. The tendency of evolution has been toward a union of these various organs. A plant with a tubular or gamopetalous corolla like the morning-glory or the phlox, is higher than one like the buttercup in which the petals are separate.

It follows, also, that a flower with pistils separate and distinct is far less specialized than one with them united. The modern terms used to indicate these conditions are *apocarpous* for flowers with pistils distinct and *syncarpous* for flowers with pistils united. There has also been an evolution in the position of the ovary with regard to the other parts of the flower. In the simplest flowers the stamens, petals and sepals arise from the base of the ovary a condition that is often indicated by the statement that the ovary is "superior," or that the calyx is "inferior." More properly the flower is said to be *hypogynous*, which means that the floral parts are below the ovary. The word *perigynous* means around the ovary an example of which may be seen in phlox or in any other flower in which the petals and stamens appear to be inserted upon or to spring from the calyx tube. *Epigynous* flowers are those in which the calyx seems to have grown up around and over the ovary and the petals, sepals and stamens seem to spring from the top of the ovary, as in the apple-blossom. Evolution has been from hypogynous to perigynous and epigynous flowers, the latter, of course, being the highest.

In wind pollinated flowers it is usually necessary that much pollen be produced in order that some at least will

reach the stigmas. Therefore, simple flowers have many stamens and pistils. Since the stamens in such flowers could not be arranged in a single whorl, we find them placed spirally on the receptacle which is elongated to receive them. The stamens and pistils in the buttercup and magnolia are arranged in spirals. The *spiral* arrangement is most frequently noticed in stamens and pistils, but it may occur in the other organs of the flower as in the petals of the water-lily or cactus. The higher flowers have fewer stamens and pistils. These are usually arranged in circles and the flower is said to be *cyclic*. Evolution has proceded from spirals to cycles, and this reduction of the essential organs has gone so far that the highest types, though possessing five sepals, petals and stamens, often have the pistils reduced to one.

It is probable that the first flowers to possess petals had these organs all alike and arranged radially as in the buttercup, rose and lily. Later, the modifications of the flower to protect the nectar from undesirable insect visitors or to facilitate the work of cross-pollination, made it "irregular," that is the petals began to be of different shapes in the same flower. Thus was brought about the two-lipped flowers of the mints, the butterfly-like flowers of the pea family and the one-sided flowers of violets, jewel-weeds and orchids. Plants with radiate flowers are said to be *actinomorphic*, those with irregular flowers *zygomorphic*. Evolution has, of course, proceded from actinomorphic to zygomorphic flowers.

It is not to be assumed that these various evolutionary forces have acted on all flowers in exactly the same proportions. In one flower certain lines will be found accentuated, in another very different ones. It is therefore a never ending source of interest to the student to examine the flowers in the light of these facts. Evolution seems often to have proceded independently in each set of the floral organs and one may find united pistils and separate petals, or the reverse.

THE ROMANCE OF THE LOTUS.

When one speaks of the Lotus in India, one does not, of course, refer to that wonderful Libyan shrub of which the early Greeks told and believed so many marvelous tales, one of which Tennyson has woven into his exquisite poem of the Lotus Eaters. The Indian lotus is the well-known and beautiful water lily, a sister of which may be found growing on the banks of the ancient and historic Nile. The natives of India, with more poetry in their souls than we are disposed to give them credit for, have made a good deal of the lotus from the very earliest times. Brahma, the great Creator, is its son, for, according to the Puranas, there sprung a lotus from the navel of Vishnu, and from the remarkable blossom, Brahma emerged into existence. Mark the contrast in this pretty story to the old Greek myth that the white lily sprang from the milk of Hera. Saraswati, the goddess of learning, and Lakshmi, the goddess of wealth, are supposed to be the daughters of the lotus. With such excellent credentials, apart from its intrinsic loveliness, is it to be wondered at that the lotus has been largely pressed into the service of the imaginative Oriental poet?

The lotus goes by a great many names in this country, the most striking of its numerous titles being "thousand petal," "moon face," "Vishnu's navel" and "water born." It is the subject of some very extravagant and far-fetched beliefs and superstitions. The abundant blossoming of the red lotus is supposed to be an indication that rulers will prosper, while that of the blue lotus is a sign of coming prosperity for ministers and commanders of armies. The various species of the plant are turned to many uses. The seeds and roots are eaten roasted. The large leaves make a cool bed in fever and also serve as plates on which offerings are placed. The juice of the leaves is esteemed a remedy in diarrhœa. The root is used as a paste in skin diseases and the fibre is converted into wicks which are employed in temple worship. In several parts of the country, the owner of a lotus pond can always make a

tiny revenue by the sale of the leaves, flowers, fruit and stems of the plants. As a rule, the lotus is not regularly cultivated out here, but when it is, the method of sowing the seeds is by enclosing them in balls of clay and throwing them into the water.

As a device, the lotus enters into all the ornaments of brass vessels used in Hindu temples, doubtless chiefly because it is considered the first attribute of Vishnu and is sacred to other deities of the Hindu pantheon, and partly too because of its own beauty which is so highly admitted that the flower is looked upon as emblematical of female loveliness. The Egyptian lotus is believed to have found its way from India to the land of the Pyramids and the sacred scarab.—*Indian 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.

HOW FUNGI BECAME PARASITES.—A great number of fungi are saprophytes, that is, they live upon decaying plant and animal substances; but many others are parasites, taking up their abode in the tissues of a living host. The various rusts are among the most destructive of parasites, but curiously enough each rust has its own special host to grow upon, and cannot grow upon others. If placed on a moist leaf of some other plant the spores of the rust germinate but the haustoria seem incapable of penetrating the leaf. Recent experiments seem to point to the presence of repellent substances in the cell sap as the cause of the non-development of the rust. In many cases this deterrent element is malic acid. Saprophytic fungi may be educated to become parasites by sowing the spores on living leaves and then infecting the tissues of the latter with substances favorable to the growth of the fungi.

THE PEANUT ABROAD.—According to the *Gardening World* the British are beginning to take to peanuts for which they appear to have coined the new name monkey nut. How they have been able to run their country fairs for so long without the, to us, indispensable peanut, is a mystery.

A BRITISH PECULIARITY.—Never by any chance do our British cousins speak of beets. With them it is always beet-roots. Yet they never think of saying parsnip-root or carrot-root for exactly the same structures in the carrot and parsnip. It is amusing to us, but they doubtless find our uses of other words equally amusing.

THE HAWTHORNS.—According to a writer in *Gardening* nearly five hundred species of hawthorn (*Cratægus*) have now been described from America. Of these, Prof. Sargent has described about one hundred and seventy-five while C. D. Beadle and W. W. Ashe each have nearly one hundred and fifty to their credit. Fortunately for botanists there is nothing to oblige them to accept these forms at the valuation of their describers.

THE ADDER'S-TONGUES.—Is it wild or cultivated? is a question one often hears asked about some strange and handsome flower, as if all species are not wild somewhere. In the popular mind, however, cultivated plants are those that come from a different locality than the one in which they are grown as garden flowers, and far too often this distinction is made the basis of a division that excludes many a fine native species. The adder's-tongues (*Erythronium*) would be called cultivated flowers in the Old World, but scarcely placed in the same category in the New, and thus it happens that these handsome plants are usually absent from American gardens. The British are more appreciative of their beauty and a recent number of the *Gardening World* recommends no less than twelve species for cultivation. All of these with the exception of the single European species (*E. dens-canis*) are native Americans. *E. dens-canis* was cultivated as early as 1596. Our common yellow species (*E. Americanum*) was soon intro-

duced and has been cultivated since 1665. The white one (*E. albidum*) was introduced in 1824 and was followed by *E. grandiflorum* and *E. gigantium*, the latter often bearing as many as ten flowers on a stem. A further acquaintance with these species would seem desirable on this side of the world.

WILDFLOWERS FROM SEEDS.—Without doubt, desirable wildflowers are most easily transferred from their haunts in wood and field to our own grounds by means of seeds. They do not bloom so soon, it is true, but balanced against this is the great difficulty of digging up and transporting mature plants, not to speak of the care necessary to make them live. Where the walker may bring home one or two dozen living plants from a trip, he may transport unnumbered thousands by means of seeds. In planting the seeds, one should follow nature closely. Select a half shady spot not too dry, plant the seeds and keep out the weeds. The plants from such a seed bed will be better than any you can dig afield.

TRILLIUM ERECTUM.—Botanical works speak of this common trillium as having dark red or occasionally white petals and the inference is usually made that the white flowers spoken of are of the nature of albinos and to be found scattered among the common red-flowered plants. This, however, is not the case. In the vicinity of Joliet, Ill., all the flowers of the species are white—not the dingy yellowish white of the albino eastern plants, but the pure white of the wake robin (*T. grandiflorum*). So far as the editor has observed in the hundreds he has seen, there is not a single red flower among them. They are really handsome flowers and easily to be mistaken for the wake robin though not when the two are growing in company. That the fairer hue can scarcely be due to any lack in soil, water or locality is shown by the fact that two other species with dark red flowers (*T. sessile* and *T. recurvatum*) are very common in the same plant societies. Some day this white-flowered form will be dubbed a species with a long Latin name—probably *Trillium album* since Wood characterizes a variety with white flowers by this title.

COLOR OF THE SQUAW HUCKLEBERRY.—I find the berries of *Vaccinium stamineum* inclined to vary somewhat as to coloring. While most of the shrubs, here, produce yellowish or greenish fruit, a number of exceptions were noted the past season. In these, bright pink was the predominating color, though occasional plants were found loaded with deep wine-colored berries. A single low bush bearing white fruits was also noticed.—*J. Ford Sempers, Aikin, Maryland.*

ANEMONE CAROLINIANA.—One of the handsomest of our anemones bears the name of *Caroliniana* though in no sense does this justify the common name of Carolina anemone, for the plant is found in the Mississippi valley and ranges eastward only to Illinois and Georgia. The flowers are borne singly on a slender stalk and begin to appear shortly after the grass has turned green. They are about an inch and a half across, the fifteen or twenty sepals ranging from deep purplish blue to pure white or rose color, in this respect duplicating the efforts of the hepatica. This species would make an attractive addition to Eastern gardens.

DOG FENNEL.—In our boyhood at the North we were familiar with a common weed with finely divided leaves, white flowers and an ill odor. It was commonly called dog fennel. But while the northern plant was an annual, not to exceed 18 inches high, the Southern plant was a perennial from six to ten feet high. The botanical name of the former is *Maruta cotula*, of the latter, *Eupatorium fœniculaceum*. Up to this spring we never saw a plant of the *Maruta* in Florida. This spring several plants of it have sprung up and are in bloom under a scuppernong grape arbor. We have for a year past had small coops of hens with little chickens under the shade of this arbor. We feed these chickens whole wheat and probably the seed of this weed came in the wheat. It seemed almost like an old friend, still it would hardly be wise to allow it to go to seed. We have native weeds enough without cultivating any imported varieties.—*Florida Agriculturist.*

BETULA.—Mr. W. H. Blanchard of Westminster, Vt., has issued the first leaflet of a series to be called *Betula* and devoted to observations on the plants in which he is interested. In this first number he has described two new white birches from Vermont.

JEWEL WEEDS AND FROST.—In connection with the hardiness of the seedlings of jewel weed (*Impatiens*), it is interesting to note that in the fall the first plants to show the effect of frost are these same jewels. Before the hickories begin to turn, or even the ailanthus shows the action of the cold, the jewel weeds will turn black, and wither; and that is the end of summer.—*H. C. Skeels, Joliet, Ill.*

SOAP TREE OF ALGERIA.—Steps are being taken in Algeria to manufacture natural soap on a large scale from the tree known as *Sapindus utilis*. This plant, which has long been known in Japan, China and India, bears a fruit of about the size of a horse-chestnut, smooth and round. The color varies from a yellowish green to brown. The inner part is of a dark color and has an oily kernel. The tree bears fruit in its sixth year and yields from 55 to 220 pounds of fruit. By using water or alcohol the saponaceous ingredient of the fruit is extracted. The cost of production is said to be small and the soap, on account of possessing no alkaline qualities, is superior to the ordinary soap of commerce. We may remark that this is the "soap nut" of India, our common *Rheeta*, in such extensive use among the natives of India.—*Indian Planting and Gardening.*

PLANT FOOD TABLETS.—It is well known that plants take most of their bulk from the air, the roots serving mainly to supply them with water and mineral matter. The amount of the latter needed is so small that many plants can live for long periods in ordinary rain-water, but sooner or later plants cultivated thus, begin to show the lack of the minerals. That it is these substances and not merely the soil for which the plants languish may be proved by adding certain chemicals to the water when the plants continue to thrive as well as if planted in soil.

Most of these essential substances are such common ones as table salt, iron, epsom salts, gypsum, phosphate of lime, etc., and Dr. E. F. Bigelow has hit upon the scheme of combining them in their proper proportions in tablet form. One may then plant his plants in sawdust, chopped straw or even pure water, and by adding a tablet to the water supply, grow thrifty plants. Dr. Bigelow, whose address is Stamford, Conn., offers thirty tablets postpaid for ten cents.

THE STUDY OF SEEDS.—Relative to the article on seeds by Mrs. Bradshaw and Dr. Bailey, ought not special emphasis be laid on the fact that an herbarium specimen is not complete without ripe fruit and seeds. Certainly the greatest interest attaches to a trip afield in the late fall or winter when one is familiar with the fruiting tops of the summer's flowers. Studying capsules, seeds, and seed dispersal is to me more interesting than the discovery of new plants. With a generous supply of little paper bags and a roomy overcoat pocket one can carry, in a very handy way, material that will afford study during many a long winter evening. Small druggist's envelopes to paste on the herbarium sheets will contain a pod and sufficient seeds for reference use. The bags of seed pods may be collected during the whole season and packed away in a box for study during the winter. It is my custom to keep a check list in which all species with seeds in my collection are checked and I am constantly on the watch for fruits of plants not checked. To really know a plant one must be able to recognize it in all stages—from seed to seed.—*H. C. Skeels, Joliet, Ill.*

GRAPE-FRUIT.—Referring to the controversy touched upon in the last paragraph of the February AMERICAN BOTANIST, we must say that it appears to be a case of "neither but both" being right. Our editor was right in maintaining that the fruit is not borne in "grapose" clusters; while the southern subscriber is correct in asseverating that it does grow in clusters. Oranges, as well as grape-fruit, frequently are produced in clusters near the

tips of the branches, these irregular "clusters" containing sometimes a dozen or more fruits; but the grape-fruit cluster is not a thyrse, botanically speaking, like that of the grape or lilac—as we hope the subscriber has noticed. To illustrate how one always misses some point of even his "pet" subject: In Trinidad I found an experienced cocoa planter who didn't know that he had white-seeded varieties of cocoa growing along with his common red ones! And this, notwithstanding the fact that one of the tests applied to the "beans" during fermentation is breaking them open. And another very similar case in Venezuela has just come to notice. Hyperopic perspicacity: things get so near we can't see them.—*O. W. Barrett, Mayaguez, P. R.*

ACTINELLA ACAULIS.—In the sixth Edition of Gray's Manual a pretty little spring-flowering composite is described under the name of *Actinella acaulis*, Nutt. Since then it has been transferred to the genus *Picradenia* by Britton and to *Tetraneuris* by Greene. Possibly a few other changes have been made to suit the whims of species makers, that we may have overlooked. The principal thing we wish to mention in this connection is the variety *glabra* which is reported "from an Indian mound near Joliet, Ill." Unless this glabrous variety is to be found elsewhere it is now extinct. It no longer grows on the mound near Joliet, in fact, the mound itself is nearly extinct having gone down the throat of the omnivorous stone-crusher to form road material for northeastern Illinois. The mound is not strictly an Indian mound though it once was a meeting place of the tribes. It is a glacial kame of rounded limestone pebbles, etc. *Actinella acaulis* is still plentiful in the vicinity of the mound and each May produces an abundance of yellow daisy-like flowers somewhat larger than dandelion heads, and of a deeper shade of yellow. At a little distance the plant is easily mistaken for a dandelion.

EXTRA-FLORAL NECTARIES OF ELDER.—One of the commonest illustrations of extra-floral nectaries may be found in the common elder. Along the rachis of the leaves and at the base of the leaf-stalk may be found small platter-like objects that produce nectar. On such plants one will usually find numerous ants and has only to watch a few minutes to see them approach the platters and help themselves.

THE FLOWER OF THE PAWPAW.—Pawpaw blossoms are more familiar to southern readers than to those of the north, but it is not uncommon for this plant to be found some distance north of the Ohio River. The flower, which opens in June, is a curious affair with three sepals and six petals—three large and three small ones—all of a dull red color. The flowers are as large as a silver dollar. The pistils ripen first and project above the globular mass of stamens. In this way cross-pollination is effected, the principal agency in this work appearing to be certain large butterflies. The flower has an unusual odor that may be likened to the smell of yeast.

THE SHOOTING STAR AND INSECTS.—The shooting star (*Dodecatheon*) is one of our most attractive wild flowers not merely by reason of its size and color but by the peculiar shape of the flower as well. The flower is nodding but the petals are reflexed in a manner that makes them nearly erect. In this position they point backward from the base of the flower. After the blossom has been pollinated, however, the petals fall and the nodding peduncles straighten up and hold the seed-capsule erect until maturity. One who finds the plant in fruit can scarcely believe it the same he saw in flower. The question why the flower assumes these different positions is hard to answer, but it would appear that it is to guard the pollen and nectar from creeping insects, such as ants. While the flower is open the reflexed petals form a cup about the flower stem beyond which the insects find it hard to penetrate. After pollination the erect position can be assumed without fear of the ants.

Editorial.

"Who reads a book more than once and who accumulates a library, nowadays?" asks a correspondent in a recent number of this journal. If by "library" our interrogator means a collection of books chosen more with a view to having their bindings match the rest of the furniture, than for any regard for their contents, we will quickly agree that that fashion has happily passed on; but we are not so ready to admit that the studious man or woman finds these strenuous times to militate against the accumulation of good books. The statement is as true now as it was when first penned that "a book that is worth reading is worth owning." In fact one may find in this statement a very safe guide to book buying. Buy no books that are not worth reading, and read no books that are not worth buying and you will have a library to be proud of.

* * *

If any reader of these lines thinks that a scientific book will not bear reading more than once, let him try to prove it by a second reading of such books as Thoreau's "Walden," "Excursions," or "Maine Woods," Burrough's "Locusts and Wild Honey," "Signs and Seasons" or "Pepacton." Gibson's "Sharp Eyes," Torrey's "Footpath Way" or any of the half hundred books on kindred subjects that have appeared since those mentioned were written. The fact is that however carefully we may read a book there are many things which the mind fails to make its own at a first reading for want of a peg to hang the ideas upon, if we may so express it. If you have never seen the delicate *Arethusa* in her chosen bog, or the great flowers of *Sarracenia* glowing above her clustering pitchers, how can you either understand or appreciate what others have written about them? One must see his plant or perform his experiment for himself before the ideas of others will have the fullest significance. Each

addition to his stock of knowledge increases his capacity of absorbing more from books. Not until one knows as much on the subject as the author of the book, will he be warranted in laying it aside.

* * *

Nor should the line be drawn at books. Any good scientific magazine will bear a second reading, but we are ordinarily in such haste to get the very latest word on the subject that we quite overlook the great mass of sound information to be obtained from this source. Those who cannot indulge their taste for new magazines to the limit are advised to take down the old ones for another perusal. The late Thomas Meehan, perhaps the best informed botanist of the preceding generation, once expressed to the writer his opinion that it would be far better to render the matter in past publications available by copious indexing than to establish a new publication. But so resolutely has the public set its face toward the future that new publications spring into favor while those of the past are neglected.

* * *

Libraries are still being accumulated, especially libraries of scientific books. One may be satisfied to know that the latest novel may be had at the nearest circulating library, but who would be willing to have his botanical volumes even that far away? The scientific works that we seldom have to consult may remain in such a place, but we want the others near at hand ready for use. There are certain lines along which every individual is interested. Let him get all the literature on these special subjects, and buy sparingly of other books and he will find the accumulation of a library a most important item in his advancement.

* * *

A correspondent who finds the present arrangement of matter in the botanical publications unsatisfactory writes as follows: "I would like to see all botanical magazines published in separable form, each article on a separate or

separable sheet, no two genera treated on the same sheet, with uniform headings, as might be done by agreement among the various publishers. Then, those who like the present unfindable arrangement can keep right on with it, and those who like to file things where they can be found when wanted, can separate their magazines and file alphabetically. I have such a mass of periodical literature, government reports, odds and ends, "separates" and the like, that they are practically useless to me. It is such a bother to look up an article, the exact location of which I do not remember, that I do not look it up at all. It would be to the common interest to make the change and it would not trouble those who do not want it." The proposition that publishers adopt some such scheme as here outlined is sufficient novel to be interesting. It cannot be denied, however, that a vast amount of information is constantly being lost by being buried under an ever increasing amount of new literature. Thus it is possible for a student to take up a problem for investigation quite unaware that others have settled the same question earlier. Yet it is doubtful whether a magazine issued as suggested would meet with favor; we are too accustomed to the appearance of present day magazines to make the change. However, if we ever do come to such things we would add to our correspondent's suggestion that the magazines should also adopt a standard size of page and type. At present, in lieu of the separate articles, we must depend for a finding list upon the indices published in the magazines. The *Fern Bulletin* prints each quarter a list of all articles on ferns and fern allies appearing in American publications, and the *Torrey Bulletin* prints a monthly list of articles on botany in general, later reprinting each item on a card ready for indexing. This index, however, includes only the longer articles appearing and so is often likely to miss most important notes. What we need is someone to compile a complete list monthly, but it is likely such a list would cost too much to make the venture profitable.

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CONTENTS.

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Books Recommemded

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

I.—Two Books by Grant Allen.

There are few books dealing with ecology that we have read with greater pleasure than Grant Allen's "Vignettes from Nature" and "The Evolutionist at Large." The author's style is too well known to need special comment. The edition we offer is bound in paper and each volume costs 20 cents. The 40 cents that brings these two volumes will be well spent.

II.—Two Books on Seed Dispersal.

Recently we have received numerous inquiries about books on seed dispersal. The literature on this subject is not abundant, but we are able to offer two small volumes which are desirable. Beal's "Seed Dispersal," 87 pages, cloth, 35 cents, and Weed's "Seed Travellers," 72 pages, boards, 25 cents. It is seldom that one can get all the literature on a subject for 60 cents!

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RAILROAD BOTANIZING.

BY WILLARD N. CLUTE.

A TRIP by daylight through a picturesque region is something that is likely to appeal to all travellers; but when the road runs through a flat and monotonous country the experienced are likely to so time their travels that the journey through it is accomplished at night when they are absent in a country called dreamland. To the botanizer, however, no country is monotonous, provided he crosses it during the blooming season and while he may prefer the more attractive country he would doubtless be able to find something of interest even in a desert.

In all parts of the country the railway is recognized as an excellent botanizing ground. May the day be long in coming when we fall into the British custom of allowing no trespassers upon the right of way! The railways do more, albeit unintentionally, to preserve the native flora than all the plant protection societies put together. Railway lands are neither plowed nor cultivated nor grazed and in consequence many of the wildlings maintain a foothold here long after they are driven out of the fields adjoining. Would that we might add that railway lands are not mowed; but the average railway official has the same ideas of "improvement" that characterizes the country road-maker and both express them in the same way. Therefore, at frequent intervals the verdure and beauty that clothe the unsightly railway embankments are ruthlessly removed and the traveller gazes out upon heaps of dying vegetation instead of the flowers that once grew in the region. At the same time, in order to make the railways more attractive, exotic shrubs are planted about the stations as if the borders of the entire line were not full of

native shrubbery that is hardier and even more useful for decorative work. But if it is desirable that the stations be beautified with blooming herbs, shrubs and vines it seems equally desirable that the roadsides between stations be also. The first can only be accomplished by the landscape gardener, but the second will be amply taken care of by an ancient dame named Nature if the section boss will only stay his scythe. If he must mow, let it be late in the year when the dead vegetation might otherwise be a menace to the fences if accidentally fired.

By affording a sanctuary to many a hard-pressed plant afield, the railways preserve to us perhaps a better representation of the original flora than is to be elsewhere found in the neighborhood. This is especially true of prairie and other scantily wooded regions. In others the woods and fence-rows also afford protection.

It is surprising how many plants one can identify from a car window. Even when moving at the rate of nearly a mile a minute, the dominant plants in the landscape are recognizable. We cannot pick out single flowers, it is true, but as they flash past in groups of varying size, their color and the way in which they grow give us clews to their identity that are unmistakable. As we botanize in this way, we appreciate more and more the superiority of habit and habitat over form and color in our identifications. This, too, probably explains why it is so easy to find a plant after one has once seen it growing and so difficult before. Having seen just how and where a plant grows we next time recognize it by these signs; in fact, we are often able to predict its occurrence before we see it. But who is there, that, seeing for the first time a plant about which he has read, finds it to exactly correspond to the mental picture he had formed of it?

Aside from giving us a good idea of the dominant plants in the flora at a given time, the railway borders afford most graphic examples of the distribution of plants. One can scarcely travel five hundred miles in any direction without finding many changes in the flora and the longer

the journey the greater will the changes be. There are some plants, to be sure, that are seldom missing during the blooming season. One of these is the flea-bane (*Erigiron*) whose insignificant daisy-like flowers may be seen throughout the summer season in all the Central and Eastern States. Another is the common buttercup (*Ranunculus acris*) though in some sections other species take the place of the common one. But ordinarily a few hundred miles is sufficient to carry one out of the range of a given species, or at least out of the center where it is plentiful. A few days ago I had some excellent illustrations of this in travelling from Joliet, Ill., to Binghamton. Shortly after leaving we began to pass through masses of a pink phlox-like flower, which though I had never seen it growing I assumed to be *Phlox pilosa*. It had the general habit of *Phlox divaricata* but with blossoms of the same color as those of the moss pink (*P. subulata*). All along the line of the Michigan Central from Chicago to Detroit it was the most abundant and the brightest object in the landscape. Then it suddenly vanished and was seen no more. Along with the phlox was the common blue flag. It appeared at intervals all along the way, but it was most abundant, or at least most noticable, in southern Michigan. Such masses of Iris I have never seen equalled elsewhere, except, perhaps, in Louisiana late in April. Still another color-note in the Michigan landscape I utterly failed to identify. Possibly some Michigan correspondent can enlighten me. It was a deep rich yellow but was not a buttercup, nor a dandelion, nor *Rudbeckia hirta*. It had the look of a Composite and I think is a plant new to me.

East of Michigan City the lupine began to appear and soon the roadsides were blue with it. Later this gave place to the purplish-lavender clumps of beard-tongue (*Pentstemon pubescens*) and for long distances this color took its turn in being the dominant one. No doubt a few days or weeks will see this color give way to a new one, but at the time of our trip it had no near competitors.

Here and there the train sped by isolated masses of other flowers—the handsome flowers of the anemone (*Anemone Canadense*) the brilliant painted cup (*Castillejia*) or the ox-eye daisy (*Chrysanthemum leucanthemum*). I have never had an opportunity of gathering the painted-cup but there was no mistaking the plants. For a long distance a low moist stretch was scarlet with them. Just east of Kalamazoo we passed a sunny slope covered with the great white blossoms of *Convolvulus spithamæus*, a plant so little known as to have no common name, apparently. Its nearest of kin, the bindweed or wild morning-glory (*C. sepium*) is well known in the North but this plant seems not to be common. It delights in sunny situations and spreads its blossoms all day low down in the grass.

Canada was something of a disappointment. I saw scarcely a noticable flower except the wild mustard; but that was everywhere. Some fields were one glare of the yellow blossoms. I have seen the Canadian roadsides at other seasons and know that they are able to produce as showy flowers as any, but they were not in evidence in the middle of June.

Across New York State we found whole fields yellow with buttercups or white with daisies. Looking at the latter it is difficult to realize that in the middle west this plant is still something of a rarity and that it is occasionally cultivated for its blossoms. Those to whom the daisy is still a stranger, however, may be cautioned against making its acquaintance. Its blossoms are certainly handsome, but its weedy qualities are too great to be overlooked. In New York the beard-tongue again appeared and with it the Northern bedstraw (*Galium boreale*). In the midst of a country in which these at present predominate, the journey ended.

TONGUES IN TREES.

BY DR. WILLIAM WHITMAN BAILEY.

I LOVE on summer afternoons, to live in the shade of forest trees. I leave the dirty city far behind me, and seek some leafy nook, where, lulled by the tinkle of distant cow-bells, I can repose, half dreaming, on the velvet moss. Through the foliage, just rustled by the sweet south wind, I catch glimpses of the beautiful river as it flows onward to the ocean, here and there dotted by the white sail of some ship that goes out with the trusting faith of youth into unknown storms, or still more dangerous calms. Now and then a great full-laden bee blunders against my face and with a buzz of apology flies off with his golden pollen treasure; then, a gaudy butterfly, banded with black and yellow drops upon me like the petal of some tropic flower.

Afar off from the shrubbery comes the music of the thrush, as in peasant garb of brown he woos his gentle mate. Above is the deep blue of the sky, flecked by billowy clouds—beyond which fancy soars to the infinite. Even ants, who laboriously pursue their various vocations and cross our human obstacle of the body as indifferently as they would a log, seem in perfect keeping with the place and hour. I like to contrast my present laziness with their unceasing energy, and really feel a pity for these mites who take no rest.

Sweetly the pine trees sing to us of the ocean. From standing so long in view of the waves, they have caught the song of the Atlantic. Now they murmur softly, like ripples when they kiss the beach; now we scarcely note that the deeps are stirred; and then, with swelling grandeur, arises the full sound or diapason of the roaring breakers and dashing surf. "O, pilot, 'tis a fearful night!" We hear a vessel in distress, the signal gun, and the loud thunder of the tempest; again, all is still, and the billows chant their requiem over the lost. There is no more melancholy sound in nature than this soughing of the pines. The most unimaginative person must pause and wonder,

when without any apparent motion, he hears this echo of the sea.

Each tree has a language of its own, and the sylvan philologist learns to know them all. Sometimes he may be puzzled at an unusual expression, but he will soon understand. A perfect sympathy between man and tree abolishes all little word difficulties, and brings two souls in harmony. Many a lovely story have the beech-trees told me of the classic times of dryad and of nymph. The chestnuts sing of Andalusian maidens, of poor Boabdil and the ruins of Granada; the oaks narrate the glories of the Roman legions, whose heroes its leaves have crowned; the birches recall the too frequent admonition of childhood; the hickories suggest the memory of autumn days when "the sound of dropping nuts was heard," and the gentian opens its holy eye; lastly, the "wild witch-hazel tree," as Drake calls it, deceives us with stories of buried treasures, which so far, we have failed to unearth.

It is comforting when all else fails, and even in the midst of the whirl of life we often feel alone, to hold communion with Nature, she that "never yet forsook the heart that loved her." Through her ministers, the trees, she tells us never to despair; while to her sisters of mercy, the flowers, she intrusts the task of leading us to the feet of the bounteous Giver.

The hammock, once associated with rolling billows and general unpleasantness, is now the synonym of terrestrial enjoyment. It is all very well for the poets "to sit on rocks and muse." But the true dreamer, he who has Nirvana in view, takes to the hammock as the oriole does to the pendant elm branch. If there be such a thing as profitable laziness, which the super-energetic will, of course, deny, it is this hammock revery.

We swing our cradle between two old cherry trees, upon which the juicy globes are still luscious and enticing. Lying with an umbrella to shield us from too dazzling light, and a palm-leaf fan to ward off flies, we gaze up through the rustling foliage.

"Where the sailing clouds go by,
Like ships upon the sea."

A few little clouds wander off by themselves, and there are great fleecy ones that recall the impression of snow-topped peaks. The wind soars with them somewhere; it is one of the peculiarities of our day-dream that we care not how or whither. A cock leads by his speckled harem. A cat of many days makes our acquaintance, and two festive kittens almost arouse us from our reverie by their jolly performances. We turn our eyes slowly from their gambles to the green meadows, wall-partitioned, that roll to the distant hills; they are alive with motion. The breeze tosses the daisies till we think of the white crests of the actual sea. Clouds and shadows are cast over the green waves, and then we think of the mountains where long ago, as a child, we watched similar shadows chase along the slopes and leap the ravines. As the clouds fly, so do the days and years.

It is a beautiful scene upon which we gaze; ours by right divine. Somebody else pays the taxes and claims nominal possession. Without claim of primo-geniture, or shares in mills or mining stock, or oil-wells (more's the pity) we do own many a patch of land by superior appreciation. No man can steal or misappropriate our acres. Bulls and bears cannot effect the values. Warning signs and barbed wire fences are not potent to exclude us. He who loves Nature, is not deterred by apparent inaccessibilities, for he surmounts all opposition.

Afar off we hear the tinkle of little bells, "sweet bells jangled" by some milky mother. This was all that was wanting to sooth into complete forgetfulness. We now have the *ranz-des-vaches* and alpine yodel. Slowly, cloud after cloud fades out before us, and the landscape grows hazy as with autumn mist. The bells sound more and more remote, and we pass from vision into dreams. Who shall determine the boundary line between them?

Brown University, Providence, R. I.

BOTANY FOR BEGINNERS—XIV.

THE GREAT DIVISIONS OF FLOWERING PLANTS.

All plants higher in structure than the ferns and fern allies are called flowering plants, though the pines and other conifers, which are thus included might seem at first glance to have no claims to such a position. The fact is, however, that the pines have two kinds of blossoms. One, which bears the pollen is a catkin-like affair containing many stamens; the other is the structure which later ripens into the familiar pine cone and consists of a great number of pistils. The great difference between conifers and what we may for convenience term the true flowering plants, is this: in flowering plants the pistil forms a closed or bottle-shaped ovary containing the embryo seeds, while in the conifers the embryo seeds are not enclosed in an ovary, but are borne on the base of the scales in the cone. At the time of flowering, the scales of the young pistillate cone open, allowing the wind to sift the pollen down on their embryo seeds. And then they close up, not to open again until the ripened seeds are ready to be dispersed. The seed-bearing plants, whether pines or others, are called *Spermatophytes* or *Spermatophyta*, and this distinction between the pines and our real flowering plants is made the basis of the first division of the spermatophyta. The pines and their relatives—what we usually call the conifers or cone-bearers—are called *Gymnosperms*, a word meaning naked ovules. All other flowering-plants are classed as *Angiosperms*, the word meaning enclosed seeds. The angiosperms comprise the great majority of spermatophytes. Leaving aside for the present the gymnosperms, we will sketch the principal differences in this larger group.

One of the first things that impresses the student of the angiosperms is the fact that the species fall easily into two very natural groups. One is characterized by three parted flowers and parallel-veined leaves—such as the orchids, lilies, grasses and palms; the other has usually five parted or four parted flowers and netted-veined leaves. That this is no mere superficial difference is found

upon a closer examination of the plants, for those with three parted flowers have stems or trunks in which the wood-bundles are scattered through the pith—a very good illustration of which may be found in the corn-stalk—while those with five-parted flowers have the wood-bundles arranged in a circle around the central pith such as is seen in a cross-section of an ordinary tree like the oak and maple. We find further that these plants with three parted flowers have only one seed leaf or *cotyledon*, while the plants with five parted flowers have two cotyledons. Thus when we plant corn, which belongs to the first group, a single spire of green comes up; but when we plant beans which belong to the latter, we expect every one to come up with two seed leaves which soon spread out to the sun. Of course, there are many plants with two cotyledons that do not bear them above the surface of the soil, but they will be found upon examination of the seed. Now while the number of the floral parts, the venation of the leaves and the structure of the stems may be depended upon to separate the plants of these two groups, the most distinctive character is found in the cotyledons and therefore one is called the *monocotyledons* and the other the *dicotyledons*. The beginner, interested in fixing these differences in mind, would do well to write down these terms in their order, adding the characters that distinguish each.

THE MONOCOTYLEDONS.

There are about twenty thousand species of monocotyledons in the world. These are classified according to their relationships into Genera, the genera are arranged into larger groups called Families and the families themselves form still larger groups called Orders. Ten of these orders are represented in Eastern America, six belonging to a division in which the pistils are separate or distinct, and four to one in which the pistils are united. Bearing in mind what has been said regarding the evolution of the flower, we see that the section with pistils separate, or *apocarpous*, is least specialized and we will therefore begin with that. The first order, the Pandanales takes its name

from the screw-pines (*Pandanus*), a tropical genus, and includes among our plants the cat-tails and burr-reeds. The second order, the Naidales named for the genus *Naias*, includes the pond-weeds, the eel-grass, the water plantains and their relatives. The grasses and sedges constitute the order Graminales, and the Arales named for the arum family, contain in addition the duck-weeds (*Lemna*). This completes the orders of apocarpous monocotyledons represented in our territory. In the tropics another large order, the Principes which contains the single family of the palms (*Palmaceæ*), would be included.

Of the syncarpous monocotyledons, the least specialized are the Xyridales named for the yellow-eyed grasses (*Xyris*). They include, also, the pipe-worts (*Eriocaulon*), the pine-apples, the spider-worts (*Tradescantia*), the pickerel-weeds and others. The next and most important order, the Liliales, in addition to the great lily family, includes the rushes (*Juncus*) and the smilax, amaryllis, iris and yam families. The order Scitaminales is mostly tropical. To it belongs the arrow-root family (*Marantaceæ*) and various others, the most familiar representatives of which are probably the cannas. The Orchidales, highest in structure of the monocotyledons, complete the list of orders.

Glancing back we see a gradual line of development beginning with humble marsh and water plants with insignificant corolla and calyx and separate pistils, running through the lily-worts with showy actinomorphic flowers, often with the parts united, until it culminates in the zygomorphic orchids in which nearly all parts of the flower are united, the ovary is inferior and the flowers highly specialized for cross-pollination. Here the line of the monocotyledons abruptly ends. There is no imperceptible gradation into the lowest of the dicotyledons as many suppose. It therefore seems probable that the monocotyledons have had a separate line of development with their highest types to be found among the orchids. For comparison we shall next trace the line of evolution in the dicotyledon.

It is necessary to remember that in the great majority of flowers the pollen, whether deposited by wind, insect or any other agency, or whether it is extraneous pollen introduced by the hybridizer, begins to germinate on the surface of the stigma and produces a pollen-tube. This is the commencement of the actual process of fertilization or impregnation. Of course it is of the utmost importance that extraneous pollen applied in the art of artificial crossing should be in the proper condition, neither too old nor too young. The operator with his instrument removes the pollen from the stamens of the flowers selected, and applies it to the stigmatic surface of the flower operated upon—in other words, the breeder undertakes to a limited extent the duties of Nature. He prevents self-fertilization by removing the anthers at an early stage in the growth of the flower selected for manipulation, and with the guidance of knowledge and experience selects the extraneous pollen which he intends to introduce with a regard to whatever dominating influences or qualities it carries with it, thus stamping the future seed with its potency. The pollen tube grows in length with greater or less rapidity in different species of plants, and in the process forces its way through the conducting tissues in the interior of the style until it reaches the ovarian cavity. It might be in the ovary that one or more ovules are found, and one can always distinguish in them certain parts, viz: a central mass of cellular tissue, known as the nucellus, enclosed in either one or two coats, called by botanists the integuments, and the whole is attached to the placenta by a short stalk. The integuments, however, are not entire, as there is a minute aperture at the anterior end, termed the micropyle, through which the pollen-tube could enter in order to reach the embryo-sac, so that the contents of the former might be brought in contact with the contents of the latter, becomes evident. The result of impregnation is that inside the embryo-sac, an embryo begins to form, and at the same time the fertilized ovule

increases in size until, finally, with the contained embryo, and occasionally with some reserve food material in addition, it forms what is called a ripe seed. It might be thought that, since in most flowering plants the stamens are so closely related in position to the carpels, it would be a relatively easy matter for pollen to fall on the stigma and fertilize the ovules of its own flower. But this rarely happens, although barley and some of the grasses furnish examples where such a thing does take place, for it is known that they are persistently self-pollinated without the species seeming to suffer deterioration from this in-and-in breeding. Here it is that Nature plays into the hands of the producer of new breeds, who has been able to change a two-rowed into a six-rowed barley, with all the characters of a first-class malting variety. An infinite number of new and distinct breeds of oats, barley, wheat, clovers, grasses and roots have been produced by dexterous manipulation of the flowers before they had pollinated themselves. In some flowers this self-fertilization has been prevented by mechanical means, the respective lengths or positions of the involved organs being unsuitable. In the case of unisexual flowers, that is, those containing only stamens or carpels, respectively, self-fertilization can never take place, and it is in such cases that insects play an important part in Nature. It may happen that the stamens and carpels do not ripen at the same time. This is, however, a subject by itself, and we shall continue it in a subsequent issue.—*Indian Planting and Gardening.*

LEAVES.

To the popular mind the aspect of a full foliaged tree suggests the idea that it is the function of the ramifying fabric of trunk, branches and twigs to produce the leaves which bedeck them; whereas in point of fact, it is the latter which are the builders both for themselves and the woody portions which bear them, plus the unseen labyrinth of far spreading roots which lie beneath the soil, and often rival in extent the aerial branches above it.

It is quite true that roots and leaves together are essential to the building process, and that their growth and extension are correlated; but the roots are merely providers of more or less raw material for the actual builders—the leaves—which, drawing upon the supply of water, and the simple salts dissolved in it, fashion, with the aid of the carbonic acid gas absorbed from the air and the all-essential vital influence of the sunbeam, both their own fabric and that of all the rest of the tree, plus the chemical constituents which it may contain, and the flowers and fruits which are its ultimate aim to perfect.

A tree in point of fact is less an individual than a gigantic community, the leaf being the individual proper; a little on the lines of the coral polyp, in so far that during its existence it adds its mite to a more permanent growth which long survives it. We have been careful to say "a little on the lines," because there are material differences in other directions. The coral polyp simply builds up its quota of the edifice *in situ*, while the leaf, when its own structure is complete, fashions through its chlorophyll, and the action of the sunbeam thereupon, a contribution of sap to the general fund as it were, and with this prepared material a myriad busy cells beneath the bark of the trunk and branch, build up the annual ring of wood and so strengthen the fabric more and more as its branches extend abroad and exercise a greater strain.

In vegetation below the rank of trees, i. e., devoid of obvious trunks and branches, we have the leaf; but, except in the fungi, the essential, vital work is always done directly or indirectly, by the green chlorophyll granules. In herbaceous plants the surplus energy, which in the tree would thicken its timber, goes to build up, in addition to its seed, a root-stock, bulb, corn or tuber, stored with nutriment sufficient to give the plant a fair start when the next growing season sets in, precisely as in the autumnal buds of the tree there is a reserve for the same purpose. In annual plants, where no such provision is made, there is a correspondingly greater profusion of seed, which

serves the same purpose of bridging over an adverse season.

The mention of the seed brings us to the consideration of another feature of the leaf—one of the most wonderful of all—and that is, its metamorphosis into the flower. The popular idea is that leaf and flower are fundamentally distinct, and we cannot wonder at this when, for instance, to take a present example, we see the broad, fan-like leaves of the horse chestnut and compare them with the tall, snowy plume of its flowers, or when we contrast the simple foliage of the rose with its finest blooms. The botanist, however, will tell us, and be able to prove to us, if we be intelligent enough to follow him, that every blossom is built up of modified leaves, i. e., leaves which in process of time have gradually changed both form and function, until from simple flowers like the *Richardia*, in which we see, as it were, a step, more and more complex ones have arisen, until all indications of origin appear to be lost. Flowers, however, occasionally hark back, some of their parts or organs assuming green and leafy forms, and in so doing give clues to their genesis.

When, too, we consider the general sameness of function in leaves—i. e., to catch as much sunlight and absorb as much carbonic acid as possible, we fail to be struck by their infinite diversity of form, even though we take into account the necessity of great modifications to enable plants to live in the equally varied environments which land and water present. Finally, amid the marvels of leaf formation, we must not omit to mention the presence within some of them, perhaps in far more of them than we imagine, of nerves and muscles, however differently these may be constituted from those of animals. It suffices to mention the sensitive plant and Venus' flytrap to bring this fact to mind; while a very little study of climbing vines with twisting stems and tendrils will show to us, as they did to Darwin, that plants are by no means the senseless things they are usually regarded as being.—*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.

Edible Stink-horns.—One group of the higher fungi has been named stink-horn fungi, because of the horribly disgusting odor the mature plants emit. The young or "egg" stage of the plant is palatable, according to the *Mycological Bulletin*, but most people who delight to eat fungi will doubtless consider these eggs as bad eggs.

More About Nomenclature.—One of the greatest evils in modern botany is the class of pure name-jugglers, who for the love of seeing their names in print dig up all kinds of vague excuses to change plant names. These men do not, perhaps, advance a single new thought or idea regarding the relationships or classification of plants. They simply dig back into the musty and dim records of the past and unearth some forgotten fact, or more often make some supposition or guess, and then proceed to elaborate a lot of new combinations to which their own name is invariably added.—*C. G. Lloyd in Mycological Notes.*

Nature's Seed Testing.—The harvest of a single season results in a great crop of seeds, good, bad and indifferent, from Nature's wild lands. Not all of these grow, however. Nature has no Agricultural Department, but she manages to test her seeds pretty rigidly. Some succumb to cold and moisture and others are too light in weight to hold their place after reaching the soil but are blown hither and thither by the wind. Of those that grow, only the ones with an ample store of energy back of them in the shape of good, sound tissues can expect to reach maturity. The rest are choked out by stronger competitors.

Food of the Quail.—The Government has been investigating the feeding habits of the American quail or bob-white (*Colinus Virginianus*) and now announce that this is one of the most useful of birds. An examination of more than eight hundred stomachs has shown that the bird's bill of fare contains no less than ninety-eight kinds of weed seeds and nearly forty kinds of berries, to say nothing of nearly two hundred species of insects.

Rare Colors Among Flowers.—Of all the colors exhibited by North American flowers, the rarest is undoubtedly red. Shades of pink, such as are shown in the blossoms of wild rose, rhexia, pogonia and azalia, are plentiful. The true reds may be divided into three sections, the scarlets, represented by cardinal flower, bee-balm, and painted cup, the orange-reds by hawkweed and wild lilies, and the dull reds such as pitcher-plants, red trillium, hound's tongue and pawpaw. If anyone can add others to this list it will be welcome. There are also a few flowers with considerable red in their composition notably the ground nut (*Apios*) and the columbine. Who can name others.

Why Seeds Are Kept Cool and Dry.—One of the first rules of the gardener is to store seeds in a cool, dry place. The question why this is necessary has never been extensively known. A contribution on the subject issued recently from the United States Department of Agriculture, explains that seeds breathe just as plants and animals do. In this process, of course, the substance of the seed is slowly oxidized and death eventually takes place. With seeds, however, the amount of moisture in the air is of great importance. The more moisture there is, the more rapidly respiration is carried on and the sooner the seeds loose their vitality. Seeds must therefore be kept dry. There is practically no danger of drying them out too much. It is found, also, that in high temperatures seeds rapidly loose their vitality, but they may be cooled when dry to the temperature of liquid air without injury.

Insects as an Aid to Fungi.—Most readers are familiar with the fact that certain ants are growers of tiny fungi, preparing the beds and sowing the spores in order that they may later eat the plants. There are other fungi, however, that although not cultivated by insects, manage to exist in their burrows. Certain wood-destroying fungi, like the bracket fungi (*Polyporous*) are said to gain entrance to the trunks of trees through the holes made by boring insects. In the "Fifteenth Annual Report" of the Missouri Botanical Garden, Perley Spaulding tells of two mushrooms (*Flammula sapineus* and *Claudopus nidulans*) that grow in the entrance of similar galleries in Texas. A certain wood-borer making tunnels about a quarter of an inch in diameter attacks fallen trunks of the long-leaved pine (*Pinus palustris*) and in the entrance to these burrows leaves considerable finely divided wood. In this the mycelium of the fungus grows and when ready to fruit sends its umbrella-shaped fruiting parts out into the sun and air. In every instance noted, the fungi were growing only in such burrows.

Practical Plant Protection.—The original plant protection society—the one with headquarters in Boston—continues its work of protecting plants in a practical manner by the distribution of leaflets calling attention to the harm done by indiscriminate picking of wild flowers. More than forty thousand of these leaflets have been distributed and the society has on its rolls nearly seven hundred members—about twice the number of the Washington Society. Any person interested in plant protection may become a member upon application to the Corresponding Secretary, Miss Margaret E. Allen, 12 Marlboro St., Boston. No membership fee is required although those who contribute one dollar or more toward defraying the expenses of the work are enrolled as sustaining members. Every botanizer in America ought to be a member of this society.

Editorial.

Some time ago we hinted that we were planning to use colored plates in this journal. Negotiations have now proceeded so far as to warrant us in stating that the next volume will be illustrated in this manner. This present number has been held in the expectation that arrangements would be completed in time to make a full announcement of the matter in this issue but the time has grown so late that we go to press with the statement that subscribers for the coming volume may depend upon finding colored plates in it. It is expected, now, that the first of these will appear in the July issue.

* * *

In this number, all subscribers whose subscriptions have expired, will find a bill for the new volume just beginning, together with the amount due for back subscriptions, if any. Those who find no bill will know that their accounts are paid to the end of this year, at least. This magazine is sent to all subscribers until ordered discontinued and those who do not wish to be considered subscribers longer should notify us at once. In view of the fact that we have arranged for several important improvements in the coming volume we trust that few will find it necessary to discontinue.

* * *

For the past year the editor has been away from home and the mailing of this magazine has been under the supervision of others. If any subscriber for any cause has failed to get a copy of each issue we will gladly send the missing number free. A subscriber wrote us last week that he had not received recent numbers and supposed the magazine had ceased publication. We hope nobody else will make such an assumption. With a constantly growing subscription list there is no reason why we should suspend. If your magazine does not appear it is the fault of the mails, but we will make all such losses good. Look

over your files and be sure they are complete. Do not delay and later pay a good price for what can now be had free. Those subscribers who lack some of the earlier volumes will some day regret it if they do not get them. More than four hundred pages for less than two dollars is less than you can buy the same amount of botanical literature for, elsewhere.

* * *

One of the evil results of a neglect to become familiar with what has been written upon one's specialty is found in the re-discovery of previously known facts, if we may so express it. By this we mean that an experimenter may in all honesty announce as new, something that has been worked out much earlier by others, published in the magazines and forgotten. To take a single example, the sleep of *Marsilia* has been re-discovered in this way at least three times. It would be an excellent thing if we could have a botanical dictionary compiled from periodical literature, to which we could turn in case of uncertainty. The present encyclopedias and dictionaries do not answer the purpose for they only treat of the main facts. What we want is all the facts. In lieu of such a volume, an occasional glance through the back volumes of standard botanical journals is very desirable, and is especially to be recommended to beginners.

* * *

If any reader of this magazine is prevented from taking the customary vacation trip to the haunts of unfamiliar plants this summer let him not consider the season out of joint. It is only the young plant collector or the ardent species-maker that sighs for something new. Quite likely the familiarity that breeds contempt has made him oblivious to the beauties of vervain, and self heal and hardhack and St. John's-wort and Joe-Pye-weed. Let him see what new virtues can be discerned in the common plants during a leisurely saunter through the nearest country-side. There is probably not one of us that fully appreciates the beauty of the common flowers.

BOOKS AND WRITERS.

A volume devoted to the Fern Allies and illustrating every species by Willard N. Clute is expected to appear early in 1905. There is no popular manual of this kind to be had at present.

Nature study is to have another publication devoted to its interests. It is announced that *The Nature Study Review* will begin publication in January, 1905, and be issued bi-monthly. Prof. M. A. Bigelow of Columbia University is to be editor and there is an advisory board of half a hundred or more of our leading educators. The price will be $1.00 a year.

"The Garden Diary" is the title of a little book from the press of James Potts & Co. It contains a page for every day in the year with space left for garden and nature notes. At the head of each page is a stanza from one of the British poets, with observations upon the progress of the seasons in England. There is also a page for each month of the year, wherein is set down an account of the festivals and saints days occurring in it. Another page is devoted to the gardening work for the month. Although intended for British readers and dealing with British seasons, fauna and flora, many Americans will be glad to have it for comparison. (New York, James Potts & Co., 1904, 75 cents, *net*.)

Dr. A. J. Grout recently issued the second part of his "Mosses with Hand-lens and Microscope," which carries the work well into the second hundred pages. In paper and typography, the book is a model while the illustrations make it second to none. In the present part there are twenty-five full page octavo plates reproduced mostly from "Bryologia Europæa" and Sullivant's "Icones" and nearly fifty smaller illustrations drawn mainly from the same sources. The text covers the ground from the Dicranaceæ to the Torulaceæ. Dr. Grout is to be especially felicitated upon the excellent taste displayed in the selection and reproduction of the plates. Nothing more helpful to young students has ever been published in America. (New York, Published by the author, $1.00.)

THE AMERICAN BOTANIST

DEVOTED TO ECONOMIC
AND ECOLOGICAL BOTANY

EDITED BY WILLARD N. CLUTE

Volume VII

BINGHAMTON, N. Y.
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CONTENTS

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CONTENTS.

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SPECIAL NOTICE.

Two volumes of this magazine are issued each year. Subscriptions 60 cents a volume or $1.00 a year. All subscriptions must begin with a volume. This magazine is sent to all subscribers until ordered discontinued and all arrearages paid. Subscribers may pay each year when most convenient. All subscriptions more than a year in arrears will be collected by law. The publication is sent free to no one except by special arrangement.

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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.

I.—Two Books by Grant Allen.

There are few books dealing with ecology that we have read with greater pleasure than Grant Allen's "Vignettes from Nature" and "The Evolutionist at Large." The author's style is too well known to need special comment. The edition we offer is bound in paper and each volume costs 20 cents. The 40 cents that brings these two volumes will be well spent.

II.—Two Books on Seed Dispersal.

Recently we have received numerous inquiries about books on seed dispersal. The literature on this subject is not abundant, but we are able to offer two small volumes which are desirable. Beal's "Seed Dispersal," 87 pages, cloth, 40 cents, and Weed's "Seed Travellers," 72 pages, boards, 30 cents. It is seldom that one can get all the literature on a subject for 70 cents!

For the above books, or any others, address,

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THE AMERICAN BOTANIST.

VOL. VII. BINGHAMTON, N. Y., JULY, 1904. No. 1

TWO NEW BLACKBERRIES.

BY W. H. BLANCHARD.

NEARLY all of our botanists have avoided blackberries and are still doing so. They prefer to take up lines in which they can feel that everything is settled. Very little material has been collected and very little persistent, faithful, patient field work has been done. The writer has dropped the popular work that so many others are following and is making a determined, continuous and tireless search in this neglected field, but has failed to succeed in stirring up others. The aid of other botanists is hereby requested.

The plants described and named in this article have been watched continuously for three seasons in southern Vermont. They are very common, very conspicuous, and probably very wide-spread. From the Connecticut River to the western foot of the Green Mountains, and from the Massachusetts line to Ripton, the writer has made their personal acquaintance.

Imagine a blackberry about half-way between the needle blackberry (*Rubus argutus* Link) with its numerous prickles, fine and strong as needles, from five to ten to the inch of stem and the plant called Peck's dewberry by Rydberg (*R. nigricans* Rydb.; *R. setosus* Bigelow) with from 200 to 300 long, soft bristles and you will have some conception of

RUBUS VERMONTANUS, n. sp. Green Mountain Blackberry.

*New Canes.** Upright, two to four feet long, with about fifty bristle-pointed prickles to the inch of stem; prickles straight, slanting downward, set at random and

*Often improperly called sterile canes. It would be as proper to call a chicken a sterile hen or rooster.

not restricted to the ridges of the stem and the backs of the petioles. When handled the bristle points turn harmlessly in a calloused hand, but the stiff base will at least irritate. Leaflets five, dark green; the middle one has a stalk one-half inch long, the others sessile, oval, rather coarsely dentate-serrate; outline regular and entire, taper-pointed; length about twice the width; bristles on petioles strong. The entire plant is as perfectly glabrous as *Rubus argutus*, there being no stalked glands, and the only pubescence is a close one barely preceptible on the fruit branches or new growth on the old canes.

Old canes. These put out no basal leaf branches like *Rubus argutus* and some other kinds, but only fruiting branches, generally from one to four from the axil of each old leaf; and as these buds seldom fail to grow, the old cane is so loaded that it often partly reclines on the ground, or on stones or anything which is at hand to support it. It thus often becomes the "running blackberry" of many persons who do not know *Rubus villosus*, Ait. which prefers low altitudes. The fruit branch is generally somewhat zigzag, five to seven inches long, slender; bristle-prickles few and weak with about two leaves at nearly equal intervals. Leaves mostly trifoliate, not so deep green as those on new canes; leaflets sessile, wedge-obovate, coarsely serrate, somewhat pointed. Unifoliate leaves not numerous, more or less incised.

The inflorescence occupies about one-third of the fruiting branch; racemose not corymbose, six to twelve-flowered; pedicels rarely branched. Flowers of good size, one to one and one-quarter inches broad but often less; petals spatulate-obovate, regular in shape, normally five but often more, about one-half inch long and rather less than one-half as wide, not wrinkled, very white.

The fruit is generally too small, sour and seedy to be much sought by berry pickers since better berries can generally be had, but it is a profuse bearer, and in favorable places is often more than one-third as large as the famed *Rubus nigrobaccus*, Bailey, or high blackberry, better known to many as the "sow-teat blackberry," and

is then very good eating. It is highly probable that cultivation might develop a valuable berry from this.

There is a distinct form growing with this at considerable elevations which has so great a resemblance to it that it seems best to call it a variety of it, and species-makers are requested to let it rest as such. From its shining green leaves it seems to ask to be named,

VAR. VIRIDIFOLIUS, n. var. This plant generally has more slender canes than the species, the bristle-pointed prickles are much smaller, weaker, and twice as numerous, while there is an abundance of stalked, reddish glands among them. The leaves are very dark green, shining, thinner and more finely serrate-dentate. The stalked glands show on the old canes which are more often prostrate. The flowers are generally smaller, with the petals seemingly wider in proportion to length. The reddish, stalked glands are numerous on the calyx and upper part of the pedicels. Width of flower from three-fourths to one and one-eighth inches. Petals three-eighths to one-half inch long, and fully half as wide. There are scattered, weak bristles on the fruit branches, peduncles and pedicels. Having a weaker cane, it is more often prostrate, more often a "running blackberry."

The two blackberries described in this article are equally at home in sun or light shade, in thickets or around stone-piles. They blossom a little later than the needle blackberry, sow-teat blackberry or the mountain blackberry (*Rubus Canadensis L.*). The flowers are very showy, being of fair size and very numerous, rivalling *Rubus Canadensis* which is *par excellence* our flowering blackberry.

These blackberries were included under the blanket name of *R. argutus*, var. *Randii*, Bailey, in the Vermont Flora of 1900. The compilers of that flora have just published in *Rhodora* (June, 1904,) an Addenda to it which contains a new name for a blackberry, *R. nigricans*, Ryd., which probably was intended to include those here named. This name was intended to take the place of

Rubus setosus as it has been used heretofore. (See Britton's Manual p. 498 and Illustrated Flora fig. 1903.) Mr. Rydberg stoutly argues in a letter to the writer that *R. setosus* must be restricted to the comparatively rare plant of Eastern Massachusetts which Dr. Bigelow named, and of which specimens are now preserved in the herbarium of the New York Botanical Garden. These, I am informed, closely resemble *R. hispidus*, L. Mr. Rydberg was plainly not describing a new plant and these plants are here named and described for the first time.

Those interested in blackberries will find it important to read President Ezra Brainerd's article in *Rhodora*, (Feb. 1900) and Prof. L. H. Bailey's "Evolution of Our Native Fruits," (1898).

BOTANY FOR BEGINNERS—XV.

THE DICOTYLEDONS.

The Dicotyledons are regarded as higher in structure than the Monocotyledons, and so they are, as a group, but the least specialized of these are exceedingly primitive and not to be compared with the highest Monocotyledons. From the lowest to the highest Dicotyledons there is a gradual line of development but whether Dicotyledons sprang from Monocotyledons, or the reverse, is not as yet very clear to botanists. One thing is certain: there has been more than one line of development among the plants and the Dicotyledons do not represent a continuation of development from the Monocotyledons. It is probable that the two groups began to diverge a long distance back in their history and have since worked out their development on different lines.

The Dicotyledons as a whole are not only the best developed of the two groups but contain by far the greater number of species. It is estimated that there are more than a hundred thousand species in this group and most of our familiar flowering plants belong to it. As in the Monocotyledons, the group is separated into divisions based upon differences in the structure of the flower, the

most primitive being placed first as usual. The first division is made upon the joining of the petals—all with petals united being placed in a section called *Sympetalæ* and the rest forming the division *Archichlamydeæ*. Sometimes the word *Gamopetalæ* is substituted for Sympetalæ and *Choripetalæ* for Archichlamydeæ. It will readily be seen that some of the Archichlamydeæ are very primitive when it is known that many of the flowers have numerous pistils and stamens spirally arranged and lack both calyx and corolla. In this least specialized division there are represented in Eastern America twenty-seven orders and a great number of families; in the other there are nine orders and fewer families but nearly as many species.

The Archichlamydeæ are divided into two groups; one with petals and the other without, and this latter division is further divided into two groups, in one of which is placed all those species without a calyx. Taking these apetalous and asepalous species of the most primitive divisions first, we find them arranged in seven Orders, the first of which the Casurinales is not represented with us. The next order, the Piperales, named for the pepper family is represented only by the lizard tails (*Saururus*). The third order, the Salicales, named for the great willow genus (*Salix*) contains also the poplars. The Myricales contain only the bayberry family and the Leitneriales are only represented (in the Southern United States) by the cork-wood family. The Balanopsidales are not represented in our territory. The next order, the Juglandales, named for the walnuts (*Juglans*) includes the hickories and forms the last of the orders without calyxes.

The Fagales, named for the beech (*Fagus*) begins the orders that possess a calyx. In this order are found the birches, alders, oaks, chestnuts and hazels. The staminate flowers at least are in ments and this feature distinguishes these plants from the elms, mulberries, nettles, etc. of the Urticales whose flowers are clustered but not in true catkins. The foregoing orders are remarkable for their large number of trees. Among them will be found a

majority of the trees of our deciduous forests. The Proteales contain at least a thousand species but none of these are found in North America. The Santalales, named for the sandal-wood family, are represented by the mistletoes, while the Aristolochiales are familiar through the wild gingers and snakeroot (*Aristolochia*). The Polygonales, named from the great smart-weed family (*Polygonum*) contains the docks and others.

The Chenopodiales, named for the goosefoots (*Chenopodium*), is classed as the last of the apetalous orders, but there are many species in it that possess petals, notably in the pink and the purslane families. It is to be observed, however, that in these families there are numerous species that have no petals, while the order also contains such apetalous families as the amaranths, poke-weeds and carpet-weeds. To this order, also, belongs the four-o'clock family whose showy calyxes might lead one to think that the flowers possess a corolla.

All the orders higher in development than the Chenopodiales are supposed to have corollas, but there are numerous exceptions, just as in the order mentioned there are exceptions to the rule that the flowers are apetalous. In this new division, with petals present, there are two groups, one distinguished by a superior ovary and the other by the ovary inferior. The Ranales begin the orders with superior ovary. This order includes the buttercups (*Ranunculus*) for which it is named, and also such diverse plants, in appearance, as the water-lilies, magnolias, barberries, laurels (*Lauraceæ*) and their allies. The general make-up of the flower, however, shows the relationship. There are four or five thousand species in the Ranales. From this group it is thought most of the higher Dicotyledons have sprung. The Papaverales are distinguished from the preceding by their united carpels and hypogynous stamens. The poppies (*Papaver*) give the name to the order and with them are included the cresses, the mignonettes and others. In the Sarraceniales, which are very closely allied to the Papaverales, are placed the insectivorous sundews and pitcher-plants (*Sarracenia*).

The Rosales contain many families among which may be mentioned the houseleeks, stone-crops, saxifrages, hydrangeas, goose-berries, witch-hazels, roseworts, sensitive plants, sennas and the great pea family. By many this latter family, containing nearly seven thousand species, is thought to be distinct enough to form, with other closely allied forms, a separate order. Following the Rosales comes the Geraniales named for the geraniums. In this order is included the oxalises, flaxes, rues, polygalas, spurges and water starworts, many of which appear at first to have very little in common. The soapberry (*Sapindus*) gives the name to the order Sapindales, which is made up of a number of small families like the sumacs, hollies, bitter-sweets, bladder-nuts, maples, horse-chestnuts and jewel-weeds. In the Rhamnales are found the buckthorns (*Rhamnus*) and the vines (*Vitaceæ*), the Malvales include the basswoods and mallows, while the Parietales consist of several small families like the St. John's-wort, rock rose, violet, and passion-flower families.

The Opuntiales begin the orders of polypetalous plants with inferior ovaries. In this order is found only the various species of cacti. The Thymeleales contain the leather-wood (*Dirca*) and a few other plants like the buffalo berry of the North and West. In the Myrtales are found the loose-strifes, rhexias, evening primroses and water milfoils. The Umbellales is the last and highest of the polypetalous orders. It is made up of the aralias, umbellifers and dogwoods.

The sympetalous Dicotyledons are separated into two divisions, in one of which the ovary is inferior and in the other superior. In the division with superior ovary the Ericales are most primitive. This contains the old family Ericaceæ, the heaths which has recently been split up into the separate families of pyrolas, Indian pipes, blue-berries, clethras, diapensias and the heaths proper. The Primulales include the true primroses and the leadworts. The Ebenales, named for the ebony family, is composed of several unfamiliar groups like the sapodilla and storax

families. The Gentianales besides the gentians contain the olives, ashes, buckbeans, dogbanes and milkweeds. One of the largest orders both as regards families and genera is the Polemoniales, which is made up of the morning glories, doddars, phloxes, borages, verbenas, mints, nightshades, fig-worts, bladder-worts, broom-rapes, trumpet-vines and others. The Plantaginales contain the great plantain family and completes the orders with superior ovaries.

The Rubiales begin the Sympetalæ with inferior ovaries. It contains the madder and honey-suckle families. Following it comes the Valerianales in which are the valerians and teasels. The Campanulales include not only the bellworts (*Campanula*) but the gourds, and what used to be called the Compositæ, now separated into the chickory, ambrosia and aster families.

The composites are the most highly specialized of plants and so end the list of orders. From them it is a long way back to the simple flower of the willows or the grasses, but as has been shown there is a fairly complete line of development between them. No plant family is separated from its nearest allies by hard and fast lines and this explains various exceptions which all will note in which certain species or groups of species do not conform exactly to the requirements of the order.

THE DEATH OF OLD DYES.

BY O. W. BARRETT.

THE death of an old industry is sad. Is it quite fair for the new chemistry to poison and mercilessly crush out trade in many plant products, the culture of which has for generations given employment to multitudes of men? Must botanists stand helplessly by while one economic species after another is knocked down and out by this atom-wielding, molecule-splitting, dark-dealing "ology" which used to be called chemistry?

Less than half a century ago the trouble began; about fifteen years have passed since the attack, which we shall

have to call actinic assassination, began to attract public attention. The crisis is far off yet, but we know what the end must be. When a test-tube wizard can take a lump of coal and give you not only dyes of every shade, but also perfumes, flavors, explosives, sugars and salts—what chance does the plant have with its few reagents and fewer retorts? The plant-man says, "this tree knows the secret of making camphor from air; this one secretes turpentine; behold, how wonderful!" The wizard of the laboratory says, "I will put an atom of oxygen into this molecule of turpentine and then I can sell it as camphor and make money." And if he can't gain his point by liberating nascent oxygen he strikes it with even more furious lightning.

The desert Indian still pets his cochineal bug, the plodding Hindoo still sweats in his indigo field, and the French peasant may still tend his plat of madder if he has nothing else to do; but turmeric, litmus, brazil, sappan, fustic, logwood, quercitron, and scores of other good old dyes are going or already gone from the markets. High officials reduced to the ranks! Ex-economics.

And the burning shame of it all is that the chemists won't fight fair: they take products elaborated from the soil and air *by plants* and add, subtract, or divide *per formulam*.

Mayaguez, Porto Rico.

COLLECTING PLANTS FOR IDENTIFICATION.

BY DR. WILLIAM WHITMAN BAILEY.

THE note of H. C. Skeels in the May number of the BOTANIST leads me to reinforce my former statement concerning the importance of seeds. Anyone conducting a large herbarium like we have at Brown, is subject to numberless questions in regard to plants. Indeed, we invite and welcome these, only asking a stamp for a reply. It is, however, most vexing and surprising to constantly receive mere snips of inflorescence, without leaves, or roots, or fruit; often in immature bud! For instance, I had a

single leaf, of Heaven only knows what, sent me the other day for a name, the honest sender taking it for granted that the galls thereon were the reproductive parts! I have seen other innocent seekers after truth forcibly wipe off the *sori* of ferns, wondering why they were so diseased! "A little learning is a dangerous thing;" no learning at all makes one feel as if he could gladly join a botanical lynching party.

If people cannot afford to get some accepted account of processes of collecting, such as appear in most older text-books (and will again in the new), or in the writers "Botanizing," the following few simple rules may help him and save his willing correspondent from a premature grave.

1st. Collect all you can of a plant, subterranean parts, roots, bulbs, etc., also stem, leaves, open flowers and, if possible, fruit.

2d. Don't be in a hurry; give the plant time to assert itself.

3d. Don't collect the tallest or most robust of a kind, but the general average.

4th. Don't send while at all damp. Don't roll up, or mix with cotton wool.

5th. *Press* in *some* way, either in an old book, in newspapers, filter or blotting paper, or by means of the professional driers. Tell place and date of collection and whether in dry or wet land.

6th. Keep the plants in thin folios of light bibulous paper while drying. Don't change these or remove the specimens therefrom.

7th. Change the driers frequently and use lots of them; the more the better.

8th. If an herbaceous plant is tall, bend it into an N or M shape.

9th. Collect in *full fruit*, even at sacrifice of the flowers, *Cruciferæ*, *Umbelliferæ*, genus *Potamogeton*, genus *Carex*, etc. Grasses, on the contrary, should be in *flower*.

10th. See some good herbarium, profit by it. Pitch

away your first, gird up your loins, and stick to the ship, she'll finally arrive in port with a valuable cargo.

Brown University, Providence, R. I.

[It is very evident that the young lady who boasted that in the school she attended botany was so well taught that they could identify any plant from a piece of the leaf, was not a pupil of Dr. Bailey's. It would be amusing, if it were not so serious a matter to those engaged in identifying plants, to encourage the general public in the belief that a botanist can identify anything in the plant line regardless of the kind of sample sent. To send the tip of a plant for name is not soothing to the botanist though it may be complimentary. It may be added to what Dr. Bailey has said, that there is scarcely a botanist that will not name specimens sent him when prepared as suggested. But botanists are in general much underpaid individuals and object to wasting their substance in postage. Nor should the sender, as he frequently does, ask to have his specimens returned. No botanist has time to wrap up parcels of unsolicited specimens. When sending specimens for name, the sender should select some of his best plants, so that the namer may have some return for his trouble in case he should wish to preserve the specimens.—Ed.]

VEGETABLE TALLOW.

For many years the Chinese tallow-tree (*Sapium sebiferum*) has been known in India. Indeed, it may be said to have become almost naturalized in this country. Dr. Roxburgh describes it as being "very common about Calcutta" in his time. It was introduced into Chota Nagpur so far back as 1844. In fact, the tree itself is to be met with in several parts of India, but so far no one appears to have utilized the seeds for the purpose for which they are so largely used in China. We have personally been familiar with the tallow-tree for many years. The tree is most readily propagated by cuttings and seed. It grows

to a height of 30 feet, bears terminal spikes of red flowers, during the hot and rainy months, succeeded in November and December by hard, brown capsules, each containing three cells, in which are embedded the seeds. The seeds are coated with a thick, white, waxy substance, which is the source of the vegetable tallow of commerce. The tree, it should be mentioned, luxuriates in damp places, especially when planted along the banks of streams, in rich soil containing humus; but it grows equally well in sandy soils and on the acclivities of mountains. According to Mr. J. S. Gamble, the tree is of very rapid growth in India, gaining an inch of radius in six months. It also attains a very respectable antiquity; in China trees are known to be several hundred years old, which go on yielding all the time.

Mr. Hooper goes into considerable detail as to the "fats" surrounding the seeds, which form the "vegetable tallow" of commerce. These fats keep their color for any length of time. In China they are used for making candles, soap and dressing cloth. For candle making it is mixed with white insect wax in the proportion of three parts wax to ten parts tallow. Candles so made burn with a clear inodorous smokeless flame. It appears to us that in a country like India, where caste prejudices rule high, soap made from this tallow would command a ready market. In addition to tallow, the kernel of the seed yields fifty per cent. of a brownish-yellow oil, used in China for burning and the preparation of varnishes for umbrellas, to render them waterproof. The oil dries very quickly. The chemical tests applied by Mr. Hooper show that the oil approaches linseed oil in character, and possess a high saponification character. The commercial value of the tallow is about five cents per pound, and of the oil three cents per pound.—*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 GIGANTIC BUD.—If we define a bud as a cluster of undeveloped leaves the lowly cabbage can probably lay claim to being the largest leaf-bud in existence, though we should dislike to state this as a fact until our readers in the tropics have been heard from. Does anybody know of a larger one? Of course there are larger flower-buds.

A MONSTROUS FLOWER.—There was in bloom a few days back, in the Royal Botanic Gardens, Calcutta, a plant of *Aristolochia gigas* var. *Sturtevanti*, which had a flower which measured four feet one inch in length, and proportionately wide. It was a fine sight with its deep purple throat, and attracted many insects by its horrible stench.—*Indian Planting and Gardening*. [This species is closely allied to the Dutchman's pipe vine so frequently planted about American dwellings.—ED.]

MENTHOL.—Menthol, or peppermint camphor as it is sometimes called, has become so well known as an antiseptic, stimulant, and carminative, as well as for outward application in neuralgia and toothache, that any failure or shortness of supply will be a matter of considerable importance. The substance began to attract attention in this country in 1879, and since then it has become an increasing article of trade. It is a crystalline substance resembling ordinary camphor, and is obtained by cooling the volatiie oil from the fresh herb of *Mentha arvensis* var. *piperascens* and var. *glabrata*. The best quality menthol is that brought from Japan, and known in the market as Kobayashi crystals. The oil, after the separation from it of the menthol, is also an article of export from Japan.—*Gardener's Chronicle*.

ST. JOHN'S-WORT AS A WEED.—According to *Indian Planting and Gardening* a shrubby species of St. John's-wort (*Hypericum*) has taken up its abode in certain Indian grass lands where it spreads so rapidly that it is practically impossible to exterminate it. The tops form dense thickets while the roots continue to ramify through the soil conquering new territory.

PLANTS AND ANTS.—The European species of saw-wort (*Serratula*) are said to be particularly liable to attack from a certain kind of beetle which destroys their flowers wholesale if allowed free scope. The scales underneath the flower heads of this genus are furnished with glands that exude a liquid and this is much sought after by a species of ant which is selfish enough to drive away the beetle or insect with which it may be able to cope. This custom is of particular advantage to the plants by preventing the flower-heads from being destroyed by the beetle.—*Gardening World.*

THE ARITHMETIC OF FLOWERS.—Children delight in things they can count and number. I find the mathematics of flowers helps to interest young children in the first steps of botany. Beginning with the twos: a common member of the poppy family, the blood-root, is always noticed by a child during a spring walk. Here he finds two sepals, the petals some multiple of two—either eight or twelve—and an oblong pod with two placentæ. The Dutchman's breeches is another example of the twos, only not so simple. The threes are shown in the lily and iris families. The trillium is an example every child will find. Three sepals, three petals, ovary three angled and the leaves in threes. All of the mustards are plainly in fours: four sepals, four petals, four prominate stamens—usually two smaller ones besides—the wild mustards and tooth-wort are familiar examples. The fives are more numerous. The violets, with five sepals, five petals and five stamens are in the hands of every child. The pulse family is also on the plan of five, and the pitcher plant is another interesting example.—*Mrs. Flora Lewis Marble.*

CAMPHOR FOR GERMINATING SEEDS.—According to the *Journal of Agriculture* camphor has a remarkable effect in hastening the germination of seeds. They are simply soaked in a pint of water to which has been added a piece of camphor the size of a hickory nut. This process is said to be especially effective in the case of thick shelled seeds which are notoriously hard to germinate. Camphor-water is also recommended for stimulating the growth of cuttings. They are said to strike root much more quickly if the cut ends are first dipped in the liquid. Readers with a turn for experiment would do well to try this. Seeds or cutlings without camphor should also be planted at the same time for comparison.

PROPAGATION OF YELLOW ADDER'S TONGUE.—In previous woodland rambles, about this time of the year, I had frequently noticed a white growth resembling a potato sprout, springing from the moist rich loam, and forming a pretty little arch, then re-entering the ground one inch or two from the spot whence it had sprouted. It was delicate and it easily broke away from its underground parts as I found by several unsuccessful attempts to get the entire plant, but, to-day, June 8th, I secured several specimens showing the corm, the leaf and the sprouts. Though the color had quite faded from the leaf, I recognized the plant as the "yellow adder's tongue" (*Erythronium Americanum*) which takes this method of propagating itself. Two, sometimes three, offshoots spring from the base of the corm; then, instead of groping their way underground to a new location, they come to the surface and travel "overland" acquiring a few inches of growth in the light of day before plunging finally into the moist earth. The end of the sprout which works its way into the earth is slightly swollen. When roots have sprung from this end in sufficient number to procure nourishment for the young plant, the parts which connect it with the parent plant wither away. Henceforth the plant lives as a separate individual.—*H. Dupret, Montreal, Canada.*

SAFFRON.—The saffron of commerce is simply the pollen of *Crocus sativus* commonly called the saffron crocus. It is found chiefly in Kurdistan, and is largely cultivated as an economic plant in Kashmir.—*Indian Gardening and Planting.*

INFLUENCE OF FORESTS ON RAINFALL.—Most people now hold the opinion that trees have no effect upon the rainfall but the Editor of *Indian Planting and Gardening* thinks otherwise and he cites in support of his opinion the fact that some twenty-five years ago, the Multan District of the Punjab was practically a rainless region, but trees were planted and now that they have grown up the district receives a fair share of rainfall. The fact should not be lost sight of that rainfall is caused by a surplus of moisture in the air. Trees, as we know, transpire much moisture. It would seem that this contribution of moisture by forests might bring about conditions resulting in rainfall which would not occur otherwise.

PERFUME OF HEPATICA.—I was interested one day this spring on bringing home a bunch of hepatica blossoms from the woods and setting them in a vase in the house, to notice that they exhaled a perfume very like the well-known spicy odor of trailing arbutus. I had never before known the hepatica to have an odor, and should be glad to know the experience of other AMERICAN BOTANIST readers on this point.—*C. F. Saunders.* [This subject was discussed some years ago in the *Ornithologist and Botanist* and several observers made note of the fact that the hepaticas in their localities are fragrant. It is certain, however, that a very large majority of these blossoms are not fragrant. Why, then, should they be fragrant in some localities and not in others? Several possible reasons suggest themselves. It may be due to temperature or humidity. In a moist air a faint perfume would be more noticeable. Nectar and fragrance usually go together. In any situation or weather favorable to the production of nectar the fragrance would doubtless be more pronounced. Further observations are much to be desired.—ED.]

A GIGANTIC BUD.—If we define a bud as a cluster of undeveloped leaves the lowly cabbage can probably lay claim to being the largest leaf-bud in existence, though we should dislike to state this as a fact until our readers in the tropics have been heard from. Does anybody know of a larger one? Of course, there are larger flower buds.

SOME EFFECTS OF CROSS-POLLINATION.—A French experimenter has been pollinating melons with cucumber pollen and cucumbers with melon pollen and finds that the external characteristics of the fruit are not effected. Analysis of the fruit, however, showed that melons pollinated with cucumber pollen contained much less sugar than usual, although cucumbers pollinated with melon pollen showed no increase in the sugar content.

WEEDS FOR CULTIVATION.—A subscriber who wrote to *Country Life in America* for a list of choice perennials suitable for planting, was advised among other things to plant the orange hawkweed (*Hieracium aurantiacum*). There is no question about this plant having a flower of brilliant color, but its ability to overrun everything else is so generally known that no one intentionally plants it. One would as soon think of recommending the ox-eye daisy (*Chrysanthemum*) or the dandelion.

PLANT DESTRUCTION.—So great has grown the trade in Christmas greens that many species are rapidly nearing extinction. According to *Country Life in America* more than two hundred tons of ground pine (*Lycopodium*) are gathered in Wisconsin each year, and we assume a proportionate amount from other States. The plant protection societies should make a vote of this. The ground pine is a slow grower, does not readily grow from spores, and when gathered is always pulled up by the roots. Collectors are simply exterminating it. *Country Life* says "the 'green belt' moves northward perceptibly every year" and predicts that the ground pine industry will come to an end for want of plants in fifteen or twenty years.

Editorial.

Twice we have intimated that we expected to use colored plates in this magazine and we revert to the subject once more to say that beginning with the August issue we expect to run a colored plate in every other number for the rest of this year. By January it is hoped that we can complete our arrangements for a plate in each issue for 1905. We hope our readers will show their appreciation of this move by helping to make the magazine known to others. Whenever you meet a botanist or botanizer ask him if he takes THE AMERICAN BOTANIST and if he does not, tell him he should do so. We stand ready to increase the number of pages in this magazine just as often as the subscription list warrants; therefore every person you influence to become a subscriber adds to the value of your own copy.

* * *

A subscriber to this journal, himself by no means a beginner, writes as follows in response to our recent request for suggestions: "Botany for Beginners is a very interesting department in your journal and I am sure many people besides beginners enjoy it. We sometimes read in it articles on mushrooms; these articles also are intended for beginners. I should suggest that there be more articles about ferns for beginners, hepatics for beginners, mosses or cryptogams generally for beginners. It strikes me that in the *Fern Bulletin*, in the *Bryologist* or like journals there is scarcely anything for beginners. Why? Because only specialists read those journals. But would it not be the proper thing to write for beginners about those special subjects in a journal devoted to general botany? I think it would; it would help interest more nature students and make more specialists. How many of your readers cannot distinguish between a fern and a flowering plant, a moss and a clubmoss, a hepatic

and a lichen! Such articles ought to be written by specialists who should get a return for their work; but I think that this extra expense would benefit many more people and, I dare say, would increase the subscription list." Probably the reason why more attention is not paid to the lower orders of plants in journals devoted to general botany is that the whole subject is so technical that it is difficult to make an understandable article for the novice. Students of these groups usually gravitate toward them after an apprenticeship in the study of flowering plants. As regards the *Fern Bulletin* and the *Bryologist*, they may be technical at present, but one has only to get the early numbers to find plenty of articles for the beginner. They have only followed the common tendency of journals to become technical as they grow old. We cannot agree with the opinion of our correspondent that scientists should write the articles for beginners. The student who has become a scientist, has usually forgotten the trivialities of his novitiate or is inclined to underestimate their importance to the beginner. Those who have just come through the woods can best point out the way to the beginner. We are always glad to get helpful articles, however, and never inquire whether the writer is a scientist or not.

BOOKS AND WRITERS.

At this season every roadside, hedge-row and piece of waste land is filled with ripened seeds each endeavoring to fall in just the right place for growth next year. One seldom realizes by how many means seeds are distributed or how they are protected from harm until he has read such a book as Beal's "Seed Dispersal" or Weed's "Seed Travellers." Prof. Weed's little book discusses the wind, the birds and the mammals as seed distributors and is illustrated with thirty-six figures. Dr. Beal's volume, in addition to these subjects treats of how plants spread by roots and stems, how plants are transported by water, how some species shoot their seeds, how man disperses

seeds and plants, and why plants find it desirable to migrate from place to place. There are sixty-six illustrations. An excellent feature of the book is the mention of many plants in each section besides those treated which the student can investigate for himself. Both these books are worth a place in the library of the botanist and will be especially useful to teachers of Nature study. They are published by Ginn & Co., Boston.

The poet has called butterflies "winged flowers" and thus these insects should come in for a share of the botanist's attention. There is probably no branch of science that is nearer to ecological botany than entomology, in fact, if it were not for the insects we should soon be minus our showy wildflowers, and dependent upon the clumsy makeshifts of the gardener for many of our finest fruits and vegetables. There are few botanists that are not entomologists to the extent of knowing the most noticeable bees, butterflies and moths, at least, and none that should lack this information. We take pleasure, therefore, in recommending Comstock's "How to Know the Butterflies" to those who would get acquainted with these insects. The forty-five plates in this book representing the butterflies in their natural colors are of themselves nearly sufficient for the identification of the various species, but these are supplemented by an accurate and comprehensive text in which the caterpillar as well as the mature insect is described and the food plants mentioned. Under each species is also given much matter of a popular nature in regard to hibernation, migration, protection, mimicry and other interesting facts in their life histories. The book contains three hundred pages of text with numerous illustrations. It is quite the best book we have seen on the subject. (New York: D. Appleton & Co., 1904, $2.25 *net*.)

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CONTENTS.

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WILLARD N. CLUTE, - - - EDITOR.

SPECIAL NOTICE.

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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.

I.—Two Books by Grant Allen.

There are few books dealing with ecology that we have read with greater pleasure than Grant Allen's "Vignettes from Nature" and "The Evolutionist at Large." The author's style is too well known to need special comment. The edition we offer is bound in paper and each volume costs 20 cents. The 40 cents that brings these two volumes will be well spent.

II.—Two Books on Seed Dispersal.

Recently we have received numerous inquiries about books on seed dispersal. The literature on this subject is not abundant, but we are able to offer two small volumes which are desirable. Beal's "Seed Dispersal," 87 pages, cloth, 40 cents, and Weed's "Seed Travellers," 72 pages, boards, 30 cents. It is seldom that one can get all the literature on a subject for 70 cents!

For the above books, or any others, address,

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FROM PAINTING BY A. WOODWORTH.

GREEN RUSSULA (Edible).
(Russula virescens).

THE AMERICAN BOTANIST.

VOL. VII. BINGHAMTON, N. Y., AUGUST, 1904. No. 2.

THE GREEN RUSSULA OR VERDETTE.

(*Russula virescens.*)

EVEN those who have never made a study of the fleshy fungi must have noticed that while mushrooms seem to revel in bright colors, green is rarely found among them. Indeed, we may go further and say that the green of ordinary flowering plants is never found in fungi, the presence or absence of this color being considered a prime distinguishing mark. It is the green of common plants that enables them to get the energy from the sun necessary to the assimilation of their food; but the fungi are saprophytes or parasites; that is, they live on other living or dead plants from which they take the substances already elaborated, and thus do not need the plant green.

Some species of mushrooms, however, are clearly green in color, but the green is always some other coloring matter than the common plant green. One of the best known of these mushrooms is the one illustrated in our plate and called the green russula. The russulas seem to have a penchant for green, but our species is easily distinguished from any others of the same color by the fact that the upper surface of the cap is broken up into irregular angular patches by the cracking of the skin. The color, however, even in this greenest of the russulas is not deep and clear but with a grayish tinge which McIlvaine has likened to the color of mouldy cheese. Occasionally too it may have a yellowish tint.

In youth the cap of the green russula is almost spherical but as it becomes older it expands and finally the edge may turn upward and the cap become depressed in the center. In this operation the margin is often cracked and thus offers another mark for its identification. The stem is always very short, often much shorter than the diam-

eter of the cap, and as the latter is usually from two to four inches across, the plant seldom becomes very conspicuous. The gills are rather close together, white, and narrow toward the stem, which they barely reach. The spores are also white. The surface of the cap is dry and the entire plant is firm and brittle.

This species is edible, but there is some diversity of opinion as to its qualities. The taste is mild and most American writers are inclined to consider it of no especial value; but in Europe it is highly esteemed. The species is apparently not very abundant in America owing to its somewhat solitary habit, though it is fairly well distributed. It is a summer mushroom appearing from July to September and should be looked for in thin grassy woods and similar places.

The genus *Russula* to which our species belongs takes its name from a word meaning red. This was doubtless suggested by the color of other members of the genus for it is by no means committed to sober colors. On the contrary purples, pinks, violets, reds, yellows and even blues are plentiful. The genus has neither veil, ring nor volva and is easily distinguished from other genera of mushrooms. It closely resembles the genus *Lactarius* in size, shape, structure and texture, but is readily separated by the fact that the *Russulas* are very brittle and do not exude a milky or colored juice when broken. Although the genus is easily recognizable, the species are often hard to identify. In closely resembling species the taste is often of importance in separating them.

It was once thought that the spores of this genus would not germinate until they had passed through the digestive organs of the horse, but this is now held to be erroneous. Since there is still some uncertainty as to how the spores are disseminated, Capt. McIlvaine was moved to try various experiments in this line. Noting that a certain black beetle feeds upon this species, he planted the beetles and in several instances obtained a crop of the fungi.

Among easily accessible American Works containing colored plates of the green russula may be mentioned McIlvaine's "One Thousand American Fungi," plate 44; Atkinson's "Mushrooms, Edible and Poisonous," plate 36; Taylor's "Mushrooms of America," plate 1; and Peck's "Forty-eighth Report New York State Museum," plate 31.

BOTANY FOR BEGINNERS--XVI.

Before proceeding in a discussion of the various plant families, it may be well to have a summary of the principal ones and the Orders into which they are grouped. At the outset it should be noted that botanists are by no means agreed as to the grouping of these families. It depends in great measure upon the weight each scientist is willing to give to the characters that are considered distinctive. The species in a genus all closely resemble one another as may be seen in such genera as *Rosa* and *Viola;* but the genera in a family are less alike. The herbaceous clovers, the shrubby indigos (*Amorpha*) and trees like the locust (*Robinia*) are placed in the same family as the peas and beans. And just as the members of a family are less alike than the members of a genus, so the families in an order are often so little alike that one would scarcely discover the relationship at first glance. The Rosales is a good example. It is, of course, understood that stronger ties of kinship unite these families to one another than they do to other families and this explains the fact that the families in an order may have many superficial differences. Thus it happens that an order characterized by inferior ovaries may have some members with ovaries superior, while in sympetalous orders some species or genera may be polypetalous. In a general way the orders may be separated by the characters indicated in the following table:

CLASSES, ORDERS AND PRINCIPAL FAMILIES OF FLOWERING PLANTS IN EASTERN AMERICA.

Class I. Gymnospermæ.
Order 1. Pinales.—Pinaceæ, Taxaceæ.
" 2. Cycadales.—Cycadaceæ.
" 3. Gnetales.—Gnetaceæ (not represented).

Class II. Angiospermæ.
A. Monocotyledones.
Carpels usually distinct.
Order 1. Pandanales.—Typhaceæ.
" 2. Naidales.—Naiadaceæ, Alismaceæ.
" 3. Graminales.—Gramineæ, Cyperaceæ.
" 4. Principes.—Palmaceæ (not represented).
" 5. Synanthæ.—Cyclanthaceæ (not represented).
Order 6. Arales.—Araceæ, Lemnaceæ.
Carpels united.
Order 7. Xyridales.—Xyridaceæ, Eriocaulonaceæ, Commelinaceæ, Pontederiaceæ.
Order 8. Liliales.—Juncaceæ, Melanthaceæ, Liliaceæ, Smilaceæ, Amaryllidaceæ, Iridaceæ.
Order 9. Scitaminales.—Marantaceæ, Cannaceæ.
" 10. Orchidales.—Orchidaceæ.

AA. Dicotyledones.
Series I. Choripetalæ. Petals separate or absent.
* Petals usually absent.
a. Calyx none.
Order 11. Casurinales.—Casurinaceæ (not represented).
Order 12. Piperales.—Saururaceæ.
" 13. Salicales.—Salicaceæ.
" 14. Myricales.—Myricaceæ.
" 15. Leitneriales.—Leitneriaceæ.
" 16. Balanopsidales.—Balanopsidaceæ (not represented).
Order 17. Juglandales.—Juglandaceæ.

aa. Calyx present.

Order 18. Fagales.—Fagaceæ, Betulaceæ.

" 19. Urticales.—Urticaceæ, Ulmaceæ.

" 20. Proteales.—Proteaceæ (not represented).

Order 21. Santalales.—Santalaceæ, Loranthaceæ.

Order 22. Aristolochiales.—Aristolochiaceæ.

" 23. Polygonales.—Polygonaceæ.

" 24. Chenopodiales.—Chenopodiaceæ, Amaranthaceæ, Phytolaccaceæ, Portulaccaceæ, Nyctaginaceæ, Caryophyllaceæ.

** Petals usually present.

a. Ovary usually superior.

Order 25. Ranales.—Ranunculaceæ, Nymphaceæ, Magnoliaceæ, Berberidaceæ, Menispermaceæ, Calycanthaceæ, Lauraceæ.

Order 26. Papaverales.—Papaveraceæ, Cruciferæ, Capparidaceæ, Resedaceæ.

Order 27. Sarraceniales.—Sarraceniaceæ, Droseraceæ.

Order 28. Rosales.—Rosaceæ, Crassulaceæ, Saxifragaceæ, Hamamelidaceæ, Mimosaceæ, Leguminosæ.

Order 29. Geraniales.—Geraniaceæ, Oxalidaceæ, Linaceæ, Rutaceæ, Polygalaceæ, Euphorbiaceæ.

Order 30. Sapindales.—Sapindaceæ, Empetraceæ, Anacardaceæ, Ilicaceæ, Celastraceæ, Staphyleaceæ, Aceraceæ, Hippocastanaceæ, Balsaminaceæ.

Order 31. Rhamnales.—Rhamnaceæ, Vitaceæ.

" 32. Malvales.—Malvaceæ, Tiliaceæ.

" 33. Parietales.—Hypericaceæ, Cistaceæ, Violaceæ, Passifloraceæ, Loasaceæ.

aa. Ovary inferior.

Order 34. Opuntiales.—Cactaceæ.

Order 35. Thymeleales.—Thymeleaceæ, Elæagnaceæ.

Order 36. Myrtales.—Lythraceæ, Melastomaceæ, Onagraceæ.

Order 37. Umbellales.—Umbelliferæ, Araliaceæ, Cornaceæ.

Series II. Sympetalæ. Petals united.

a. Ovary usually superior.

Order 38. Ericales.—Ericaceæ, Clethraceæ, Vacciniaceæ, Diapensiaceæ.

Order 39. Primulales.—Primulaceæ, Plumbaginaceæ.

Order 40. Ebenales.—Ebenaceæ, Styracaceæ.

" 41. Gentianales.—Gentianaceæ, Oleaceæ, Apocynaceæ, Asclepiadaceæ, Loganiaceæ.

Order 42. Polemoniales.—Polemoniaceæ, Convolvulaceæ, Cuscutaceæ, Hydrophyllaceæ, Borraginaceæ, Verbenaceæ, Labiateæ, Solanaceæ, Scrophulariaceæ, Lentibulariaceæ, Bignoniaceæ, Acanthaceæ.

Order 43. Plantaginales.—Plantaginaceæ.

aa. Ovary inferior.

Order 44. Rubiales.—Rubiaceæ, Caprifoliaceæ.

" 45. Valerinales.—Valerinaceæ, Dipsacaceæ.

Order 46. Campanulales.—Campanulaceæ, Cucurbitaceæ, Cichoriaceæ, Compositæ.

THE ROCK ASTER.

BY W. H. BLANCHARD.

UNDER the title of *Aster vimineus*, Lam., var. *Saxatilis*, this interesting, early aster was described and named by Mr. M. L. Fernald on page 188 of *Rhodora* for 1899. He says of it, "Stem slender, one and one-half to six dm. high, leaves mostly ascending, the rather stiff very ascend-

ing or rarely spreading branches short (five cm. or less), leafy-bractate, terminated by solitary heads often one and one-half cm. across; or the branches longer with the heads solitary at the tips of the remote, slender branchlets. A characteristic plant of northeastern river banks and ledgy shores, flowering from late July to early September."

He gives six stations for it on the banks of Maine rivers and one in Canada adjacent. I find it abundant on the rocky banks of the Connecticut, and it may be expected in a much wider range, certainly in Massachusetts and New York. It grows here with *Senecio balsamitæ*, and like it, fastens itself so strongly in the cracks of the rocks that it cannot be pulled out. Its flowering season here is nearly a month earlier than that given above.

The plant is glabrous, generally small, being from six to sixteen inches high, though I have seen it two feet high. The heads are of good size, twice as high and wide as those of *A. vimineus*, and the disk flowers are purple. The leaves resemble those of small forms of *Aster tardiflorus*. They are toothed from the middle, narrowed at the base but not into a petiole, somewhat clasping, rather short, being from two to three inches long and about one-half of an inch wide.

Mr. Fernald considers this plant as an extreme form of *A. vimineus* Lam. var. *foliolosus*, Gray. It seems to be too extreme a form altogether and probably might have been made a variety of some other species for as good reasons. *A. vimineus* is a tall, bushy plant, growing in moist soil, with horizontal branches, a great profusion of very small heads and long, linear-lanceolate, entire, drooping leaves, and it blossoms late in the season. None of these are characteristics of this plant which it seems to me should be treated as a species. I therefore name it ASTER SAXATILIS.

This plant should be sought in other places. It is liketo be found in all the northeastern states.

Westminister, Vt.

BITTERSWEET AND IVY.

BY DR. WILLIAM WHITMAN BAILEY.

TWO very different plants are known in New England as bittersweet. One of these is the pretty, purple-flowered nightshade, commonly seen in summer trailing over walls and having at the same time both green and translucent scarlet berries. The other is a trailing or twining shrub often found growing to a great height on trees or liane-like, swinging pendant in mid-air. The first plant is doubtfully, if not actually poisonous, not to the touch but when its berries are eaten. The other, known also as Roxbury wax-work, is harmless. It grows along streams over the shrubbery or on walls and fences. It is an elegant climber and is often trained upon portiroes or trellises. The pods are red, and open in late autumn, displaying the scarlet aril of the seeds. Long trails of the plant are worth preserving for winter decoration, owing to the strong contrast between the orange pods and bright scarlet seeds.

While text books continue to present the lemon, orange and other citrus plants, as possessing unifoliate leaves, i. e., compound leaves with but a single leaflet, the Japanese or Boston ivy (*Ampelopsis tricuspidata*) affords a much better instance. I do not, however, recall its mention even in books where the plant is described. Surely it could not have escaped observation. I have myself before called attention to it. The large palmately-lobed leaf first falls, the very long petioles surviving a week or two longer, and presenting a very curious appearance. Finally they, too, succumb. There is a distinct articulation between petiole and blade, though in summer one would never suspect it. The abscise layer is slow to develop.

The rapidity of growth of the vine again is striking. A year or so often suffices to cover a wall with elegant mosaic. It clings by means of adhesive disks. It is needless to say that the autumnal color of the foliage is superb crimson and highly polished. Then after the leaves have all disappeared, the delicate tracery of stems and twigs

affords no end of delight. Well may the plant be esteemed a favorite in all our cities.

Brown University, Providence, R. I.

CREAM-COLORED JEWEL-WEEDS.

BY H. C. WOODWARD.

WHILE on a botanizing excursion on August 4, 1904, along the Paupack River about three miles from Hawley, Pa., we found the jewel-weed (*Impatiens*) growing most beautifully along the banks, and soon after we had started in our boat, one of our number saw a white flower on the bank and we pulled into the shore to examine it. The plant proved to be the yellow jewel-weed (*Impatiens pallida*) but this flower was creamy-white mottled with a delicate shade of violet with some parts mottled with yellow. We all pronounced it a freak or sport and went on our way up the river, but had gone only about a mile when I saw a bunch of the same colored flowers growing upon the bank. We rowed to shore and examined it and found it to be the same to all appearances as the yellow variety but with cream-colored flowers mottled with violet and yellow or more often with only yellow mottles and often with the upper lip which turns back being a bright pink.

There was not only one plant but scores of them, and as we proceeded further, we saw a place where there was a colony of those white flowers, perhaps twenty feet long, with no yellow blossoms among them. This was in an open spot where the sun shone on them nearly all day, and just above was a lot of the yellow variety growing just the same height and fully as perfect in every way.

We sent fresh specimens to a man who is considered the best of authority and he reports that "he has not heard of anything like this before and suggests trying the seed to see what sort of a flower it will produce another year."

Now has any of the readers of THE AMERICAN BOTANIST ever found this species in any color except yellow? If

so I should be pleased to hear from them and I will send a pressed specimen of the new variety to any one wishing to see it. The habitat was ideal for the plant and both varieties were fully developed. Where the new form grew in the shade the color was lighter and the marking more delicate.

Hawley, Pa.

FRUITS AND VEGETABLES.

Even in these days of Nature-study clubs, one may occasionally overhear a debate as to whether a certain edible part of a plant is a fruit or a vegetable. Our ideas of what constitute a fruit are expressed pretty clearly when we speak of a certain class of trees as "fruit trees" and yet, from the botanist's point of view, a walnut, an ash or a maple is as much of a fruit tree as any other. The botanist defines a fruit as "the ovary brought to perfection" and we are thus warranted in considering the dry seed capsules of the arbutus as much of a fruit as are the juicy berries of its relatives the huckleberry and cranberry.

Seed and fruit should not be confused. Sometimes the seed is almost the entire fruit as in the dry achenes of the dandelion and thistle; at others it is but a small part as in the orange, melon and gooseberry. This matter can better be understood if we remember that the ovary is the part of the flower containing the embryo seeds and that it often becomes thick and juicy after the flower has fallen. But whether juicy or dry it, together with the enclosed seeds, is the fruit of the plant.

To make a literal interpretation of the botanist's definition would rob us of many of what we now consider fruits. For instance, the strawberry is not a ripened ovary, but the red juicy part, at least, is an enlarged receptacle with the seeds embedded in it. The fleshy part of the apple and pear, also, are enlarged receptacles that have grown up and surrounded the seeds. Stranger than either of these, is that remarkable relative of the sumac, the cashew-nut, which has a thickened pear-shaped edible

receptacle the size of an egg but which does not surround the seed. The latter is found at the apex just outside of the receptacle as if the stem with the seed upon it had grown so rapidly that the receptacle could not overtake it. It is likely, therefore, that we shall have to modify the botanist's definition somewhat. It is certain that the receptacle would not increase in size if the ovary and seeds were not developing. We shall find it more in harmony with the facts to consider the receptacle part of the fruit, else the apple would come dangerously near being a vegetable!

The housewife is likely to call cucumbers, squashes, beans and peas vegetables, but the botanist ranks them as fruits. Corn and tomatoes, also, are fruits; but carrots, turnips, artichokes and onions are barred. A captious critic may insist that the definition only holds good one way, for while beets, potatoes and lettuce are not, and never can be, fruits, all fruits are vegetables in the sense that they belong to the plant kingdom. But regardless of the critic we shall be warranted in considering as a fruit, the structures resulting from any pollinated flower.

According to the botanist, the blackberry and raspberry are not single fruits but clusters of fruits. The pineapple, too, is a fruit cluster. The fig, however, must be classed as a vegetable, for it is not an enlarged receptacle nor yet a fleshy ovary but the thickened and hollow tip of a branch bearing the flowers and fruits on its inner surface. —*Willard N. Clute in The Amateur 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.

EFFECTS OF COLD ON PLANTS.—Last winter's exceptional severity did great damage to privet hedges, box and honeysuckle, but some plants seemed to come up stronger and better this season. My *Rudbeckia*, golden glow, came up thicker and stronger than ever before, and several of my friends remarked to me about a similar condition with their own plants. Not in this locality alone but in Westchester as well. My lilacs put out more compact heads of bloom than I have known them to do in the dozen years I have had them, and the same with a few other hardy plants. Also weeds in the garden beds have seemed to be stronger rooted than usual this season. I thought at first that that phenomenon was only accidental and local, but was surprised to have a friend living in Westchester remark about it to me, especially as regards chicory. At that time I had just been wrestling with a luxuriant growth of chicory in my pansy bed.—*Elwyn Waller, Morristown, N. J.*

A FREAK AMONG VIOLETS.—Fifteen years or more ago a child planted a group of large purple violets about the roots of a pear tree in an old garden. They were the deepest hued violets that the child had ever seen. The soil was rich. The plants grew and multiplied, but in a few years a queer change appeared in the blossoms. Each dark purple petal developed a white rib down the center. Now the plants have spread all over the garden. Each young plant has the white stripe on every flower petal. Seed from these plants sown and raised under other conditions bear the same peculiarity. If it were only a fading in the color, it could be accounted for in many ways. But

the purple is as pronounced as ever, while the white is clear and the contrast sharp. Some of the purple flowers are fertile every year and form seed pods. Could it be that the pollen from the pear tree has effected this change? If so, why do the cleistogamous blossoms not keep the line true?—*Mrs. Flora Lewis Marble.* [It is positively certain that the pollen from the pear tree has had no effect upon the violets. Nor could anything except the soil or climate change the flowers of the *original* plants. Seedlings from these plants, however, might possibly have sprung from seeds produced from blossoms pollinated by some white flowered violet. Otherwise we would be inclined to think that the blue violets came of a strain that numbered white species in its family line and in this case had "taken back."—Ed.]

Identifying Fungi.—Nearly ten thousand species of fungi have been reported from America. A large number of these belong to the rusts, blights, smuts, mildews, moulds, etc., but the higher fungi, to which belong the mushrooms, puff-balls, earth-stars, bracket fungi and others, comprise at least three thousand species. These latter have the greatest interest for the nature lover since most of them are of strange form or attractive color and many are edible. Edible and poisonous species, however, are often as nearly alike as brothers and the necessity for exact identification is apparent. The beginner finds very difficult the task of separating the species of the Agaricaceæ—mushrooms or toadstools—which in America number nearly fifteen hundred, but while it may be years before he can become familiar with the Agarics of his locality, no such length of time need elapse before he is able to refer the species of the higher fungi to their proper groups. Thus the Agaricaceæ form but one family of the seven composing the Agaricales. Two of these families are not conspicuous, but of the others the Agaricaceæ are readily known by the gills on the under side of the cap, upon which the spores are borne. The Clavariaceæ are the white, tawny and pink coral-like masses often fre-

quently much branched, found on old logs and on the earth in moist places. Many of the Hydnaceæ resemble the Agaricaceæ except that they have spines, teeth or other projections on the under side of the cap instead of gills. In the Boletaceæ there are a large number of species that appear like the fleshy Agaries or mushrooms, but upon looking on the under side of the cap we find in the place of gills a cushion-like flesh full of minute round pores. In the Polyporaceæ we find the same round pores on the under surface, but the Polyporaceæ are mostly one-sided forms growing out like shelves from trees, living or dead, and are usually corky or woody. The Boletaceæ frequently have a central stalk and cap like the common mushroom and are more often fleshy. As a general rule, the specimens in which the pores are easily separated from the cap, belong to the Boletaceæ while those in which they are firmly joined to the cap and to each other are members of the Polyporaceæ. In this latter family there are some species in which the walls of the pores break down leaving narrow labyrinthian passages. A common example of this is *Dædalea quercina* found on oak stumps. The stink-horns belong to the Phallales, an order equal in rank to the Agaricales. The Hymenogastrales contain the truffles and truffle-like plants and the Lycoperdales contain the puff-balls and earth-stars.

Rock-soil Floras.—The Rev. E. A. Woodruffe-Peacock has issued an interesting pamphlet upon the subject of the distribution of plants as influenced by the soil, in which he maintains that at any given altitude a more intimate relationship exists between plants and the soil than between the same plants considered from any other point of view. This he thinks is due to the chemistry of the various formations and their moisture and bacteria containing capacity. He finds in any locality that the abundance or scarcity of a given species depends primarily upon the kind of soil to be found. In making observations along this line, botanizers may find a new field for their efforts and one that should yield very valuable results.

PLANT GROUPS.—"Botany for Beginners" suggests to me that I learned when studying botany the proper mode of classifying by the mnemonic word *cogs*—the initial letters of Class, Order, Genus, Species. About that time I was playing with the mechanism of an old clock, and I noted as I turned the largest wheel once around, its cogs made the next wheel revolve several times, that again turned another wheel still more revolutions and so on, and thus in a fanciful way I connected one *class* with several *orders*, each *order* with several *genera*, etc. The idea served my purpose—it may help some one else.—*Elwyn Waller.* [This is an excellent method and will still serve the purpose, though modern ideas would change the letters somewhat. As now rendered it would be Class, Sub-Class, Order, Family, Genus, Species.—ED.]

CONSIDER THE LILY OF THE FIELD.—It is surprising that church decoration displays sometimes so little "consideration" for the lily of the field! The beautiful red lily of July, for instance, growing at the roadside, is pulled by the hundred by ruthless hands, for the purpose of beautifying the church. Often the tiny bulb is dragged out of its sheltering crevice, and so is lost to all the summers to come. Picked thus, in great, tight bunches, and crowded into vases for alters or communion tables, it can hardly glorify God nor be enjoyed by man. This method of decoration is not only not "considering the lily," but it is generally singularly unsatisfactory and ineffective. In fact, wild flowers are not useful for decorative purposes: they need, for their full beauty, the background of solitude; —one red lily, or two, or three, with tall grass, or the greenness of briers and milkweed and scrub maples, may be very beautiful and suggestive; but in a mass the beauty and suggestiveness is almost always lost. It is better, and far more effective, to use for church decoration a large simple treatment of branches, or long lines of vines, with here and there, perhaps, some deep, rich note of color such as garden flowers supply much better than the shy and single blossoms of the fields and woods. The story is

told of some one who had zeal, not according to knowledge, who made a rope of crow-foot violets to decorate a pulpit, using of these delicate and perfect creatures hundreds of single blossoms! It was a slaughter of the innocents; and, furthermore, it was entirely ineffective as a decoration. This effort to protect our native wild-flowers may well begin in the church, taking as the text that we are to "consider the lily,"—not in large and meaningless bunches, not in the passing beauty of its violent death through careless human hands, but we are to consider the lily of the fields, *how it grows!*—*Margaret Deland in Leaflet of Society for the Protection of Native Plants.*

Exterminating Wild Mustard.—Those who have passed along the countryside in May or June must have often been impressed with the great quantities of wild mustard in cultivated fields. Hitherto it has seemed impossible to root it out of grain fields but some recent experiments have shown that if sprayed when about to bloom with a solution of copper sulphate and water, it dies at once while all cereal crops are unharmed by the solution.

Red Flowers.—As to rare colors among flowers, mentioned in a recent number of your magazine possibly "bee-balm" means the *Monarda didyma* among the scarlets. As I have known it always as monarda or horse-mint, I thought I detected an important omission. But the "painted cup" in most of the cases when I have met it has seemed to my eye to belong among the orange-reds. Another scarlet, of which I am uncertain just now as to the botanical name, is known among the mountains about Asheville, N. C., as the "Indian pink." It grows one to two feet high with sticky stem and foliage; the flower of a star shape resembling in size and general appearance the cypress vine flower of our gardens. By the way I noticed that *Lobelia cardinalis* as well as *Monarda didyma* are being adopted as garden plants.—*Elwyn Waller.* [The fire pink is probably *Silene virginica*.—Ed.]

THE LULL IN FLOWERING.—Do collectors generally recognize what I call the "lull period?" I was out last Sunday (June 26) in a woody tract and saw only *Kalmia latifolia*, *Melampyrum Virginicum* and *Lysimachia quadrifolia*. A few weeks earlier the same region teems with flowers.—*Wm. Whitman Bailey*. [This is probably the season in Dr. Bailey's locality when the primitive flowers, most of whose buds are formed in Autumn, or whose food was stored up last year against the time of flowering, have ceased to bloom and before the great host of summer plants have begun. All species except saprophytes or parasites need to perfect leaves for carbon assimilation before they can produce flowers. Our spring flowering plants produce their leaves and lay up a food supply the preceding season; the summer-flowering species, on the contrary, lay up their food during spring and early summer. It so happens in most localities that this prevents the flowering season from being continuous, the lull coming some time in June.—ED.]

WHITE MARSH MALLOWS.—Your article in June BOTANIST on "Railroad Botanizing" suggested to me a sight I see nearly every day (in the season) when going to New York, which is a special delight to me. The marsh mallow (*Althæa officinalis*) which grows in profusion on the "Hackensack Meadows"—that stretch of marshy meadow land which for my route (D. L. & W. R. R.) stretches from Newark to the Palisades. Just now the flowers are in their glory. I note several clumps with *white* flowers, probably sports, which seem to be increasing every year. I do not find in any botanical books a reference to the existence of white flowered *Althæa officinalis*. They do not seem to occur in any particular place as though conditions of soil, etc., had caused the change.—*Elwyn Waller, Morristown, N.J.* [The editor has several times collected this sport. Recently, however, Dr. Britton has described it as a distinct species, finding in it what he considers sufficient points of difference. Does anyone know whether this plant will come true from seed?—ED.]

Editorial.

In an incautious moment the editor of this journal selected a clipping regarding saffron from *Indian Planting and Gardening*, and reprinted it without stopping to investigate its accuracy. Our contemparary so rarely makes an error that we have grown accustomed to take its statements without question; but in this instance it was misplaced confidence. Almost as soon as the magazine was issued, we began to hear from it. From the Atlantic to the Pacific and even from the islands of the sea, college professors, druggists, business men, botanists and flower-lovers rose up to insist that saffron is not the pollen of the crocus, but the stigmas and part of the styles. Mr. O. W. Barrett's letter is a fair sample. He says:

"The note *re* saffron in the July issue is a fair sample of what the Spaniards call "equivocacion," that is, telling half a truth at the expense of the other half. Now, in the first place, saffron is the dried stigmas of *Crocus sativus*, a very old plant cultivated in southern Asia; this is imported as "hay saffron" and made into medicinal preparations and confectionery colors. Four thousand flowers yield one ounce. But the more common saffron of the dyer is the dried florets of the "safflower," or saffron, (*Carthamus tinctorius*) a plant cultivated from China to Egypt and, even in Watt's "Dictionary of the Economic Products of India," known as "American Saffron." So when we are in America let us always think of *Carthamus*, the yellow thistle-like plant of our grandmother's garden, when we hear of "saffron." Needless to say, both of these old saffrons are being put out of business by that avid enemy of all good dye-plants—aniline."

This incident has several interesting features. It shows that our readers are well posted on botanical subjects and at this we are not surprised; that this journal is closely read, at which we are much pleased; and that our

readers are enough interested to set us right when incorrect, for which we are very grateful. We trust the watchfulness will be continued. We might add to what has been said above (after having carefully looked up the subject!) that the saffron crocus is one of the autumn flowering species and was once extensively cultivated in England. It is said that the inhabitants of localities where the crocus was grown were often known as "crokers," and thus arose a well known English surname.

* * *

Copy for the indexes to this magazine is in the hands of the printer with the prospects of an early appearance. Meanwhile we have issued an abridged index to the first six volumes, in which the titles are arranged under various subject headings such as nectar, odor, color, pollination, etc. This was issued merely for advertising purposes but readers of this magazine may care to have a copy. It is free for the asking.

* * *

It is our custom to send material for our Note and Comment department to the printer as fast as received, allowing him considerable latitude in making up the pages. To this fact, no doubt, is due the duplication of a note on the cabbage in the July issue. Evidently the printer has a fondness for this vegetable!

BOOKS AND WRITERS.

"New England Ferns and Their Common Allies" is not a re-issue of Dodge's well known work, but is a new volume designed for the beginner, written by Helen Eastman. It pays special attention to the characters that distinguish the species, and when these are much alike, the characters that are important in separating each are italicised. Photographic illustrations of fronds, tips of fronds or pinnæ of the species discussed are given, and in most cases these are sufficient for the identification of one's plants though by no means fully illustrating the species. In addition to a description of the species found

in New England, such other matters are included as the time of fruiting, the habitat they affect, the meaning of the scientific names, etc. There is also included a glossary and a key to the species. While not at all comprehensive, its compact size will permit of its being taken into the field and it will doubtless be well received in the region it covers. (Boston, Houghton, Mifflin & Co., $1.25.)

"Getting Acquainted with the Trees" is quite as interesting for its illustrations as for the text; both are by J. Horace McFarland and both are excellent in their way. The book makes no pretentions to comprehensiveness, being a series of papers reprinted from *The Outlook* in which the author has recorded his appreciation of many of our most attractive trees, both native and exotic. The illustrations are from photographs and printed on a paper made especially for them which lacks the vile odor and shiny surface of most plate papers. (New York, The Outlook Co., 1904.)

Bailey's "Plant Breeding" has recently appeared in a third edition, which is one of the best indications of its usefulness. In a general way the facts in the cross-pollination of plants are known to all botanists, but Prof. Bailey has gone more extensively into the subject. Plant breeding does not consist in mere cross-pollinating plants. It has to do also with the selection for further breeding of the best plants resulting from such crossing and the carrying the form toward certain definite and desired ends. This requires a full knowledge of the constitution of plants, the variations likely to occur through changes in environment, food-supply, climate, etc., and a multitude of other factors, great and small. All these topics have been carefully discussed, as well as DeVries' mutation theory, Mendel's laws, etc. A most exhaustive bibliography arranged chronologically is given, beginning in 1724 and extending to the present. The book is indispensable to horticulturists and every botanist should be acquainted with the facts it contains. (New York, The Macmillan Co., 1904.)

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THE AMERICAN BOTANIST.

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CONTENTS.

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WILLARD N. CLUTE, - - - EDITOR.

SPECIAL NOTICE.

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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.

I.—Two Books by Grant Allen.

There are few books dealing with ecology that we have read with greater pleasure than Grant Allen's "Vignettes from Nature" and "The Evolutionist at Large." The author's style is too well known to need special comment. The edition we offer is bound in paper and each volume costs 20 cents. The 40 cents that brings these two volumes will be well spent.

II.—Two Books on Seed Dispersal.

Recently we have received numerous inquiries about books on seed dispersal. The literature on this subject is not abundant, but we are able to offer two small volumes which are desirable. Beal's "Seed Dispersal," 87 pages, cloth, 40 cents, and Weed's "Seed Travellers," 72 pages, boards, 30 cents. It is seldom that one can get all the literature on a subject for 70 cents!

For the above books, or any others, address,

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THE AMERICAN BOTANIST.

VOL. VII. BINGHAMTON, N. Y., SEPTEMBER, 1904. No. 3.

THE EVE OF DEPARTURE.

BY DR. WILLIAM WHITMAN BAILEY.

ALL summer, under careful home influences, the seeds have been preparing for an eventual flight. Until adolescence, and sometimes at maturity they are protected in a multiplicity of ways. The evils against which they must contend are weather, animals of many kinds, from insect to man, and friends of their own household, who hesitate not at an advantage. Against the last enemy alertness is the only protection; reciprocity is unknown.

In autumn or winter one has only to think of the four-valved involucre of the chestnut, beset with needle-like prickles. No one cares to handle it without gloves. These valves are no part of the fruit proper. The three regular fruits are found within and are commonly mistaken for seeds. That they are not is easily seen by their persistent, attenuate styles and radiate stigmas. No true seed has such an appendage.

Another common illustration is afforded by the star cucumber, where it is the fruit that is armed. In this case the acicular prickles are easily detached by a touch, penetrating clothes and skin, and often, like cactuses, leaving a broken part to irritate or fester. The miserable bur-grass (*Xanthium*) of our sea-shores and dunes, is even more troublesome. Wretched is the man in whose hose it becomes imbedded!

We might enlarge upon this kind of armature, and tell how in case of thistles, cactuses and nettles, or worse than these, the stinging *Jatropha* the whole plant contributes to the defence of the seed. In this and nettles we find the hairs additionally provided with poison-glands. When the hair breaks, venom is discharged into the wound. It

is only fair to say, however, that in such cases of parental arming, the purpose is to insure the life of the plant itself.

Seeds, as in pines, are often effectually protected by overlapping, close-fitting scales. Horn-beam, hops and the like, show this arrangement. In our *Nelumbium* water lily of the west, and its fair cousin the lotus of India, the fruits are immersed in hollows of a top-shaped or obconical receptacle. They can only escape by the rotting or loosening of surrounding tissues. On this raft, even though some passengers perish, there is a change for others to escape. As in an ocean steamer, by good luck or furtive fee, the single passenger is lodged by himself. The figure fails in that, if accident occurs, he has not the essential key.

A species of *Mimosa*, a very near relative of our own sensitive cassia, as it ripens, has the frame-work of the pod, when some of the seeds are detached, become prickly on the edges. This defends the remaining seeds, a case perhaps, of partial self-sacrifice. Another acacia is effectively protected by bellicose ants that dwell in its hollow thorns. Mr. Belt in his ever charming "Naturalist in Nicaragua," which every one interested in nature should read, describes how these little creatures make a sortie when the plant is disturbed.

When the proper time arrives the real "education" or "leading forth" of the young, as the word implies, is not infrequently of a violent nature. The seeds are literally expelled without hope or chance of return, but each like the discharged soldiers in old times, has given it a temporary supply of food. Henceforth it must shift for itself.

We hear much in poetry, or poetical prose, of wind-borne seeds or fruits being carried to very long distances, and thistle and dandelion are cited as instances of such dispersal. While it is true that certain seeds or fruits (they are often mistaken the one for the other) are so remotely wind-borne, yet one will find in most cases that the vital part, the actual seed, is dropped near home. The idea then is not so much to afford an education by travel

as to remove the offspring from the too enervating influences of home. The violent hand of the parent is exerted in kindness. To be less metaphorical, it is desired and provided that the young plants when they at last emerge may have a fresh chance for soil, moisture, light and air. They must not be over-shadowed by home influences. As we see the young seed, as it were on tip-toe for flight, we can at most conjecture a certain feeling of reluctance to detach itself from the home circle. What fate is in store for it? As the Spaniard would say—*Quien sabe?*

Brown University, Providence, R. I.

A VACATION NEAR THE COAST.

BY FRANK DOBBIN.

TRAVEL is especially interesting to the botanical student. A journey of a hundred miles or even less is sufficient to bring him into localities where he is likely to find many species new to him; at the same time missing some of those common about his own home. While spending a few weeks in south-eastern Massachusetts during the past summer I was much interested in observing the plants new to me. My botanical note-book shows an addition of more than 50 new names.

East of the Connecticut River, while on the cars, I had noticed a bushy plant with bright yellow flowers, which, when I had opportunity to collect proved to be the wild indigo (*Baptisia tinctoria*). On my first ramble afield I was much pleased to find the chain fern (*Woodwardia Virginica*) a fern I had searched for in vain near my own home. A few days later I found in the same locality the Massachusetts fern (*Dryopteris simulata*) which bears considerable resemblance to the common marsh shield fern (*D. Thelypteris*). A close examination of the veins however reveals the fact that they do not fork as in the other. The beautiful Turk's-cap lily (*Lilium superbum*) I found in abundance, in low moist places and clambering over the bushes in nearly all situations was the greenbriar (*Smilax rotundifolia*). In waste places particularly in

city dumps I found several introduced plants that were new to me. Among them were the red campion (*Lychnis dioica*) the black knapweed (*Centaurea nigra*) the yellow melilot (*Melilotus officinalis*) and the canary grass (*Phalaris Canariensis*). While trailing over the burdocks of such places was usually to be found the bur-cucumber (*Sicyos angulatus*).

On a railway embankment I found the trailing wild bean (*Strophostyles helvola*) and in woods near by the spotted wintergreen (*Chimaphila maculata*).

In a swampy meadow I saw for the first time the beautiful ironweed (*Veronica noveboracensis,*) easily mistaken for an aster at a distance. Near by the meadow beauty (*Rhexia Virginica*) grew in abundance as did also the seed-box (*Ludwigia alternifolia*) and the hairy milkweed (*Asclepias pulchra*). On the edge of the same meadow I found one plant of the fringed white orchis (*Habenaria blephariglottis*) and near by a few plants of the star grass (*Hypoxis hirsuta*).

Late in August the meadows glowed with purple patches of the field milkwort (*Polygala viridescens,*) and in the same meadows I also found the small flowered gerardia (*G. paupercula*).

Beside the Seaconnet River at Dighton Rock, I found the partridge pea (*Cassia chamæcrista*) and close to the shore the sea lavender (*Limonium Carolinianum*) and the homely marsh elder (*Iva frutescens*). The water oats (*Zizania aquatica*) I found in shallow water and a little higher up the tall marsh grass (*Spartina cynosuroides*).

I was able to add several new shrubs to my list. The most beautiful being the sweet pepper bush (*Clethra alnifolia*)—would that it were of wider distribution! In nearly all situations I found the wax berry (*Myrica cerifera*). The waxy covering of the berries was once used for making candles by the early settlers.

The scrub oak (*Quercus nana*) was a noticeable shrub as were two of the sumacs (*Rhus glabra* and *R. copallina*) the smooth and dwarf varieties.

I noticed a few sour gums (*Nyssa sylvatica*) and along the streets an occasional tulip tree (*Liriodendron tulipifera*). Many more, to me, new and interesting plants were found and from a botanical standpoint my vacation near the coast was both a pleasant and a profitable one.

Shushan, N. Y.

SPIDERS AND FLOWERS.

BY JOHN H. LOVELL.

ON the 16th of July I noticed a bumblebee quietly at work collecting pollen on a flower of the wild rose (*Rosa blanda*). My attention was for a moment diverted, but was again quickly recalled by the loud buzzing of the bee. A white spider had leaped upon its back and grasped it with its mandibles just behind the head. At first the bumblebee struggled violently, but gradually its efforts became more feeble and soon ceased. The spider now dragged it over the edge of the flower to the leaves beneath, there to dine at its leisure. But at this point both insects were dropped into my cyanide bottle.

I had long known that some species of Thomisidæ, or crab spiders (so-called because they walk more easily sideways or backwards than forwards) frequented flowers for the purpose of preying on the insect-visitors; but I had supposed that so powerful an insect as the bumblebee was safe from their attacks. I was inclined to believed that the honeybee, which often falls a victim to this diminutive tiger, represented their largest game. It now seemed desirable to give more attention to observing their ways.

The commonest species of this family is *Misumena vatia*, a pure white spider with a red lateral stipe. Its colors so closely mimic those of many flowers that when concealed in a cluster it readily escapes notice. It usually frequents such flower-clusters as the meadow sweet, elderberry, the viburnums and the bristly sarsaparilla, though they are also found on large individual flowers like the rose. It does not spin a web, but conceals itself among

the flowers and then pounces upon its unsuspecting prey while it is collecting pollen or sucking honey.

The presence of these spiders, which are quite common, is often indicated by a dead insect lying upon the surface of the inflorescence. Later I found another instance where a bumblebee had been captured, and also such large flies as those belonging to the genera *Archytas* and *Theriopleetes*, or such a dangerous enemy as the wasp *Vespa diabolica*. I met with one case where a small butterfly (*Melitæa tharos*) had been taken.

It would be interesting to know how these spiders learned that they might make use of the attractive powers of flowers in getting their food supply, and also whether flower-visiting insects have yet learned to fear them. Apparently these spiders have acquired this new habit as the result of observation and experience. It is also possible that under certain conditions in localities they might become so numerous as to endanger the welfare of the flowers by hindering their pollination.

Waldoboro, Maine.

RANDOM NOTES.

BY PAULINE KAUFMAN.

OPPOSITE the railroad station at Como, N. J., I found on August third, a wild rose bush bearing a single deep red rose. The setting of the flower consisted of four branches of green leaves of which the uppermost was one and a half times larger in every way than the lower ones and serrated in such a manner as to resemble in shape the mitten-like form of the sassafras leaf. Growing through the heart of the rose was a prickly stem with six branches of green leaves, one of them having nine leaflets, each more than an inch long. I put the rose in a glass of water where the leaves kept on developing, and a pink sheath protectingly followed up each branch above the heart of the rose. It seemed as though elongated petals were formed above each other around these branches. How far this development would have reached, I cannot tell, for,

fearing some harm to the flower, I had to arrest the development by pressing the unusual find. In our garden there is a rose bush which for some years behaved itself as normal bushes do, but for at least five years back, the hearts of the roses would be pierced by buds. *This*, I believe is not by any means unusual. But the course of the flower above was another story.

In a marshy place at Avon, N. J., a fallen tree, moss clothed, made a beautiful background for a group of white fringed orchids (*Habenaria blephariglottis*) which were shielding a number of their small pale yellow sisters (*H. cristata*). Hitherto every specimen seen has been a dwarf but among about fifty of the glorious white beauties was one with stem and flower-spike equally large but of the beautiful pale yellow color of *H. cristata*). Was it a yellow form of *H. blephariglottis*, or a giant *H. Cristata?* Some botanists think the three Habenarias—the white, pale and orange yellow—are one and the same plant, the variation subject to location. My experience has been that where the three are found together, *cristata* and *ciliaris* are small plants, whereas when *H. ciliaris* is found alone the plants equal *blephariglottis* in size. Will any who have found them give their observations?

Not far from the haunts of the tall orange orchids I found a plant of ladies' tresses three feet in height, the floral part three and a half inches long. In the same wet meadow, among the sea pinks, was one with a rosy pink and a pure white flower on the same branch.

Near Indian Castle Creek, a few miles from Little Falls, N. Y., we found four edible fungi, each measuring at least twenty-seven inches in circumference, the largest over thirty inches. They were immense puff-balls with brain-like convolutions. This species, *Calvatia maxima*, is prepared by cutting in slices, turning in bread crumbs and frying. Each of us tied her mushroom into her jacket and carried it in this way to the canal boat, which took us to Little Falls—five miles in four and a half hours.

At VanCourtlandt Park, on September thirteenth,

amid a wilderness of weeds, one of our party discovered a two and a half foot high fringed gentian plant with two beautifully developed flowers three inches long. This seems a very early date for our latest flower.

The deep red of the sumachs added its quota to the color note of early autumn. Many of the plants had entire leaves of various shapes instead of the usual compound ones. A further inconsistency was the replacing of the pyramid of fruit by that of small deep red leaves, so curled and crumpled as to resemble berries except upon close inspection. Many of these plants bore no fruit, while others had branches of fruit below the thyrse of leaves, and on all of the berries was the salty exudation found on the sumachs in Connecticut two years ago from which we made Sumachade. I tried this again though the small quantity of berries brought home hardly warranted it. The berries were steeped in cold water, allowed to remain over night. Then the water was strained off and slightly sweetened. The acid taste is characteristic and found favor.

New York City, N. Y.

WITCH HAZEL.

BY DR. WILLIAM WHITMAN BAILEY.

AS the last flower in the year, the witch hazel has a peculiar interest. While it is true that a number of plants, mainly weeds of foreign origin, are found blooming as late, these are survivals of other seasons. Such, to mention only a few, are the butter-and-eggs, the soapwort and some species of violets. The autumnal dandelion, too, still lingers; but such plants are really not of the time.

The witch hazel is found growing beside our running brooks, or on the banks of ponds. It is a shrub from ten to twenty feet in height, with a peculiar, rather oblong, wavy-margined leaf. Once known it is easily remembered.

The flowers are singular and interesting rather than beautiful, though in a mass they are effective. They are

yellow and the long, linear, sprawling petals produce a spider-like effect. These are contorted in a singular manner. The pods or capsules are woody, two-celled, with one shiny seed in each cell. These seeds, at full maturity, are ejected from the pods with explosive violence and with a sound as of a miniature artillery. If one takes home a fruiting branch and forgets it, he may be alarmed some night by a bombardment of his window-panes and mirrors. The sound is really startling.

It gives one a strange sensation to find a plant naturally blooming at this late season. It seems a reversal of the natural order. If, in one instance, nature has been able to produce an exception, how easy it might be for her to continue erratic! In that case we would have our strawberries at Christmas and chestnuts on the fourth of July!

Witch hazel is well known for two reasons, which shall be stated in the order of their importance. First, it produces the various extracts of Hamamelis. Secondly, it is used by the credulous treasure and water-seeker, as a divining-rod.

It is a curious fact that while apple twigs are used abroad for their talismanic effects, our Dousterswivels should apply this plant. It may be that the true hazel or filbert is also employed in Europe and a confusion of names has resulted. Be that as it may, we fancy one is as useless as the other, though it is only fair to say that we have known educated people who firmly believe in the efficacy of the rod. But where are we to draw the line for people's superstitions? It has been stated that learned societies have at times consented to the investigation of phenomena of the divining-rod. A wand that would increase our bank account would put an end to a deal of our unbelief!

Why the shrub is called witch hazel we do not know, but the word is supposed to mean *weak*, from the drooping habit of the plant. Possibly its use in incantations may account for it. Drake, in his Culprit Fay, speaks of

the "wild witch hazel tree," as an appropriate accompaniment of his fantastic imagery.

THE STAR FERN.

When one has begun a collection of either living or pressed specimens of ferns, the star fern (*Hemionitis palmata*) is usually one of the first exotics to find a place in it. Its hardiness, notwithstanding its tropical origin, enables

HEMIONITIS PALMATA.

it to thrive in greenhouse or conservatory life, while its abundance in many parts of the West Indies causes it to be represented in the collections of nearly every returned

traveler. The remarkable shape of its fronds add greatly to its attractiveness in the eyes of those accustomed only to seeing ferns of the more usual shapes; indeed the skilled filicologist has to admit that this form is rare among ferns.

In its native lands, the star fern grows on half shady banks and prefers a moist situation, though it may often be found in full sun on slopes so dry that one wonders how it survives at all. During most of the year it may be exposed to an amount of isolation that no fern in the Northern United States, with the possible exception of the bracken, could withstand. And the star fern would probably fare as ill as any other species in such locations were it not for its covering of close, tawny hairs that prevents rapid evaporation from the leaf. When the heat becomes too intense, or when the ground is so dry as to no longer yield moisture, the fronds instead of dying, simply roll up and wait until it rains, when they unroll again ready to take up life anew.

This fern's method of fruiting is very characteristic. The veins in the frond anastomose at frequent intervals and the spore-cases are borne copiously along these veins throughout the frond, making it look as if it had been embroidered. This, however, is not the plant's only method of reproduction. In the notches of the leaves little buds are formed, and as the leaves grow old and become prostrate these buds produce new plants. One may often collect specimens in which the old fronds each bear several plantlets.

The way in which the star fern fruits makes it a near relative of *Vittaria*, *Tænitis*, *Antrophyum* and *Meniscium*, all small tropical genera containing no species with common names. Not much farther removed are the genera *Notholæna* and *Gymnogramma*, in fact the plant called *Gymnogramma rufa* is thought by some to form a very good connecting link between the latter genus and the genus *Hemionitis*, to which the star fern belongs.

As fern students now regard *Hemionitis* it contains upwards of half a dozen species, four of which belong to

the American Tropics, the rest being found in the warmer parts of the Old World. The only other American species that is at all common is a pinnate plant, *H. pinnata*, which so closely resembles *Gymnogramma rufa* that it is hard to separate them. The star fern is found nearly throughout the West Indies and occurs on the mainland from Mexico to Peru. In Jamaica it is sometimes called strawberry fern, for what reason is not apparent. In no way does it resemble a strawberry unless by a long stretch of the imagination, the leaf may be said to be like a strawberry leaf.—*Willard N. Clute in 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.

CHEMICALS FROM WOOD.—*Forest Leaves* notes that in the making of charcoal the condensible gases from one cord of wood amounts to 224 gallons of liquor. This liquor is known as green liquor or pyroligneous acid. It is largely made up of water but contains also, alcohol, tar, ammonia compounds, acetone (alyl-alcohol, ethers, aldehydes) and acetic acid. Alcohol, acetic acid and formaldehyde are the substances usually separated out of the liquor.

PLANTS PROTECTED BY LAW.—Hereafter, according to *Gardening*, any person in the State of Massachusetts, who cuts down or destroys any timber on the land of another or removes therefrom any roots, nuts, berries, grapes, sedge grass, hay, ferns, flowers or shrubs, is liable to a fine of $500 or imprisonment for six months. Such laws are a step in the right direction. Any ambitious plant protection society can do much for the cause by securing the enactment of similar laws in other States.

An Ambitious Sundew.—In a recent letter to the editor, Prof. W. W. Bailey reported finding a sundew (*Drosera rotundifolia*) that had captured a fair sized dragon fly. It required four leaves to hold the prey!

Profuse Blooming.—Certain cultivated trees have this year bloomed in profusion. Thus it has been with horse-chestnut, but notably with the yellow-wood (*Cladrastis tinctoria*). The latter has been glorious and when finally the white petals fell, the grass and gutters looked as if filled with snow.—*W. W. Bailey.*

Mushroom Culture.—Growers of mushrooms have, until recently, been content to plant the so-called mushroom spawn, or mycelia of the plant, and be thankful for the mushrooms that have appeared. Now, by various improvements in the culture of mushroom spawn, it is possible to select the mushrooms to breed from, and this will doubtless result in soon increasing the size and otherwise improving the plants. A most interesting feature of the work is found in "tissue-cultures." By this method young well-flavored mushrooms are selected, and from the stems are removed small pieces of tissue. These are planted in sterilized compost and soon put forth new mycelia.

The Ceriman.—Those who have visited almost any greenhouse where plants are grown for decorative purposes, have probably noticed among the palms and other ornamentals a large vine-like plant with thick leaves a foot or more in extent remarkable for having large holes here and there in the blade as if the substance of the leaf was not sufficient to fill in the spaces between the veins. This plant is the ceriman (*Monstera deliciosa*) a member of the Arum family very common in collections. It has an inflorescence somewhat like that of the wild calla but the spathe is pale yellow, ten inches or more long and nearly as wide. This half-encloses a long and very thick spadix that is edible when ripe. Although as yet practically unknown in the markets, it is now being raised for its fruit in southern Florida and may ultimately find its way to the fruit stores of northern cities.

Relation of Soil to Growth.—Some experiments have recently been made at the University of Chicago to show that the relative fineness of the soil has much to do with plant growth. Crushed quartz in three different sizes was obtained and various species planted in each, the three sets being treated alike in every other respect. At the end of a month and a half those in the fine soil had greatly increased in height, those in medium soil had not done half as well, while those in the coarse soil had grown scarcely any and several plants had died.

More Red Flowers.—Commenting on a note regarding red flowers in a recent issue of this publication, Mrs. A. P. Taylor of Thomasville, Ga., notes that in the Southern States there is a flower, perhaps even more fiery red than the cardinal in the shape of the coral plant (*Erythrina herbacea*). Among other red flowers of the South she mentions *Asclepias paupercula* an intense shade of red, *Lillium Catesbii*, the slender leaved sundew (*Drosera filiformis*), the small buckeye (*Æsculus pavia*) and the trumpet creeper (*Tecoma*) and some of the *Rhexias*. Can anyone name others? There are many plants with flowers inclining to red, but the clear red flowers are still rare. The West is still to be heard from.

An American Tree Abroad.—In the Hawiian Islands, according to *Forest Leaves*, there are two kinds of forests. Those in the interior and in regions of heavy rainfall consist of native species, but near sea-level the forest is made up exclusively of mesquite, a common plant of the southwestern United States. This tree was introduced in 1837 by seed planted at Honolulu and the tree is still in a healthy condition with a diameter of two feet and a height of fifty feet. From this tree have sprung fifty thousand acres of mesquite forest. In the Hawiian Islands the tree grows taller and straighter than in the United States and is used for fuel and fence-posts. The pods are eaten by cattle in summer and they are gathered, dried and used as cattle-feed during other parts of the year. To the natives the tree is known as Algaroba.

PUFF-BALL CULTURE.—Since all the puff-balls are edible, and many of them well flavored and of large size, it is remarkable that nobody has yet attempted to grow them commercially. A single puff-ball is often large enough to furnish a meal for an entire family, and if the family is small or the puff-ball unusually large it is even possible to carefully cut off as much as is needed, returning at another time for the rest which will remain in good condition for some days. The person who first makes puff-ball growing easy may be sure of rich rewards.

SPECIMENS OF FUNGI WANTED.—Mr. C. G. Lloyd of Cincinnati, Ohio, having built a museum especially for the housing of his botanical library and puff-ball collection now announces that he would like to receive specimens of any of the fungi that are firm in texture and retain their characteristics when dry, such as the well known bracket fungi (*Polyporus*) and allied species. In return he offers to send his *Mycological Notes*. This is an exceedingly useful serial publication with numerous excellent illustrations and no doubt any plant lover will consider it an adequate return for cutting off a few bracket fungi from old logs when next in the woods. Be sure to send him plenty of each kind. Mr. Lloyd will name any puff-ball sent him but does not agree to name the other fungi without further study.

VARIATION IN ROUND-LEAVED ORCHID.—In the summer of 1903 while making a collection of native orchids, I noted with interest an oblong leaved form of *Habenaria orbiculata* which seems not to have been generally known as no mention of such a variation is made in books on the subject. I referred the matter to Prof. L. R. Jones of the University of Vermont asking if it was not as true a variety as *H. Hookerii* var. *oblongifolia*, and suggesting that it ought to be generally known either as a named variety or as a variation. He replied that he had never seen it but does not consider either this or the variety of *H. Hookerii* worthy of varietal rank. He says further, "Although not recognized by name it is no less important

to observe variant forms and especially of the comparatively stable Orchidaceæ." The leaves have been described as exactly orbiculate, four to eight inches wide while a leaf of this form which I measured was four inches wide by six inches long or one-third longer than wide.—*Leston A. Wheeler, Jamaica, Vermont.* [Our correspondent is quite right in his suggestion that this form should be given a name. It might be well to call it variety *longifolia* as a companion variety to *oblongifolia*. Systematic botanists are by no means agreed upon the rank of "varieties." The tendency is to make three groups: species, sub-species and forms. Such "varieties" as have some constant character would now be called a sub-species and be given a trinomial. Those in which the variation is seasonal or geographical are likely to be called forms. The orchids mentioned above would probably be classed as forms.—Ed.]

Perennial Four O'clocks.—A writer in *Park's Floral Magazine* says that he has clumps of the common four o'clocks (*Mirabilis*) that are nearly thirty years old. Most people who grow this old-fashioned but handsome flower are not aware that this plant is perennial, but all who have attempted to dig up a plant know that the massive roots produced must be intended for the storage of food. In climates where the roots do not freeze, new shoots are thrown up year after year. Probably if the plants in the Northern States were dug up before frost and treated like dahlias, they would grow again the following season.

Camphor.—According to the *Gardener's Chronicle* camphor may be obtained from several plants belonging to widely separated families, especially from *Blumea balsamifera*, one of the composites, and *Dryobalanops aromatica* of the Dipterocarpæ. The commercial camphor, however, is produced from a member of the laurel family *Cinnamomum camphora*—a species closely related to the cinnamon tree. The camphor tree is found wild in Japan, Formosa and Central China. In Japan the manufacture

of camphor is a government monopoly and on account of the war in which the country is now engaged the supplies of crude camphor have been held back. As a consequence, the price of camphor has nearly doubled. Camphor is obtained by distillation from the wood of the tree which is cut into small pieces for the purpose. It has also been made synthetically in America.

Durability of Catalpa and Locust.—The threatened shortage in stock for railway ties has turned the attention of railway companies to the question of where the supplies of the future are to be obtained. The Illinois Central and several others are attempting to solve the problem by the extensive planting of timber along the right of way. The Catalpa (*C. speciosa*) is the favorite for such plantings since it grows rapidly and makes a strong durable timber, but the locust (*Robinia pseudaccacia*) has even stronger claims to recognition for it grows as rapidly and the wood is of even greater durability. The editor has seen a locust fence-post that has done duty in sun and storm for seventy years.

Salt and the Thickness of Leaves.—M. A. Chrysler has been measuring the thickness of the leaves of various seaside plants and comparing these with the thickness of leaves from similar plants growing on the shores of Lake Michigan. In the June *Botanical Gazette* the statement is made that in every case the maritime plants had thicker leaves than similar plants inland. The cause for this seems to be the salt in the sea-coast habitat. This is quite in line with the practice of farmers who often salt the earth about their cabbages for the beneficial effect it has upon the plants, perhaps without knowing why cabbages like salt when other vegetables do not. The cabbage once grew wild along the sea-coast and so, of course, salt is a familiar element to it.

Editorial.

Some time ago the editor of this magazine wrote a series of articles on herbarium making which has since been twice reprinted, the second time with additional matter and various minor changes It details the method of mounting plants that now prevails in most of our prominent herbariums and devotes considerable attention to labels, driers, genus-covers, etc. In some of our fall advertising we have been offering this pamphlet free to new subscribers, and the demand for it has caused us to think that many of our present readers might like a copy. We therefore offer to send one free to any subscriber who sends us one dollar for renewal of subscription before the first of next January, provided such renewal extends his subscription to the end of 1905 at least. The pamphlet is bound in extra heavy paper covers and retails for 25 cents. It is published by another company and we have to buy all we send out. We have simply secured a low rate and offer the pamphlet as a special inducement to new subscribers and to present subscribers who renew. The part of this offer applying to renewals will expire at the end of 1904.

* * *

We are all aware of the fact that half a dozen flowers in a vase are far more beautiful and decorative than half a hundred; and yet in gathering wild flowers, even those who ordinarily seem to be possessed of some esthetic sense, pick as if mere bigness of the bouquet were the only thing worth considering. Who has not noticed how much the adder's-tongue, the columbine, the water lily or the rose loses by being arranged in masses! Indeed, there is not a flower, except the few that nature has bunched together in the beginning, that does not look better in small groups; and even in the case of the exceptions, two or three stalks of flowers are sufficient. Twenty elder cymes in a vase are not as good as one, and the same will apply

to the fringed orchids, the mountain laurel and the gerardia. Believing as we do, that it will be a most difficult matter for any plant protection society to entirely eradicate the children's propensity for gathering flowers, we submit that it would be excellent to call their attention to the decided advantage to be gained by moderation.

* * *

It is becoming the fashion in parts of the Old World to provide "bird sanctuaries" by planting such shrubbery as will afford both shelter and food to the feathered denizens of the region. Even in America many of us are accustomed to place food about the premises in winter as a means of attracting the birds; but probably few have deliberately planted their grounds with this end in view. And yet, by the judicious selection of species, it is possible to accomplish this with no loss of flowers or decorative effect. A few rambles in autumn will show which of our native species are most desirable. By offering those species that the birds like best, one may have plenty of bird-life about his grounds even when his neighbors have few or none.

BOOKS AND WRITERS.

American Gardening has recently been devoting considerable space to the insect friends and foes of the horticulturist.

In "Bog Trotting for Orchids" Grace Graylock Niles has recorded her experiences in the search for these fascinating plants from Vermont to New Jersey. In one sense the title is misleading, for a good proportion of our orchids do not grow in bogs, though Miss Niles has included them all in her book. The author's adventures in penetrating to the boggy retreats of the water-loving species are such as are likely to befall any orchid collector, and being well told, make a readable work, though we cannot help feeling that the records of three summers give rather an air of repetition to the book. Following the more general part of the book is a list of New England orchids with careful

descriptions in which one new species is described. Twenty-four colored plates of orchids and many others in black and white from photographs of plants that grow with the orchids add value to the book. (New York, G. P. Putnam's Son, 1904.)

About four years ago, Capt. Charles McIlvaine issued a remarkable work on fungi which was the result of some twenty years of observation and study of the edible species. Beginning as a novice in fungus eating, he has gradually extended his experiments until he has eaten more than five hundred different kinds of mushrooms or toad-stools. His book, "One Thousand American Fungi," can not be criticised by the scientist, but it is nevertheless not intended for a scientific handbook. It is written principally for mushroom collectors and mushroom eaters and the cordiality with which it has been received is attested by the fact that already a new edition has been made necessary. This edition comprising more than seven hundred and fifty large octavo pages, and describing upwards of a thousand conspicuous, edible or poisonous species has recently been issued from the press of The Bowen-Merrill Co. of Indianapolis. It is not too much to say that in richness of illustration, exactness of description and extent of the field covered, this volume has no equal in the field of American Mycology. Capt. McIlvaine has brought to the work not only the enthusiasm of the genuine Mycophagist but an eye trained to seeing other things besides fungi and a pen able to present them attractively. For the benefit of those who may be accidentally poisoned by inedible fungi, he has presented a chapter on "Toad-stool Poisoning and Its Treatment" by Dr. W. S. Carter. A large number of recipes for cooking, contributed by authorities, is included and the volume ends with one of the most extensive and helpful glossaries to be found anywhere. There are one hundred and eighty-two plates, many of them colored and various other illustrations in the text. The original edition sold for $10.00; this new one brought up to date, costs $5.00. Its vast amount of information will make it a favorite with all eaters of fungi.

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CONTENTS.

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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.

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FLY MUSHROOM (Poisonous).
(Amanita muscaria).

THE AMERICAN BOTANIST.

VOL. VII. BINGHAMTON, N. Y., OCTOBER, 1904. No. 4.

THE FLY AMANITA.

(*Amanita Muscaria.*)

IT is commonly supposed that certain familiar fungi can be divided into two great groups, the mushrooms and toadstools,—depending on whether they are edible or poisonous. This, of course, is a mistake. The only difference between toadstools and mushrooms is in the minds of those using the terms, for both mean the same thing. There are many genera in which some species are edible and others poisonous, and to call these latter toadstools would be to make a very unnatural group of species from different genera.

There are many people even now, who imagine that there is but one true mushroom, the plant found in the pastures in late summer, and that all others are poisonous toadstools. Investigation has shown, however, that this is far from correct. The really poisonous species are very few in number and confined almost entirely to one or two families but so deadly are these that they have earned a reputation for harmfulness for the whole mushroom tribe.

One of the most widely distributed of the deadly poisonous species is the subject of our sketch, the fly mushroom (*Amanita muscaria*). It is found around the world in the North Temperate Zone, delighting in rather poor soil in open woods, along roadsides, etc., but seldom being found in the open field. It is not a gregarious species. More than half a dozen are rarely found in one place, but the gay colors of the cap are very likely to attract the eye of the saunterer. Doubtless many who are not mycophagists will recall having seen it after examing our plate.

In the young or "button" state, the fly mushroom is

inclosed in a wrapping of tissue which ruptures as the plant increases in size, part remaining on the cap in the shape of white floccose warty patches, and the rest adhering to the stem as scales, or appearing on the bulbous base as concentric rings. In other species this enclosing tissue ruptures in such a way as to form a cup about the swollen base of the stem. and as these plants, too, are poisonous, the cup-like base is often called the "death-cup". Death certainly lurks within it, and while not all mushrooms with such a base are poisonous, the beginner will do well to avoid all of them until he knows for certain that they are not.

Before it is fully grown the cap is nearly hemispherical in shape and bright scarlet in color. Later it expands, and the color, especially on the margin, often fades to a pale yellow, or even white, but the ordinary specimens are usually orange or red in the centre even at maturity. The stem, the gills, and the spores they bear, are pure white. The gills do not extend quite to the stem, and are not all of the same length. Just below the cap there is a thin veil that was attached to the edge of the cap, when young, concealing the gills but which, when grown, hangs down as a soft ring about the stem.

Sometimes after heavy rains the white flakes on the cap may disappear, but ordinarily the white patches on the bright colored cap are very noticiable and quite sufficient to identify it.

The fly mushroom has no bad taste and no disagreeable odor nor is it poisonous to the touch, but once introduced into the alimentary canal is almost certain to produce death unless antidotes are administered at the first symptoms of poisoning. There are many mushrooms that, while not deadly poisonous, cause various disturbances of digestion but these make themselves known soon after being eaten. Not so with the fly mushroom. It often does not manifest an alarming symptom until from six to fifteen hours after it is eaten allowing time enough for another meal to be taken which is often blamed for the

trouble. The principal poisonous substance found in the fly mushroom is an alkaloid named muscarine and its effects are fought with another poison, atropine, in subcutaneous injections.

Notwithstanding its poisonous properties this species has often been used as food in France and Russia and cases are on record where it has been eaten without ill effects in our own country. On the other hand it is usally concerned in the fatal cases of mushroom poisoning and the Czar Alexis of Russia is said to have died from eating it. From these facts it has been questioned whether the poisonous properties may not be due in part to the soil in which it grows. It gets its specific name of *muscaria* from a Latin word meaning fly because it is attractive and poisonous to these insects. Dr. Peck says he has seen a a circle of dead flies surrounding one of the plants where they had fallen after tasting the moist surface of the cap.

The natives of Northern Russia and Siberia are said to make a curious use of this species. Dried specimens are steeped in whortleberry juice to form an intoxicating liquor, which when taken causes a sort of hilarious condition in which the subject performs many amusing antics.

The fly mushroon may be found from June until late in October, and is probably the commonest of the poisonous species. There are several other poisonous species in the genus *Amanita* and curiously enough several more that are edible and highly valued as food.

Colored plates of this species may be found in the following works. Atkinson's "Mushrooms Edible and Poisonous" Plate 1; Peck's "Forty-eighth Report of the New York State Museum" Plate 42; Taylor's "Mushrooms of America" Plate 15; Marshall's "Mushroom Book" Plate 3; and McIlvaines "One Thousand American Fungi" Plate 6.

HONEY.

BY J. FORD SEMPERS.

THERE appears to be occasional misapprehension with respect to the relation existing between honey and nectar. Not because the subject has failed to receive ample attention from various writers, but because of the presence of certain established, but misleading expressions. We often speak indiscriminately of nectar and honey as one and the same thing. The habit of calling plants that yield nectar, honey plants, has become in ordinary usage, almost a necessity.

The term honey plant is misleading in that it conveys to the mind of the average layman the idea that honey is the direct product of the flowers. So it is taken for granted that the bees play the roll simply of gatherers. Such a notion can not be accepted by those familiar with the habits of the honey bee.

What the bees do find in the blossoms is nectar. Under certain conditions some species of plants may secrete what to all appearances is honey. Such cases however are to be regarded rather as exceptions. It may then be naturally asked what the difference is between the two substances? A partial answer may be had by examining them as they are found in the hive. With that end in view we will place in a vigorous colony of bees, during the early morning hours, a perfectly empty honey comb. A day, of course, must be selected when any wide spread nectar yielding plant, white clover for example, is actively producing nectar.

Towards evening in removing the comb it will be noticed that the cells are more or less filled with a thin watery liquid; so thin indeed that it may be readily poured from the comb. Aside from the fact that it is sweet there is little about the liquid to suggest honey. This, however, is nectar very nearly as we would find it in the blossoms if we could gather it ourselves.

Our inquiry also involves in a measure the problem of nectar formation in plants, a subject claiming separate

consideration. Nectar as normally found by the bees is composed very largely of water. Only after the elimination of this excess of water, and certain other changes effected by the bees, does the product of the flowers become honey, It is believed that a part of this water is absorbed and ejected by the bee while the latter is in transit from the field to the hive. But the greater proportion is expelled by evaporation, it is thought, after having been stored in the open celled combs of the hive.

If in the evening after the bees have spent a busy day in the fields, we approach a hive, there will be noticed a loud humming sound. The noise comes from the rapidly vibrating wings of worker bees. These are noticed at the hive entrance. Strong currents of air are driven by their ceaselessly buzzing wings over the combs of freshly gathered nectar. This warm moisture-laden air as it leaves the hives under certain conditions may deposit little drops or pools of condensed water just out side the hive entrance. The bees continue this concentrating process until the superfluous water disappears.

The finished product of the hives differs variously from the freshly gathered nectar. Not only in mechanical condition, but chemically so. If separate quantities of raw nectar, and well ripened honey be subjected for some time to a summer temperature, the nectar will be found to have turned to vinegar, while no change will be noticed in the honey. We may, therefore, regard honey as a kind of concentrated nectar in which a chemical change has taken place.

For the sake only of comparison we may be permitted to liken the transformation of nectar to honey with the manufacture of syrup from the sugar maple sap. What the farmer accomplishes by means of his fire and the boiling of the sap, the bees bring about chiefly, perhaps, by the deft use of their wings. We must not, however, overlook certain digestive processes on the part of the bees, which are lacking in the making of the syrup. Yet who would think of calling the thin and slightly sweet maple sap by any other name?

In the usual order of things the botanist is concerned almost wholly with nectar. I fear he rarely finds insects "sipping honey from the blossoms" though repeatedly so assured.

As a matter of convenience nectar yielding plants will doubtlessly be called honey plants indefinitely. There is little reason why they should not. For are we not depending on them and the *bees* for our supply of honey? And nectar in its various phases will continue to be known as honey in a casual sense. But let there be more careful discrimination, especially with those of us who are striving to be botanists or botanizers.

Aikin, Md.

MORE ABOUT CREAM-COLORED JEWEL-WEEDS.

WHILE reading THE AMERICAN BOTANIST for August, 1904, my attention was drawn to an article concerning cream-colored jewel-weeds. I was especially interested, since for several years I have known of such a plant, although until recently I knew of but one place where it grew in a wild state. This was along a rocky woodland stream called Campbell Run, which is about ten miles from my home. Two years ago I visited the stream for the purpose of collecting seed, but on account of lumbering operations along its banks, found fewer plants than in previous years. However, the yellow jewel-weed (*Impatience pallida*) grew in abundance and seemed less delicate than the other. I collected seeds of both kinds and later planted them in the garden at my home. The next spring both sorts grew and thrived, although the yellow ones still seemed the stouter. The flowers of the lighter variety were of a pale cream-color sparingly mottled with dark violet spots. I have never had any with pink petals, although on two occasions I have seen single plants of *Impatiens fulva* which were of a deep rose color. This year I grew plants from the seed which I had raised last summer and had as good results as before.

From my observation I am convinced that the seed

holds true and that the plants are more than a freak of the yellow species. In no case have I seen a plant bearing both kinds of blossoms, or any that appeared to be a cross between the two.

This fall I unfortunately lost my seed but have no doubt that enough dropped to give me plenty of plants next year. Moreover, during the summer I discovered a new habitat of the flowers and my brother found still another. I am very anxious to learn anything further concerning the plants and whether they will be considered as a variety or a species.—*C. H., Wellsboro, Pa.*

[The fact that this form is capable of reproducing itself from seed adds interest to the subject. We suggest that our correspondent compare the plants bearing the cream-colored flowers with the yellow-flowered form, next year, to discover whether there is any difference between them besides color. Color of itself is not sufficient to characterize a new species though it is often enough to distinguish forms and this one might be named variety *Alba*.—Ed.]

WASTE PLACES.

BY DR. WILLIAM WHITMAN BAILEY.

NOTHING is more unsightly to the casual observer than the dump-heaps about our cities. Where grassy lanes once led through leafy copses, sweet with the odor of wild grape, there are now cinder tracks covered with abominations. Tin cans, rusty stove-pipes, corset-wires, broken crockery, paper collars, dead cats, all find here an ultimate resting-place. The traveller over this desert thinks of Mecca and Tinsi. He expects to see a troop of pilgrims. He beholds, in fact, very busy and picturesque Italians rummaging for whatever they may find.

It is just such a spot that nature loves to redeem. Here her vegetable missionaries take up their work. Even in early spring a moss that especially loves alkaline soil, springs up everywhere in the ashes. This makes the way straight for other higher forms of life. One such dust-heap

recalling Mr. Boffin and Silas Wegg is invitingly near my house. At times when the limitations of age are too much in evidence and long trips are precluded, I gird up my loins, strap on a vasculum, and put in an hour's hunt on the delightful mass of disjecta.

Here one sees in full action the unending struggle for existence. It is not necessarily the *fittest* that survive. The strong weed achieves success by sheer vigor, but there is many a politician and shrewd business-man among these contestants ready to profit by any mistake of a neighbor. Woe to the weakling! He goes under and is trampled down.

See how some plants, unable from any innate force to aspire, use the shoulders of others to raise them to the light! Such are the twiners and climbers that wriggle in and out of the general scramble. They have their "ends" and "full" and "half-backs." One sees, too, the despicable parasite, maybe, often of good family, who has sunk to doing nothing for himself, and who preys upon his neighbors.

There is the nettle that says "hands off!", the brier, aggressive at every point, the wild cucumber, and the balsam-apple. Some of them are protected by spines or prickles, or some, like the milkweed, by easily exuding juice that hardens in the air, thus miring ants or other intruders. How much one may learn here of plant protection!

In direct juxtaposition are plants of high and of low affiliation; coreopses in intimate association with pigweeds; amaranths and holly-hocks cheek-by-jowl; the morning-glory enwrapping the thorn-apple; the bindweed hugging a thistle; the purslane hustling its cousin portulaca.

The ruined cellars of old houses are favorite resorts of waifs. Many regetable tramps therein find a home. We see the thistle and fig together in one such place, though it is doubtful if one can gather figs from these thistles. A queer place for a fig-tree surely, but a little seed here found a congenial home and the resultant plant has thus far re-

sisted the winter. Here, too, the grape-vine loves to nestle, warming up with ruddy glow its emerald beads. Wild mustard shows a mass of yellow bloom, recalling the beautiful wood-picture in "Ramona." The celandine exhibits its yellow blossoms, the diurnal lychnis its pink ones. To give a tropical look to the picture, the sumac presents its long, pinnate, coppery-tinted leaves.

On waste places, around railway termini and also on lands used by shipping for discharge of ballast, one may find immigrants still waiting for a pass-port, but thriving all the while. Some of these may have come by rail from distant states; others are voyagers from trans-oceanic regions. There are those that come to stay; there are those that abide only for a season. These last like not our ways. Unfortunately, there are but few such.

Most of our weeds are of foreign origin. They thrive to the exclusion of the natives. They bring their language and their customs with them. Such abandoned grounds as we have been describing are a perennial delight to the plant lover. They afford the seeker all the pleasures, and few of the toils of exploration. At no expense he can see a grand range of plants, and find on an ash-heap, quite convenient to his home, what ordinarily might take a long journey to discover.

Brown University, Providence, R. I.

WITCH HAZEL NOTES.

BY CHARLES FRANCIS SAUNDERS.

SUPPLEMENTING Dr. Bailey's interesting article on the witch hazel in the September issue of THE AMERICAN BOTANIST, I might state that the hazel (*Corylus avellana*) of Europe has furnished divining rods from time immemorial, and the use of the witch hazel's switches for the purpose of locating hidden veins of water is no doubt to be traced to our early settlers, mistaking the American shrub for a sort of true hazel. A number of plants have been used as stock for divining rods abroad—the tamarisk,

for instance, the peach tree, the almond, even the golden-rod, besides the apple twigs which Dr. Bailey mentions. All these, however, have been considered equally efficacious in detecting lodes of ore in metalliferous districts and hidden gold.

The curious will find much to interest them on this subject in Mr. T. F. Thiselton-Dyer's volume on "The Folk-lore of Plants." I have myself within a few years seen in an English periodical the advertisement of a water-hunter employing a divining rod, though I cannot at the moment recall whether or not he mentioned it as being of hazel.

The etymology of the term "witch hazel" seems to work out as follows: In England there is a species of elm (*Ulmus montana*) the wood of which used to be employed in the manufacture of a sort of chest called a "wych"; whence the tree was called wych elm. As the leaf somewhat resembles that of the hazel, the innate propensity of human nature to go wrong asserted itself, and the tree came to be spoken of the "wych hazel." Then in process of time as the word "wych" lost currency in popular speech, writers put the expression down as "witch hazel," and so it stands now. How the term came to be transferred to our *Hamamelis virginica* can only be surmised. We know, however, that pioneer folk are not as a rule botanists, and in a new country plants are to a great extent named by the common people from their resemblance to the plants they left in the fields and gardens of their mother country.

Philadelphia, Pa.

[Still another derivation of the name witch hazel may be found in Friend's "Flowers and Flower-lore" where it is said to come from the Anglo-Saxon *wic-en* meaning to bend and to have reference to the pliant nature of the wood. That the world in general still places considerable faith in the efficiency of the divining rod is shown by the fact that the columns of publications designed for circulation among the more ignorant classes still contain numer-

ous advertisements of "divining rods," "dip-needles" and "Spanish needles" to be used exactly as twigs of witch hazel would be.—ED.]

THE FERTILIZATION OF CALOPOGON PULCHELLUS.

This beautiful orchid is an inhabitant of open bogs, and where it finds a deep bed of sphagnum with plenty of water beneath, flourishes in great profusion. The outstanding characteristic of this species, which easily distinguishes it from any other of our *Orchidaceæ*, is the position of the labellum, which, on account of there being no twist in the ovary, is uppermost. This peculiarity is noted by the Gray, but in Britton and Brown not only is no reference made to it in the text, but the diagram is incorrect, as it shows the column uppermost. The representation of the labellum, which is given separately, is also erroneous as the triangular dilation at the base is omitted, as are also the bracket-like ridges.

On account of the unique position of the labellum and the very open character of the flower, I thought that the method of fertilization would prove interesting and determined to investigate it. The way in which it is accomplished is as follows:—The bee alights upon the labellum, which bends near the base (the three bracket-like ridges prevent it doing so elsewhere) until the back of the bee is in contact with the column. The bee, which is of course up-side-down, sups the nectar secreted in the glands at the base of the column. As it withdraws, its back opens the operculum of the anther and a pollinium (or several) adheres to its back. On visiting the next flower the pollinium slips past the convex surface of the closed operculum, but as the bee withdraws, the pollinium is caught by the slight break of the stigma and adheres to it, the bee meanwhile receiving another pollinium from the anther of this flower. —*A. B. Klugh, in Ottawa 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 GROUND CHERRY AS FOOD.—The ground cherry (*Physalis pubescens*) is in considerable demand in some of the larger cities for use in making preserves. Twenty cents a quart is the usual price paid. Among the dealers the fruit goes by the name of husk tomato, dwarf cape gooseberry, strawberry tomato and paper shell tomato.

UNUSUAL POT HERBS.—In an old number of *Garden and Forest* we note that *Hydrophyllum virginicum* is often used for "greens" and is known as Boston cabbage. Other plants recommended for pot herbs are the trilliums, comfrey (*Symphytum*) and the yellow adder's-tongue (*Erythronium*). It may be added that the common Solomon's seals (*Smilacina* and *Polygonatum*) are often gathered just as they are coming up in spring and used as we use asparagus.

PROTECTION OF THE HIGHWAY LANDSCAPE.—It is fine to know that some States—Massachusetts, Connecticut, and Rhode Island, also, I think—have given to trees along highways and in situations where they are part of the highway landscape, the protection of a wise law. Under this law each town appoints a tree-warder serving without pay (and therefore with love) who may seal to the town by his label such trees as are truly the common possession, regardless of whose land they happen to be on. If the owner desires to cut down a tree thus designated, he must first obtain permission, after stating satisfactory reasons, of the annual town-meeting, and this is not so easy as to make cutting frequent.—*J. Horace McFarland in Getting Acquainted with the Trees.* [Here is a point for those who really desire to protect our native plants.]

ORIGIN OF THE NAME DOGWOOD.—According to the authorities the name dogwood was given to the cornels (*Cornus*) because a red barked species of Europe was used to make a decoction with which to wash mangy dogs!

STORAX.—The sweet gum (*Liquidambar styraciflua*) is well known for its production of a clear resinous balsam used for chewing gum. Form the resemblance of this balsam to the storax of the drug stores the tree is sometimes called American storax. The true storax is obtained from an allied species (*L. orientalis*) native to the region about the Red Sea.

USE OF THE TEETH OF MOSS CAPSULES.—"I remember a story of two botanists who were much interested in mosses. One said to the other that he had often wondered why the teeth of the capsules differed so much in different species. 'Oh,' said his friend, 'I see no difficulty. If it were not for those differences, how in the world should we be able to distinguish one species from another.' I once heard a lady suggest that the reason of the great number of bulbous plants in South Africa was because the Dutch are so fond of bulbs!"—*Lord Avebury in Nature Notes.*

WHEN FLOWERS PRODUCE THEIR ODORS.—In all probability the odors of flowers were developed for the sole purpose of attracting insects to their blossoms. It is therefore interesting to note that flowers pollinated by insects that are abroad for only part of each day, produce their odor only during the hours when the insects are flying. Various pinks, which are scentless by day, give off a strong perfume at dusk, and the petunia and honeysuckle are said to be most fragrant after nightfall. On the other hand, flowers pollinated by day-flying insects become scentless in the dark. The common evening primrose which is open from twilight to the middle of the following morning developes its odor late in the evening and seems to lose it early in the morning. For this reason it is often thought to be scentless, because examined at a time when the odor is not produced.

SENSITIVE OXALIDS.—The various species of *Oxalis* are noted for closing their leaves and blossoms at night and often, also, in cloudy weather. It is interesting to note in connection with this sensitiveness to light that four or five species of this genus are also sensitive to touch, the leaves closing downward as in the night position and just opposite to the position assumed by the sensitive *Cassia* under similar conditions.

MORE RED FLOWERS.—I was interested in what was said in a recent number of THE AMERICAN BOTANIST about red flowers and after a little thought wrote the names of four flowers not mentioned in your list. These were the *Anagallis arvensis* (poor-man's weather-grass), *Lonicera sempervirens*, *Acer rubrum* the maple so familiar to us in the springtime, and the fire pink, spoken of by Elwyn Waller in the Note and Comment in the August number. This flower I used to find abundantly in and about Bethany, West Virginia.—*Mrs. A. E. Dolbear.*

THE CHANGING FLORA.—At least two forces are constantly at work changing the plant covering of our planet. The flora of any considerable area is as changeful as the population of a great city. The same number of individuals may constantly inhabit it but they are not identical with those that inhabited it last year nor with those that will inhabit it in years to come. Nature, herself, is constantly assisting one species against another in the struggle for territory, by filling up lakes, drying up swamps and leveling the hilltops; but this, important as it must be in the accumulated years is as nothing compared with that destructive animal, man, who clears the forest, dries up the streams and by his agricultural operations drives out the wild plants and gives place to weeds of foreign origin. These weeds, however, are merely certain of the wild species that are able to thrive in spite of man. Many of our worst weeds are from across the sea, but we have natives, also, that cause endless trouble and some have actually gone abroad to compete with the foreign weeds in their own territory.

THE SPELLING OF PERSIMMON.—In early days writers on botanical subjects exercised great choice in the spelling of words especially if they were words of unusual origin. In their efforts to represent the Indian word for persimmon the old botanists have used all of the following: pushemin, pichamin, pessemmin, putchamin, puchamine, parsemena, parsimena, pissmien, putchimon, pitchumon, phishimon, persimon, possimon, pishamin and parsimmon.

A NEW USE FOR SUMAC.—The aborigines in the interior of the island of Formosa are still a pretty wild lot not entirely above the suspicion of being head-hunters. According to the Japanese *Botanical Magazine* they formerly obtained their salt by barter with the more civilized people near the coast, and when they failed to behave properly, the supply was held up until they became more tractable. Lately, however, the natives have become quite indifferent to offers of salt and an investigation shows that they have discovered a way of getting a salty liquid by soaking in water the seeds of a species of sumac (*Rhus semialata Roxburghii*).

THE WHITE MARSH MALLOW.—Apropos the editorial note accompanying the paragraph on the above subject by Elwyn Waller in the August number of THE AMERICAN BOTANIST, I would say that the query is answered in the article referred to by himself. "The Rose Mallows" by Dr. Britton in *Journal of the New York Botanical Garden*, December, 1903. Dr. Britton therein quotes a letter from Mr. Wm. F. Bassett, who introduced the plant into cultivation, in which occurs the line "very unexpectedly I found them to come true from seed and we raised and sold a great many thousand of them." They also came true from seed sown by the writer at his old home in western Pennsylvania and I have known them to do likewise for others. To my mind it is not a mere sport but a really good species.—*J. A. Shafer, New York Botanical Garden.* [The editor has many times seen the species from which Dr. Britton described his new species and has never been quite convinced that they are distinct from the common

kind. In their native haunts the white ones are scattered among those of normal color, much as the white-flowered form of the closed gentian occurs among the blue ones but nobody would consider these latter as separate species. In asking if the white form comes true from seed we had in mind the idea of stimulating further experiments in this line. There is the possibility that the plants of the Hackensack Meadows are not identical with those introduced by Mr. Bassett. If there were any pink ones at all in the progeny of the white-flowered form we would not be inclined to consider the two distinct.—Ed.]

Cleistogamous Flowers of Sundew.—The editor of *Nature Notes* observes that in forty years he has only once or twice seen the flowers of the sundew open and asserts that they are self fertile and almost always cleistogene. We assume that these remarks refer to the round-leaved sundew (*Drosera rotundifolia*) and if so, our observations do not agree for we have usually found the flowers open at the proper season and have seen them thus within a week. There would seem to be some error in calling these closed flowers, cleistogenes, however. A cleistogene is commonly regarded as a closed flower that shows considerable reduction in its parts especially as regards petals and stamens, otherwise the flowers of the closed gentian (*Gentiana Andrewsii*) might be called cleistogene. Possibly the behavior of the sundew may indicate the way in which cleistogamous flowers have originated.

In the Sign of the Moon.—Mr. Elwyn Waller has favored us with the following contribution regarding the influence of the moon on vegetation taken from a recent issue of the Transactions of the American Institute of Mining Engineers. "It is the general belief of the natives of the country [Panama] that timber must be cut in the period after the full moon and before the new moon, or otherwise it will soon decay. This belief is always regarded by strangers in the country as a superstition; but experience shows it to be based on fact. With the hardest varieties of wood in use, such as black *guiacan* or *nispero*,

little difference is noticed, whether the rule is kept or violated; but, with the exception of a few of the hardier varieties, the woods, if cut during the waxing moon, begin to rot almost immediately, and also become infested with a borer that riddles the outer sap-wood. The fact has been noticed by many observers doing work in the country. Mr. Woakes advances the theory that there is a greater amount of sap present in the wood during the waxing moon, and its fermentation and decomposition hasten the decay of the wood when cut during this period. Perhaps the most striking illustration of the fact is given in the thatched-roof houses common in the country, where the thatch is composed of of a species of palm-leaf. The leaves cut during the first phases of the moon becomes useless in fifteen days, being literally eaten up by worms, while the same leaves, cut during the last quarter of the moon, do good service as roofing for a year. Whatever the cause, the facts are as stated, although the writer does not expect anybody unaccustomed to the country to believe them. As an actual test is always sufficient to convince the most skeptical, he hopes, for their own sakes, if they are ever called upon to erect in this latitude timber-structures of native wood, they will make some experiments as to the influence of the time of cutting upon the duribility of the wood before proceeding with the work."

Goldenrods in Late Autumn.—It is possible to have goldenrods in bloom a long time after their usual season is past by simply cutting down the early flower stalks. Some may be cut as early as June and others later. In this way a succession of blooms may be maintained.

Passing of the Southern Pines.—We of the north are helping to ruin the next generation of southern pines by lavish use for decorations of the young trees of about two feet high, crowded with the long drooping emerald needles. The little cut off pine lasts a week or two in a parlor—it took four or five years to grow!—*Getting Acquainted with the Trees.*

Editorial.

The principal difference between the theories of the origin of species advanced by Darwin and DeVries appears to depend entirely upon the length of a jump. According to Darwin, present species have been derived from more primitive ones by gradual variations from the type, those best fitted to survive continuing to carry along the line of development, the rest dying out. DeVries, on the other hand, maintains that new species spring full fledged from old ones without these intergrading forms and that he has actually brought this about in many cases. Unfortunately for the DeVriesian view, the new species produced are unable to successfully compete with their neighbors, and but for the intervention of man, die and leave no mark. It seems conceivable to us that every plant is at times throwing off these differing forms, and that the Darwinian theory of the origin of species takes this point into consideration, but DeVries has shown us the important fact that there is often greater difference between parent and offspring than Darwin supposed, and that, provided the conditions are right, a new species may be produced in a much shorter space of time than Darwin considered possible. DeVries may be right in the main, but there are some relations between plants and animals, the beginning of which seem better explained by Darwin's view. In the case of myrmecophilous plants it is much easier to suppose that the plants and the ants that frequent them have been evolved together, than that each by just the right mutation at the right time have found themselves specially adapted to each other. And if we consider the armed stems of various plants to be principally for defense against animals, it seems reasonable to infer that the most prickly or best protected have survived while the weaklings have died out. Many plants are admirably protected from grazing animals by thorns and spines. To adopt the view of DeVries would be to assume that these

marvellous defenses have been evolved incidentally and not called into existence by the necessities of the plants themselves.

* * *

Even greater apparent objections to the mutation theory arise in connection with the processes of pollination. Aside from a desired explanation of how it happened that when the first entomophilous flowers were ready to be pollinated there were insects with fully developed appetites for pollen and nectar ready to do the pollinating, we still need something to account for the astonishing reciprocal forms of flowers and insects. Flowers are not only adapted to be pollinated by certain insects, but the insects themselves are coated with hairy growths in just the positions necessary to receive and transport the pollen. We can easily perceive the hindrance to cross-pollination it would have been, had the beetles with smooth and burnished armor, instead of the bees and moths, developed a taste for the gifts of the flower.

* * *

There are some species, like the buttercup and the dandelion, that are pollinated by a great variety of insects and therefore have little bearing on the case, but there are others that appear to be absolutely incapable of self pollination and yet are pollinated by a single species of insect. Should this insect not appear at the right time, the flower will set no seed. The classic instance of a Madagascar orchid with a twelve-inch spur may be cited. This is pollinated by an insect with a proboscis long enough to reach the nectar at the bottom of the spur and we find it difficult to imagine any process of mutation by which insect and flower could be so perfectly fitted to each other in a single move. We wish Professor DeVries would explain. There seems to be in any extensive flora, one or more species of plants whose very existence seems dependent upon that of a single species of insect rising with its rise and dying with its disappearance. On this supposition many are accustomed to account for the rarity of several of our native orchids.

Now that attention has been so forcibly directed to the forms thrown off, by what we have been calling species, a new field for original work has been opened to all plant students. It will need many and careful observations on a great number of species before the mutation theory will be either proved or disproved. While annuals and biennials, from the shortness of their span of life, are likeliest to give the most results in the least time, it is doubtless in the forest that we shall find the most striking instances. Many trees have an individuailty about them that is lacking in lesser plants and this may be well set down to mutation. Possibly, too, the many forms now believed to be hybrids among the oaks, willows, etc., may be of the same nature. Provided that a single seed encloses a plantlet with evolutionary tendencies, it only requires to be germinated and brought to maturity to show through a hundred years what DeVries' primroses show through a single season.

* * *

It may be added in passing that the mutation theory is likely to have a very practical bearing upon nomenclature and species-making by showing us a way of testing the specific validity of segregates from other species. If the plant from which the new species is separated, can be proved to be constantly producing such forms through seed, it would seem that we are scarcely warranted in calling the new form a species in the sense that the parent is. This, also, suggests that if all the seed produced by a single hawthorn tree were brought to maturity there might be several surprises for workers with this genus. We understand that Dr. Sargent has begun work of this nature with the hawthorns, and others will no doubt make similar experiments with the violets, blue-eyed grasses and other variable genera. Every person who possesses a few square feet of ground and the patience and time for such work can contribute materially toward a better understanding of plant evolution by careful observations along these lines. The merest botanizer has here a chance to do original work of the greatest scientific value and we hope that many will undertake it.

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CONTENTS.

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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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THE AMERICAN BOTANIST.

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WHAT WINTER SHOWS.

BY DR. WILLIAM WHITMAN BAILEY.

THOSE familiar with our woods are well aware that there is no season of the year entirely devoid of flowers. Not that this blooming necessarily occurs every successive season. What is claimed as the result of long experience, is, that in cycles, say of five or ten years, the acute observer will see and record some flowers in every month.

For instance, we have collected dandelions at least once, on Boston Common, on Christmas Day. Every one knows, too, that on April 19th, 1775, the day of Lexington and Concord, apple orchards were in bloom; that is, the blossoms, and no doubt the orioles, were there weeks ahead of time!

The dandelion is a very hardy plant and has been found well up toward the pole. In late November, too, it is not unusual to find *Houstonia cærulea*, *Viola lanceolata* and *ovata*, and *Leontodon autumnale*. The latter begins to bloom in New England in June.

Everyone knows that chickweed, a most frail, flaccid and delicate looking plant, will, when the snow is off the ground, blossom all winter. It is said that in its hibernal state, it is self pollinated, as there are no insects about to assist it. In summer, it is adapted to cross-pollination—and its flowers modified accordingly. Its seeds will germinate at a very low temperature.

It is not at all uncommon in November or even December, to find the trailing arbutus (*Epigæa repens*,) as well as hepatica, both essentially vernal flowers. As we have noted, violets have a way of appearing late. With adventive plants we expect these tricks. Even two centuries

do not seem to wholly acclimatize them. They are hardier than the natives. They do not take up the Yankee customs. But when this unseasonable blooming occurs among indigenous things, it is remarkable.

Generally the discoverer, not necessarily young, thinks when he finds these winter bloomers that he is a modern De Gamo, Columbus, Americus, or Balboa. He either rushes into print or proclaims his experience from the house-tops. It is as with albino forms of flowers—usually colored; it is hard to convince the finder that his observation is not original. Where is the old botanist who has not had white gentians or cardinal flowers sent him as things extraordinary?

Dr. Asa Gray used to say that he proposed if he lived to issue a new edition of the Manual, to insert in the preface a remark "Always expect a white form of any flower." Certainly it would save postage stamps and disappointment. The world, even by conservative estimates, has existed a good while, and during the time many persons have seen things, and many things have happened. It is well to remember this.

Our deadest months as to real flowers, are, no doubt, January and February. Then, if ever, come bloomless days. But to show what may happen, skunk-cabbage now and then pokes through the ice in February, or *Draba verna* ripens a pod. Often has the writer seen the silver-leaf maple in full bloom on Valentine's Day. A little unusual weather, too, will cause the pendant catkins of elder and hazel to shed their pollen.

Apart from actual flowers, winter shows many forms of life. Certain low algæ and fungi show themselves on tree trunks, and moist banks, fences, etc. More especially after a rain do the northern sides of trees show what George Eliott calls "Nature's powdery paint." Flowers in the common sense, these have not, but they do possess highly organized means of reproduction. Again, lichens, the pioneers of vegetable progress, which recent observation show to be dual existences, alga and fungus in combination, are much in evidence in winter.

Under ground our forest plants are now very busy. We have but to dig up a spadefull of black loam from the woods to reveal many vigorous, aggressive, buds, bulbs, corms and root stalks, all provided for an active summer campaign. Vitality, too, is shown in the orange, yellow, red, or green tinge of various twigs on tree or shrub. As spring approaches these colors become more prominent. They herald the advent of leaf and flower.

Brown University, Providence, R. I.

COLOR CHANGES IN INDIVIDUAL FLOWERS.

BY JOHN H. LOVELL.

COLOR changes in individual flowers are much more common than is generally supposed. A good illustration is afforded by the widely cultivated shrub *Hydrangea paniculata*. The inflorescence at the time of expanding is green changing to white, later becoming reddish, and finally in wilting turning brown. In another species of Hydrangea (*H. hortensia*), cultivated from eastern Asia, the flowers are at first green changing directly to pink or purple. A species of *Lantana* common as a house plant has the corolla at first white, then yellow, and finally red. An observer in South America states that the flowers when yellow are sought by bees, and when red by butterflies.

The bush honeysuckle (*Diervilla trifida*) has yellow flowers, which change to red, and similar change may be observed in the flowering currant (*Ribes aureum*) and in the genera *Weigelia* and *Fuchsia*. It is the opinion of Hermann Muller that this variation in color may save the time of the pollinating bees by enabling them quickly to distinguish the older flowers, which have ceased to secrete honey, from the newer ones. But this is not the case in the bush honeysuckle; for I have repeatedly observed that the honeybee visited the older reddish flowers, which still continue, to yield nectar, quite as often as the younger yellow blossoms.

The climbing honeysuckle in my garden has the interior

of the flowers white on the first evening they open, but by the second evening they have become yellow. The plant is pollinated by hawk-moths and the change in color, it is believed, may guide them in their work. On the first evening the antlers are ripe and stand directly in front of the entrance, while the stigma is bent downward. In this manner self-fertilization is averted.

In *Cobæa scandens* the flower on expanding is green but soon assumes a violet hue; in the Christmas rose (*Helleborus niger*) the sepals change from white to green; while in some flowers of the mustard family (*Cardamine*) the petals change from green to yellow. Many red flowers, I have noticed, fade nearly to white before the petals fall, as in some roses, spiræas and the flowering almond. I once transplanted some poppies before they had blossomed. Those undisturbed produced flowers with scarlet centers and white margins, while the plants that had been moved displayed only pure white flowers. A plant of *Nemophila insignis* in my garden throughout the summer yielded a profusion of blossoms with deciduous blue petals, but in September the petals became persistent changing from blue to green and increasing in size.

But in no family is this peculiarity of floral coloration so marked as in the Boraginaceæ, or borage family. The flowers of borage in bud and when first expanded are pink but change to blue. They are very attactive to bees, and during the past summer I watched the honeybee and bumblebees for the purpose of ascertaining whether they found the red or blue blossoms the more attractive. They were repeatedly seen to visit flowers of both colors, but no preference was observable in their behavior. In *Myosotis arvensis*, which also belongs to this family, the corolla has in bud a yellow tube with pink lobes, which change to blue and fade to white. *M. versicolor* is yellow changing to blue or violet; while *M. alpestris* produces dark blue, bright blue, reddish and even snow white flowers. *Echinospermum lappula* is white in the bud, red before expanding, and finally bright blue. The corolla of

Arnebia cornuta, to mention only one more of the many examples which occur in this family, bears at first five purple spots which in a few days fade away leaving it a bright yellow.

It is not possible to attribute all changes in the coloration of individual flowers to the same causes, for in many instances special conditions must be taken into consideration. But in a general way it may be stated that they preserve transition stages in the evolution of floral colors. When the transition is from green, white or yellow to red and then to blue the course of development is upward; while a change from blue or red to white or yellow may be ascribed to reversion.

Waldoboro, Maine.

THE BEAR BLACKBERRY.

BY W. H. BLANCHARD.

THIS blackberry was described and named in 1891 by Dr. N. L. Britton as *Rubus Millspaughi* in *Torrey Bulletin 18:* 366 from specimens found by Dr. C. F. Millspaugh on Point Mountain, Randolph County, West Virginia. I have lately learned some interesting things about it from Dr. Millspaugh, himself, now of the Field Columbian Museum, Chicago.

The mountaineers call it the "October blackberry" as it ripens its fruit late in October, long after all other blackberries in that region have ceased to bear fruit. They also call it the "thornless blackberry" and it is absolutely unarmed. But they claim that it is upon the fruit of this blackberry that the bears grow fat for their winter hibernation, and so they call it the "bear blackberry." The fruit is long, slender, juicy and "heavy-seeded."

The flowering season is from July till into September. The plant is perfectly glabrous and the wand-like canes are from twelve to fifteen feet long. One can go among them unscathed. A typical leaf on a new cane is 16 inches long, five foliate. The petiole is 6½ inches; middle leaflet 7 by 3 inches; petiolules 2½ inches; side leaflets 6½ by

2¾ inches; petiolules 1¾ inches; basal leaflets 5½ by 1¾ inches, nearly sessile.

Dr. Millspaugh's observations were made in Randolph, Pendleton and Pocahontas Counties on the high Alleghanies. Dr. L. H. Bailey in "Evolution of Our Native Fruits" quotes from a correspondent an account of this blackberry growing on the high mountains of North Carolina, describing it as tall, unarmed, with long, slender fruit, ripening very late. It seems to be a profuse bearer, and the fruiting season must be a long one judging from its long flowering one.

After the bear blackberry had been described, it was noticed or remembered that we had a blackberry at the North which agreed with this description better than with any other, and so our botanists assumed this belonged to the same species. Then Dr. Bailey, while studying American berries in European collections, discovered that *R. canadensis*, L. was not our northern dewberry as everybody had supposed, but was a glabrous, unarmed, erect kind which he considered to be the same as *R. Millspaughi;* and so, *R. canadensis*, being an older name, has displaced *R. Millspaughi.*

But are these northern and southern plants the same? The writer has an intimate acquaintance with the northern plant. The bear blackberry appears to be a much taller plant, *really* unarmed, while ours is not, only comparatively so, with much larger leaves, broader stipules, shorter inflorescence, smaller flowers and more ascending pedicels. The fruit of our form is globose or short oblong, never long and slender. I think we have pretty good proof that *R. Millspaughi* should hold its place as a distinct species.

Probably some of the readers of THE AMERICAN BOTANIST have some acquaintance with the bear blackberry, and possibly some live where it grows. Now is a good time and this journal is a good place to let botanists hear from them. Furthermore, the writer would like to correspond with them in regard to it, and obtain specimens

showing accurately the leaves on the new as well as the old canes, the flowers, form of inflorescence and the fruit.

Westminster, Vt.

IN A WASHINGTON MARSH.

BY A. S. FOSTER.

PUT your finger on the map in the northwest part of the United States, trace east from Puget Sound some forty miles until you find Mt. Baker, one of the many grand peaks of the Cascade Range. Here in the piedmont district, within twenty miles of his summit may be found not only beautiful scenery of woodland and valley but many rare forms of plant life—a wonderful volume spread out for the reading of any naturalist, and especially so for any of our friends who are familiar with the Eastern flora of this great country. Here the geologist may uncover the remains of a tropical vegetation of some carboniferous period, and, on the other hand, in an hour's ride, study glacial action at first hand, or turn his attention to the varied effects of glacial drift and denudations of the Ice Age, or listen to the scream of our emblematic bird.

On the flanks of Mt. Baker are many bogs once subalpine lakes of small area, which now contain many interesting forms of vegetable life. These bogs are surrounded with the giant trees of the region such as Douglas spruce (*Psendotsuga taxifolia*) growing with very thick bark and merging into the variety *suberosa*. Even the Sitka spruce (*Picea sitchensis*) flourishes on the sides of the ridges. The giant shingle cedar (*Thuja plicata*) is often found six feet in diameter. Our hemlock (*Tsuga heterophylla*) is interspersed with other conifers often preempting the more favorable locations. These trees make the prominent features of the forest which may surround one of these bogs.

A hemlock straggling into the swamp becomes decrepit and prematurely old. Trees apparently forty or fifty years old are not over eight or ten feet high, reminding one of their Japanese cousins one may see in the curio-

bazaars. The little sugar pine (*Pinus monticola*) struggles through a depauperate existence at last dying when it is fifteen or twenty feet high, or else it is overturned because its roots cannot take hold of the cold, wet, clayey soil, but the thimble cone pine (*Pinus contorta*) is able to do fairly well so it spreads over the floor-like level of the logs, serving as a protection to the golden moss (*Hypnum schroderi*) and support for thousands of lichens, being grotesquely festooned with *Usnea barbata*, which may run into a reticulated variety of lace-like beauty.

The floor of the bog is covered with sphagnum (*Sp.?*) in very beautiful shades of brown, red, and green, and the usual ericaceous plants such as, *Ledum grœnlandicum*, and *L. glandulosum*, the first of which is often called Labrador tea. These bogs are often referred to as cranberry marshes on account of the abundance of the wild cranberry (*Oxycoccus palustris*) which grows in profusion and whose fruit is eagerly sought to make a sauce for the annual Thanksgiving turkey. These plants make a beautiful mosaic and give the bogs the appearance of a carpeted park, around which stand the grim sentinels of centuries. Growing in and among the sphagnum is found that peculiar insect catcher, the sun-dew (*Drosera rotundifolia*) battening on the millions of midges—yes, we caught him with a gnat in three or four of his hands! The carices struggle with the huckleberries (*Vaccinum parvifolium* and *V. vitis-Idæa*) for the spaces in the surrounding forest where the fallen logs were settled upon by the salal (*Gaultheria shalon*) and feather moss (*Hylocomium splendens*) with many other interesting species of moss and hardy ferns, making an almost impenetrable rampart; but the many broken limbs indicated that bruin had made many a feast on the luscious berries, and that where beast has gone man may follow.

Hamilton, Wash.

BOTANY FOR BEGINNERS—XVII.

THE FLOWERING PLANT FAMILIES.

It will be remembered that the flowering plants are placed in two great groups one of which, the Gymnosperms, contain the pines, spruces, cycads and other closely related plants, while the other, the Angiosperms, contain the rest. The general public, inclined to think of the coniferous trees as flowerless, would probably consider all flowering plants as belonging to the Angiosperms. For this reason we shall leave the Gymnosperms out of consideration for the present and begin with the better known division of flowering plants.

The Angiosperms also consist of two great divisions that are structurally very different. In the Monocotyledons, of which palms and grasses are good examples, there is but one cotyledon or seed leaf, the woody bundles are scattered throughout the pith in the stem, the leaves are parallel-veined, the trunks have no bark, and the flowers are of the three-parted type. The Dicotyledons, on the other hand, have two seed leaves, the woody bundles form a cylinder around the pith, the leaves are usually netted-veined, the trunk produces bark and a new layer of wood annually, and the flowers are four-parted, five-parted, or at least of some other number than three.

ORDER 1—THE PANDANALES.

Those who have seen in some conservatory devoted to tropical plants, a slender-stemmed plant with long narrow, tapering, leaves hooked on the margins and arrang-in three spiral ranks on the stem, will have a good idea of the family of screw-pines (*Padanus*) for which the first and least specialized family of Monocotyledonous plants is named. In many ways do the plants comprising it show their primitive character. We have heretofore considered principally the flower, but it is interesting to know that the structure of the stem and leaves, the habit at affected by the various species, and their wide distribution, are all taken as evidences that this is a primitive group. In the three families comprising the Pandanales, the

Typhaceæ, the Sparganiaceæ and the Pandanaceæ, there are but five genera and a very limited number of species, all of them water-loving plants.

The screw-pines and their allies in the Pandanaceæ are shrubs and trees found in the Tropics of the Old World. Our representatives of the order are the cat-tails and burr-reeds of our marshes and swamps. Not so long ago, all were placed in a single family, the Typhaceæ, but they are now pretty generally regarded as distinct enough to form two families of equal rank. In the Typhaceæ there is but a single genus, *Typha*, and about a dozen species, while the Sparganiaceæ, has the single genus *Sparganium* and about the same number of species.

As befits the most primitive of the Angiosperms, the flowers are very simple structures. In the Typhaceæ they are assembled in spikes, and in the Sparganiaceæ in heads and these are subtended by scarious spathe-like bracts that doubtless foreshadow the spathes so noticeable in the *Arum* family. In the cat-tails the staminate flowers are borne above the pistillate ones and on the same axis. They consist normally of three stamens surrounded by various slender bristles which by some botanists are taken to represent a calyx and corolla. The pistillate flowers, also assembled in spikes, each consist of a single ovary elevated on a thread-like stalk called a gynophore. In some cases each pistil is surrounded by a tiny spathe. Below the ovary the gynophore produces numerous hairs which as in the case of the stamens are often considered to be a rudimentary perianth. The stamens ripen just as the pistils are receptive and self-pollination seems to be unavoidable. The pollen is shed in prodigious quantities and in some parts of the world is used as food. It has also been used like Lycopodium spores.

Sparganium differs from *Typha* in having both stamens and pistils in heads, but the staminate flowers are as usual above the pistillate and self-pollination is the rule. It is likely, however, that the flowers are occasionly cross-pollinated by insects since both sorts of flowers are fairly

conspicuous. The heads of flowers are bracted and there are various scales surrounding the individual flowers which may be called the perianth, though many do not so regard them.

When the fruits of the cat-tail are ripe the silky hairs on the gynophores form excellent parachutes, by means of which they float away on the wind. Should they alight on water they float about for some days when the fruit opens and allows the seed to drop to the bottom. In germination the young plant pushes out through a sort of trap door in the end of the seed.

The stems of our species are in the form of rootstocks buried in the mud, often beneath the water. From these the leaves rise in two equal ranks and usually become nearly erect. If one will examine the leaves he will often find them twisted in two or three turns. According to Kerner this is to lessen the force of the wind, the leaves simply turning with the blast instead of breaking.

The burr-reeds are mostly found in the North Temperate Zone. There is one species in New Zealand. The cat-tails extend to the Tropics. Our common species (*Typha latifolia*) is found around the world, and others are as widely distributed.

FRINGED GENTIAN NOTES.

BY J. FORD SEMPERS.

IN raising the fringed gentian from seed I notice the plants are capable of being rather closely crowded the first season without appearing to suffer greatly. Indeed they seem to thrive best when the low-lying leaves have just room enough to cover the intervening space between adjoining plants. Thus far with me, the plants seem content with very meagre opportunities for growth the first year. When I have attempted to give additional room and other adjuncts tending to insure greater growth I have been rewarded with scarcely larger plants than those taken from closely planted groups.

It is quite likely that in raising these that it has not

been possible to supply every requirement for attaining perfect growth, which may account for the result obtained. Be that as it may it appears that the gentian is able to persist in quite close quarters at first.

This peculiarity, with the biennial habit of the plant, suggests an explanation of the presence in some gentian localities of the many small depauperate specimens noticed, and which apparently result from overcrowding. It is, of course, in the second year that the plants, when thus crowded, are unable to make normal growth. Such a limited area can not yield the necessary elements for the building up of so many individuals. So we have the next best thing, many dwarfed plants.

As gentian seeds are very small and numerous it is evident that they must be well scattered to succeed in the struggle for existence. A single average sized plant is capable of starting a plantation of these depauperates if only a small fraction of the matured seed should germinate, and be able to grow. To judge by what we see this may sometimes take place. It is to the well spaced and widely scattered seeds that we owe our well formed plants.

So it likely happens that if the rival plants with which the gentian has to contend in its second year are those of other species, especially late starting annuals or even perennials, the prospects for a gentian victory are good. But if the contending plants are all gentians closely grouped we may reasonally expect a lot of small ones or two-flowered specimens. These may appear more or less isolated but investigation will no doubt reveal others, and smaller ones which may not have been able to develop flower buds.

It is also of interest in this connection to mention the means by which gentian seeds are distributed. If examined under a lens many blunt disk-like projections are noticed covering the seed. It will be further noticed that the edges of these projections are destitute of hooks, serrations, or other devices for causing the seed to adhere to passing objects. But quite to the contrary their object

seems to be to repel the seeds from anything in motion, coming close enough for contact. That is, the disk-like processes act as so many springs which tend to keep the seed moving if but lightly touched. Try placing a quantity of seed on a newspaper or other plane surface, and touching the mass with a lead pencil. You will soon find the seed scattered over several square feet. So in falling from the ripened capsules the seed is apt to rebound to some distance, especially if striking the frozen ground, or glazed snow.

No doubt we are indebted to certain of our winter birds, particularly the tree sparrow (*Spizella monticola*), and the snow-bird (*Junco hyemalis*) for aiding in the scattering of the seed. It so happens that the gentian grows in company with other plants, the seeds of which are gathered as food by these and other winter visiting birds. We can reasonably believe that a seed so plentifully supplied, and so well equipped for motion as that of the gentian will hardly escape the busy feet of these birds as they delve in the fallen leaves or scurry over the snow.

Aikin, Md.

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 KENTUCKY COFFEE TREE.—According to a writer in *Park and Cemetery* the Kentucky coffee tree (*Gymnocladus canadensis*) is purely American there being but one species in the genus. The fruit is a broad pod with several seeds nearly as large as marbles. It is said that the tree gets its common name from the fact that the early settlers used the seeds as a substitute for coffee, though they are exceedingly hard and must have been difficult to crush.

FLOWERS OF THE COMPASS PLANT.—The compass plant (*Silphium laciniatum*) and others of the same genus are well known to turn most of their leaves in a general north and south direction with their edges toward the sky and earth; but it is not generally known that the flowers also have a peculiarity in the way they face. In an old number of *Garden and Forest*, E. J. Hill notes that a majority of the flowers face the east and do not turn with the sun as those of the sunflower do.

REGARDING THE PERFUME OF HEPATICA.—As I have observed this only in very early spring, I had concluded that the hepatica is only fragrant when it first opens. However, your suggestion that possibly moist air or the temperature, may have something to do with it, is well taken and may possibly be the explanation. To what is the various shades of color—deep blue, pink, white—of the sepal due? Do they change with age or are they different from the beginning? My experience is that they are of different colors and do not vary *greatly* with age. I find, too, that the flowers are all, no matter what color, equally fragrant.—*Charles C. Plitt, Baltimore, Md.*

RED FLOWERS OF THE WEST.—Should not *Malvastrum coccineum* of the western prairie be added to the list of distinctly *red* flowers? Coulter gives its common name as false mallow, and Miss Eastwood calls it red mallow. It does not seem to have any hint of orange, scarlet or dull red, and I never heard the most careless observer call it pink. It is a clear vermillion, lighter or darker as it varies more or less towards white. It grows in mats all over Denver's vacant lots, and the prairies surrounding the city. This mallow, the blue spiderwort and the big white evening primrose form a color trio which glorifies Denver streets in spring, and later is replaced by the sunflowers, the white prickly poppy and the pinkish-magenta *Cleome*. *Gaura coccinea* is also red when the blossoms first open, but so quickly turns pink and then white in fading that perhaps it could hardly be classed with flowers distinctly red.—*Mrs. Byron C. Leavitt.*

THE STRIPED MAPLE.—The author of "Getting Acquainted with the Trees" says that the striped maple (*Acer Pennsylvanicum*) is hard to transplant. The editor of this journal does not find it so. He has one growing in his home grounds that is now nearly fifteen feet high with a trunk five inches in diameter. It is one of the handsomest small trees to be found in the vicinity, whether viewed in summer, clothed in its dark rich foliage, or in winter, when the green and white striped bark is most conspicuous. Each season it is covered with racemes of pale yellow bell-shaped flowers that appear just as the leaves are opening. The natural habitat of this species is in cool shady ravines, but the tree in question is planted on the south side of the house and exposed to the sun throughout the day.

THE MARSH-MALLOW AGAIN.—Under "Note and Comment" in the issue of your journal for August, 1904, I observe that a writer under the heading "White Marsh-mallow" refers to the marvelous floral display seen upon the "Hackensack Meadows" during mid-summer and the name there given to this showy flower is marsh-mallow or *Althæa officinalis*. This piece of low meadow land lies between Newark and the Palisades in New Jersey. The mistake here made is one quite commonly entertained and as these meadows, with their floral decorations, are probably seen by more people than any other like spot in this country it seems important that it should be corrected. The flower referred to is the rose mallow or *Hibiscus moscheutos*. I am not sure that the *Athæa officinalis*, that serves as the basis of the confection known as marsh-mallow, is found in this state. I, at least, have not had the good fortune to meet it. The white variety, about which inquiry is made, is common with the *Hibiscus moscheutos* and all the intervening shades between the white and the rich rose may easily be gathered.—*Ellis A. Apgar, East Orange, N. J.* ["*Athæa officinalis*" was doubtless a slip of the pen which the editor, at least, should have discovered. The marsh-mallow has a general resemblance to

the rose mallow but the flowers are smaller. It has been reported from New Jersey, but is very rare if it occurs at all. What Prof. Apgar says about intergrading colors is of special interest, as it bears directly upon the question recently raised in this journal regarding the specific distinctness of the white flowered form.—Ed.]

Mountain Ash Berries.—Judged by human tastes, the berries of the mountain ash are anything but palatable, but the robin and the blue-jay appear to be very fond of them beginning to carry them away as soon as ripe and while other food is still plentiful.

Cultivation of Trailing Arbutus.—It is said that the trailing arbutus, which ordinarily is a most difficult plant to establish in the garden, may be readily transplanted if one will select the small seedlings and remove them with plenty of earth. It is practically impossible to transplant large clumps. The plants may also be raised from seed; but owing to the fact that this species is practically diœcious with perfect stamens and pistils on separate plants, there are many blossoms that cannot set seed. It is said that the sex of the blossom is often indicated by the color, the pale blossoms being staminate and those of deeper color pistillate.

The Ceriman.—The note on this plant in the September American Botanist awakes fond memories. I fell in love with it at first sight (for it is a striking beauty) down in the dank jungles of Southern Mexico. Though very affectionate in its embraces of the sturdy old trees it never stoops to parasitism. The only faults of the fruit are that it is too rich, too aromatic, too fragrant. The richness of the banana and the perfume of the pineapple! And, oh, the delightful way those fruits have of telling you where they are when you are riding through the forest at night! In the close, humid atmosphere you can smell them fifty yards away. The plant is behaving splendidly under cultivation in Trinidad and, if we have our way, Porto Rico will be able to send fruits to New York within two or three years.—*O. W. Barrett, Mayaguez, P. R.*

GUMS IN THE PLANT ECONOMY.—While we are inquiring into the uses of gums and milky secretions of plants, it may be well to remember that one important function is the closing of wounds. No sooner are the tissues injured than these secretions pour out and soon solidify, making a perfect protection to the injured part. In many cases milky secretions may protect from biting insects, but the larva of the milkweed butterfly is not among the number.

OPPORTUNITIES FOR INVESTIGATION.—"There is not an animal or a plant, however common, which would not afford material for, and amply repay not merely the study of an hour, a day or a year, but even the devotion of a lifetime. Look round at the endless diversity and complexity of leaves and flowers and fruits. For every one of these innumerable differences—differences of color, form and structure—there is no doubt a sufficient explanation if we only knew it. Some, no doubt, we can explain more or less satisfactorily, but for every problem we solve we open out a dozen mysteries."—*Lord Avebury in Nature Notes.*

COHESION.—Every botanist is familar with instances of cohesion of foliar organs which are normally separate. Thus, usually cordate leaves, even unsymmetrical ones, like elm, may now and then form a cup-like base. A wedge-shaped leaf of *Gingko biloba* may even become a funnel. While this is so, I have just seen, as far as I can recall my experience, an instance of the union of the two cotyledons of a dicotyledon, resulting in an obcordate, *single* seed-leaf. It has occurred in the seedling of a squash germinating in my laboratory—and at once observed by an acute student. Branched inflorescence of a plant, usually spicate orracemose, is also not infrequent. A specimen of Indian corn (*Zea mays*) in this condition was brought me the other day. Well-formed and half developed ears are confusedly commingled with a mass of silken styles. I am inclined to think, but am not sure, that some of the flowers are even staminate.—*W. W. Bailey.*

Editorial.

We cannot refrain from congratulating our readers and felicitating ourselves upon the amount and character of the matter now being received for publication by this magazine. At the beginning it was not an easy task to secure an adequate amount of original matter, for the average young writer, and many an older one, too, prone to drift into the categorical style and make his articles little more than mere lists of species. Many such we were obliged to return to the writers, but our persistence has at last set the tide in the right direction. We hope, however, that any reader who has been thinking of sending us a note or a longer article will not hesitate under the impression that we have more contributions than we can use. One of the greatest inducements to further enlarging this journal would be the fact that we had more good articles than we could print in the present size.

* * *

It is probable that many of our readers are not aware that good material for botanical articles lie close about their doors. We are doubtless most impressed with articles about the flora of a distant land because the plants composing it present very striking differences when compared with those that surround us; but if any one will investigate the plants of his own immediate vicinity from the standpoint of their habitat he will find that the plant groups inhabiting a lake, a sphagnum bog, an ordinary swamp, a ravine, a dry hill-top or a rich meadow differ almost as much from one another as his own flora as a whole differs from that of distant lands. The cause of this difference is due to the fact that each plant is modified for its own special habitat. How it is modified and how such modifications aid it in its struggle for existence are problems that in many cases are yet unsolved. Their solution calls for observation and deduction of a very high order and may well engage the best minds in any community.

But the fact that we recommend the study of the plants in one's own locality should not deter others in specially favored regions from giving us more general articles upon their flora. Such of us as have never visited the Gulf Coast, or Alaska, or the summits of the Rockies, or the West Indies, or the prairies, or the Atlantic Coast, or the desert region of the Southwest have an idea that we would not have to go very far in such regions to find plants of the greatest interest. Even the commonest plants would be sufficient for us. To one who has never seen a real desert with its many forms of cacti, a single prickly-pear cactus growing on a sandy plain is a wonder and a revelation. And half the pleasures of a great conservatory are derived, not alone from the flowers in bloom, but from the curious forms of the exotic plants there displayed.

* * *

Along with the improvements in the contributed articles there has gone a gradual change in our circle of readers. Those who were interested only in collecting and exchanging plants have dropped out to give place to what we are pleased to believe are the real botanists—people who know plants and love them quite as much for their individuality as for their possible value as specimens. The collection of specimens is not criticised, but collecting we maintain is only the beginning of botany. One of the first instincts of the child is to collect something, even if it be nothing more important than marbles, or tobacco-tags. Later the collecting spirit may turn its possessor to some branch of science, but if any collection does not inspire its owner to know more about the subject in hand, and if the knowing more does not incline him to a greater regard for and interest in it, it has failed of the principal object of all good collections. Most of our readers have been, or are still, collectors of plants, but they are more than mere collectors or this magazine would not appeal to them. We believe that this class will increase in numbers as the years pass, and systematic botany no longer requires the col-

lection of additional specimens. The end and aim of botany is not found in the amassing of specimens nor in the completion of any botanical system, but lies rather in the enriching of life by supplying the knowledge for a thoughtful, contemplative enjoyment of the beauty of the plant kingdom.

* * *

The title page and table of contents to the first volume of this journal has been published and will be sent free to any possessor of the first volume upon application. The other title-pages will appear as fast as we can get them printed.

BOOKS AND WRITERS.

The Atlantic Slope Naturalist published at Narberth, Pa., is apparently dead. Recent letters asking for sample copies, etc., having received no response.

After an existence in various forms for nearly half a century, *American Gardening* has suspended publication. In a nation as big as our own it would seem as if all the gardening magazines now published should be able to find a sufficient following to support them.

A new quarterly magazine devoted to Natural History, called *The Apteryx* is to begin publication in January. It is to be edited by C. Abbott Davis, of the Roger Williams Park Museum, Providence, R. I., and although its name indicates that it will be unable to fly, we trust that it will be able to maintain its place in the race for subscribers.

The editor of *The Plant World* is apparently out of patience with both the magazine and its readers. In the October number he asserts that technical articles would be "absolutely unintelligible to the majority of our readers" and follows up this remarkable statement by printing a testimonial from a subscriber in which he says "I think *The Plant World* is about the thinnest excuse for a magazine of any of them published."

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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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CHANTARELLE (Edible).
(Cantharellus cibarius).

THE AMERICAN BOTANIST.

VOL. VII. BINGHAMTON, N. Y., DECEMBER, 1904. No. 6.

THE CHANTARELLE.

(*Cantharellus cibarius.*)

THERE are some species of fungi whose edible qualities are more or less a matter of opinion, but the chantarelle is one of the few that all unite in praising. It has long been known in the Old World where it grows abundantly and it is often exposed for sale in the markets. On state occasions it is occasionally served up with other costly dainties, and the specific name, itself, means food. An old writer says of it "not only this same fungus never did any one harm but might even restore the dead."

The chantarelle is not an uncommon species in America and is to be found growing both in woodlands and more open places but its merits do not seem very familiar to the general public. It seems to be a species easy to cultivate. McIlvaine says it is easy to transplant the mycelium and that he has also raised the plant from spores. The specimens are most abundant at the height of summer especially after showy weather.

This species when mature is usually shaped somewhat like a cornucopia and hollowed at the top, in this resembling various species of *Hygrophorus* and *Craterellus*. It is quickly distinguished from these, however, by the gills which are broad and round like veins. These extend part way down the stalk and occasionally unite with one another. In *Hygrophorus* the gills are often thick but the edges are sharp, while in *Craterellus* the gills are barely evident. Full grown specimens are three or four inches high and "egg-yellow" in color. Atkinson calls them rich chrome yellow. They have a habit of growing in small clusters in curved lines as if forming

segments of a "fairy ring" and often have the odor of ripe apricots.

Among other colored plates of this species may be mentioned McIlvaine's "One Thousand American Fungi," Plate 46; Peck's "Forty-eighth Report of New York State Museum," Plate 32; and Taylor's "Mushroom's of America," Plate 7. The species is found over most of North America.

THE ORCHIDS OF STONY PARK.

BY LESTON A. WHEELER.

STONY Park is not an extensive tract of land such as is occasionally used for the preservation of wild life, or for its natural wonders, neither is it the breathing place of a city's multitudes; it is merely a small piece of land of about two acres, adjoining the home grounds of a farmer, far from the city's noise and dust. It is about half covered with trees, mostly maple, and has a variety of soils and situations, from a dry knoll to shady woods, bog and a small pond of dead water. There is no less than six or eight out-croppings of ledge and many loose rocks, therefore it is well named.

Last year (1903) I began a special study of our native orchids and for further reference as well as for their beauty I have set them in the park, as nearly as possibly in a similar situation to that in which they were found. In this manner I have got in my collection at least sixteen species and two varieties. Perhaps a few notes on the different species may be of interest.

Habenaria orbiculata which is in bloom by July 6 is quite common here and is one of my favorites, partly, no doubt, from early associations as it has always been highly valued in our family on account of its leaves from which we make an excellent salve. Thus has probably originated two of its local names, heal-all and salve-leaves. It is to be found in cool, moist woods of hardwood or but slightly mixed growth, more frequently on the north side of hills and ledges. I found it growing spontaneously in

the park and have set more around it, also some plants of the variety described in THE AMERICAN BOTANIST for September, 1904. I hereby name it *Habenaria orbiculata* var. *longifolia*, with thanks to the editor for suggesting it to me. In the same hollow with the preceding species I have set its smaller companion *H. Hookerii* and variety *oblongifolia*, which is to be found in the same kind of situations, but blooms about a month earlier. It is also found in the mossy borders of bogs, therefore for trial I have set some on a small island in the pond which I have appropriated for the use of bog-loving orchids. One of the most noticeable differences between this and *H. orbiculata* is the absence of bracts on the stem of the smaller one and which are very conspicuous on the large one.

Another habenaria which is growing naturally in the park is *H. lacera* which grows in three situations in this locality, the most common of which is a mowing which is moist enough for good grass land. It is also found to some extent in bogs. This year I found it in moist woods —a situation that was a surprise to me. It was so different from where I had supposed it grew that, before it bloomed, I thought it must be a different species. On the island in the park it is not doing as well as I would like, but it has established itself in the woods. It is in bloom about July 22nd. Blooming about the same time as *H. lacera* is the purple fringed orchis (*H. psycodes*). It is one of the most conspicuous as well as one of the prettiest members of the family. I have not as yet found it in Jamaica although I believe that others have seen it in town. I went into the adjoining town of Stratton for my plants where they were growing in a sphagnous bog accompanied by such other vegetation as is common to such places. In the park it forms the main feature of the island.

The two other habenarias that I have in my collection are growing on the island. One, *H. virescens*, I first found this year in the bed of West River, growing among the roots of some willows which protected it against high

water, ice, etc. I should ordinarily look for it in wet meadows or bogs. It is in bloom about July 7th. *H. clavellata* I have found in nearly every bog in this neighborhood which I have visited. It seems to delight in the discharge of springs, in which places I have found it the most common. It blooms about the 22nd of July.

My next largest genus is *Spiranthes*, of which I have three species. The first to bloom is *S. Romanzoffiana* which is in flower by July 22nd. It is very fragrant. I have found it in two places, in hardwood or mixed growth where the soil was loamy, and in bogs where I have found some of the best specimens. It failed to winter well on the island, only one root growing this spring out of perhaps eight or ten which I set last year. I was greatly pleased this year to find it growing spontaneously in the park. *S. gracilis* is in bloom by July 29th and has quite an extended blooming season. I have found plants in bloom the latter part of September. It grows in several situations in the woods, in nearly clear sunshine, and in thick shade, in loamy soil, on the borders of ledges and on wet banks. It is quite common here and is doing well in the park in my "woods garden." I have found two forms of inflorescence. In one the flowers are close together and the stalk but little twisted, and in the other the flowers are much farther apart and the stalk much more twisted. The dying of the leaves which is mentioned in the botanies seems to be more frequently, if not always, found with the loose flowered form. I have found the common spiranthes (*S. cernua*) in the woods beside the preceding species, in open fields and in bogs. It is doing well in the woods garden in the park although I have not succeeded in establishing it on the island. I have set some more plants this year and hope to have better success. It is growing naturally in the park. It blooms the latter part of September.

Our only species of *Cypripedium* is *C. acaule*, which is, with us, the first orchid to bloom, it being found by May 22nd. It grows mostly in softwood growth and is more

frequently seen in the valleys of this section. It is doing well in the park beside the *Habenarias* in the woods garden. Its color ranges from dark pink to pure white. Its roots have been supposed to be good in nervous troubles which gives it the local name of nervine.

Achroanthes unifolia is situated on the island and also in a place by itself where it is drier. I have found it in different situation, under pine trees on a dry hillside, in hardwood growth, on the border of a bog, and beside a wall in the open field. It blooms in July. I have had considerable difficulty in determining which species of *Goodyera* I have. I am, however, certain of *G. repens* and a botanical friend thinks that I have the new species *G. ophioides*. Whether I have *G. pubescens* is doubtful. In the park they have a bed by themselves back of a small hemlock. I have found them in cool moist woods, more commonly of hemlock or spruce. They bloom the latter part of July.

Of *Corallorhiza* I have two species. *C. innata* is very inconspicuous and easily passed by as it likes to get under an overhanging limb in a hollow where the leafmold is deep. It is found in cool woods without much reference to kind. It blooms in early June. *C. multiflora* is much more common and more easily found, but blooms later, not before the last of July or the first of August. It grows in cool moist woods where the leafmold is abundant. I have both species set among the rocks back of the woods garden where I put in a lot of leafmold, as, being saprophytes, they will not grow in soil the same as ordinary plants.

Liparis lœselii I found in an old part of the mowing where the soil was about as moist as the average garden. It was in seed when I found it therefore I could not identify it positively until this year. I set it on the island where it is doing better than in its original situation. It is not common here as I have found it in but one place. It blooms in July.

Last year I went several miles to procure plants of

Pogonia ophioglossoides and set them on the island where they have established themselves, but this year I found the plants in considerable abundance in a bog about a quarter of a mile from home. It is one of the prettiest orchids of this region. Its flowers are very delicate in substance and color. As a rule there is but one flower to a stalk but occasionally there are two. It blooms about June 30th.

It is very interesting to watch the development of these plants from the first appearance of the shoot in the spring to the maturing of the seed in autumn.

Jamaica, Vermont.

PORTO RICAN PALM HOUSES.

BY O. W. BARRETT.

THROUGHOUT the interior of Porto Rico one may see, perched upon a hillside or half hidden in a lowland thicket, the typical hut of the native "jibaro," as the town people call him. Now the "jibaro" (pronunced, he'-bah-row) is not interested in modern architecture, and he doesn't care how the Filipinos build their houses; he builds on the same old plan of his forefathers, though of course he has improved considerably upon the methods of the aboriginal Arawak Indians.

In the first place he has his own palm to work with, and it is unlike any other islander's palm in the world. He calls it the "Yagua," but a governmen botanist studied it carefully three years ago and pronounced it different from the royal palm of other localities, giving it the name *Roystonea borinquena*. The trunk of this species is of a grayish fawn color, straight, with one or sometimes two swollen spaces about midway of its length; it reaches a height of thirty to sixty feet and lives about half a century. Just beneath the crown of long, dark green leaves is the smooth green portion of the trunk composed of the bases of the leaves which enwrap each other, and the "palmillo," or heart, which is really the tender white terminal bud. The leaf-bases, or bud

sheaths, which fall with the leaves are about one-eighth of an inch thick, three to five feet long, and as wide as the circumference of the green "bud part" of the trunk, i. e., about two feet; when cut from the leaves these are called "yaguas," and are worth half a cent or more apiece for the "siding" of the houses.

In forming the sides of the house narrow strips of the bark of the "majagua" tree (*Paritium tiliaceum*) are used to lace the "yaguas" to the poles of the framework. Though a heavy rain may drive through the cracks and holes for the lacing thongs, when well overlapped there is little fault to find with the cheapness and durability of this unique lumber.

For the floor the outside shell-like part of the Yagua trunk is split into long strips about four inches wide; these boards, or rather slabs, laid with the convex side uppermost make a floor which never wears out and which always has plenty of cracks through which the dirt falls (for of course it is not often *swept*) to the ground below.

The roof is thatched with the leaves or, more often, with the "pencas" of the yagua or with the leaves of the cocoanut, or else with a kind of bunch grass; it leaks during only the heaviest rains. The house is usually about ten feet square, with two doors and one or two windows. The doors and windows are made of the same "yaguas" bound into a light framework, and may or may not have hinges; no glass is ever used, of course. The frame of the house rests on posts from two to four feet high; this plan keeps the interior much drier and freer from vermin. When the "jibero's" family becomes large he constructs a rude low partition extending as high as the eaves, but only about two-thirds of the way across the middle of the interior. Sometimes a kitchen is built as a "lean to" shed at the back of the house.

The total cost of material (supposing it had to be actually bought) for such a house is about five dollars; and with labor at thirty cents a day the expense of erection would not exceed three dollars. The furniture is,

of course, very primitive: one or two benches, a couple of "maguey" hammocks made from the fibre of the century plant, a rude table, perhaps a shelf or two, and a small trunk. And yet it is a comfortable dwelling; and, perhaps, it shelters fewer "family skeletons" than the average Fifth Avenue mansion.

When on a recent tour of inspection of the Public Lands in the very mountainous Luquillo district, I stopped at one of these palm houses away up in the hills and, while waiting for a rain storm to pass, was served with an exceedingly good cup of coffee; and here again was the palminess of it all in evidence,—for the coffee was served in the *half shell* of a cocoanut.

Mayaguez, Porto Rico.

NATURE EVER WITH US.

BY DR. WILLIAM WHITMAN BAILEY.

THERE is no time of year when the plant-lover is wholly deprived of material for study. Even if gross material is wanting, there is memory and sentiment. Nor, by sentiment is designed "gush," though the two things are often confused. There is far too much of the mock-heroic of the "sposhy" in articles written about nature, who is, herself, most modest and retiring, except perhaps, in her angry woods. If anything would excite her righteous anger to hurricane or tornado pitch, one might fancy it would be some of the things said in her name!

To return from a perhaps uncalled-for digression, spring delights us with the ever joyous renewal of life; summer affords a bounteous display of floral beauty in meadows, woods, mountains and fields; autumn is gorgeous with perfection of foliage and fruit. Even winter, at first though forbidding, offers a myriad charming mosses and lichens, the frozen cascade, the broad, dark expanse of crystal-covered river or lake. Again, at all times, nature yields her sea-weeds in ocean, bay, river or even in fresh-water streams; for algæ are not necessarily marine. Diatoms and desmids, for instance, are fresh-water forms,

and to them the designer can well resort for original, striking and exquisite patterns. Forms of these can be found in nearly every stream or pond. Moreover, the botanist, who has been at all active in collecting in the warm months, has on hand in winter a store of material for investigation or arrangement.

It is sometimes said that the love of nature is inherent. To those who advance this view, it is sufficient to call attention to the manifestations of window-gardens, and of back-yard cultivation among the very poor. Where, it is said, is the hovel or slum, too squalid to reveal the struggling flower in broken pot or cracked water-pitcher? While such displays are assuredly frequent and speak well for humanity at large, it is no doubt a fact that real nature-love, never to be mistaken when met with, is an inborn faculty. Like poetry or art, it comes with the breath of life. Often it is sporadic and sudden in development. There are many that possess it not at all or to a slight degree only, To a few poor souls a stately tree is but so many feet of timber, Niagara (alas!) so much wasted power; an exquisite flower, something colored—a primrose "and nothing more." Upon such, form, color, design, all are lost, for them

"No minstrel raptures swell."

At the same time it may be said, that of these, even the dullest and least appreciative possess the germ of something better, and may be benefitted by example. Given but a slight spark indicating an admiration of the beautiful, it may be fostered, cultivated and caused eventually to illumine the individual and his household.

An experience of many years has proved to the satisfaction of the writer, that while a large number of persons are influenced merely by charm of form or color, there is an increasing number, under the incentive of recent teaching of design or science, who evince intense delight in learning the habits, peculiarities, adaptations and uses of plants; in short, how they live. The extraordinary manifestations of design in nature, the myriad exhibitions

of special structure for particular ends, excite the liveliest interest.

Brown University, Providence, R. I.

SOME PLANTS OF HEMPSTEAD PLAINS.

BY JAMES KIRBY.

IN looking over a recent number of THE AMERICAN BOTANIST I was much interested in reading the names of some wild flowers which I found on a trip across the Hempstead Plains some two years ago. One of the plants is the *Baptisia tinctoria*, or false indigo. It grows here in quantity, and is very attractive when in bloom. The other is *Hypoxis erecta*, star grass. Here also in great patches is *Andromeda Mariana*, the stagger bush. Cattle eating the leaves of this, lose the power of their limbs, and in some instances die from its effects. It flowers in May, and is a beautiful sight when in bloom with its white "lily-of-the-valley" like flowers.

These plains are noted for the acres of violets,—(*V blanda*) the white sweet-scented, *V. Delphinifolia* and others. They certainly are a sight worth seeing. Numbers of school children and adults from the adjoining villages gather them by the thousands. Other plants which grow in quantity on the plains are *Aletris farinosa*, *Helianthemum corymbosum* and *H. canadense*. I have seen herbalists gathering the *Helianthemum* and *Aletris* for medicinal purposes.

Taking an opposite direction and going east towards Hicksville we find some *Opuntias* and *Arctostaphylos uva ursa* or deer feed, the latter plant is found in quantity from Hicksville east through the center of the island, as is the wintergreen (*Gaultheria procumbens*). A little south of the Meadow Brook Club is a meadow on the edge of which I found *Habenaria ciliaris*, some *Eupatoriums*, *Chelone glabra*, and numbers of ferns which I did not know at that time.

[It can probably be said with truth that New York City is in the center of a richer flora than any other part

of the United States of like area can boast. Within short distances are the mountains, the Palisades of the Hudson, the salt marshes, the sea coast, the New Jersey "pine barrens" and last but by no means least, the Long Island plains of which Mr. Kirby writes. The editor has derived about as much pleasure in botanizing over them as he manages to get out of the study of plants anywhere.—ED.]

"NEW SPECIES" OF PLANTS.

In late years the multiplication of "new species" seems to have passed all bounds, and the systematist engaged in determining collections finds it a most difficult task to consult the literature of the subject. And that for two reasons: first, because the literature has grown so enormously; and second, because many of the modern plant descriptions are incomplete. The rapid increase in the number of "new species" is mainly due to the failure of many writers to appreciate what is really meant by a species, and also their incompetence to understand the botanical terms applied in scientific botany. Last, but not least, the careless publication of anythink "new," in no order whatever, and with no information as to the affinity of the said new species, is a stumbling block to students of systematic botany. Let us illustrate this by a few examples.

It is not unusual, nowadays, to come across diagnoses, which are so incomplete that one does not gain any idea of how the plant looks, and such statements as "flowers not seen," "fruit not known," are far from uncommon. Moreover the parts underground, the roots and rhizomes, are seldom described, and if described, they are often misunderstood. To make a description complete involves the consideration of all the different organs of the plant, besides a comparison of its nearest allies. But to describe the organs of the plant is by no means an easy matter; this implies a thorough knowledge of botanical terminology, seldom possessed by authors,

whose names figure most prominently among the so-called "species makers." Because if these authors were familiar with that branch of botany which is called terminology, they would be more scrupulous in establishing their many species, and they would not detect so many "supposed undescribed." Then it is a common case that authors of new species disregard the conception of a species. Of course, this is a most difficult problem to discuss, and might give rise to endless dispute, but so much is sure, that all plants do possess some amount of individuality expressed by their ability to adapt themselves to different environment as to climate and soil. The field naturalist is well familiar with such problems as the variation of plants, how they change their foliage, their color, hairyness, etc., when growing under various conditions, in the sunlight or in the shade, in dry or moist places, etc. Some plants otherwise glabrous, become hairy in shaded places; some that are naturally rigid and stout, become lax and weak when found in the woods or dense thickets. It is a question of exposure to sunlight or shade that governs the development of such variations, and much more so than the differentiation into new and undescribed species. That such local variations may be the very outset for the formation of varieties is a well known fact, but we know, also, that such plants regain their former stature when grown under proper conditions to which they are naturally adapted. Cultivation has taught us so.

Another point, which is very often ignored, is that many plants show a wide geographical distribution. Many of our Rocky Mountain species occur, also, in the mountains of Europe and Asia, and it would be very unwise not to consult the foreign floras before establishing "new species." It may seem very discouraging, but the truth is, that if our modern systematists would consider the geographical distribution of plants, if they would study the laws of phytography and, last, but not least, consider plants as living beings, the number of new

species would become much more limited, and we should gain a more correct idea of the vegetation, of its components, the genera and species.

There is still another point which often evades the attention of botanists, the selection of a name for the "new species." This is by no means unimportant, and we regret to say that not only are so very many of the lately published genera and new species poorly founded, but they are often so badly named, that botanists must shrink from recording such names. It is an old law that a name must be either in Greek or in Latin, and there seems no excuse for introducing such linguistic atrocities as: Yellowstonense, pseudo-repens, pendocarpa, Gallonchis, Rubacer and the like. Names that are so badly composed must necessarily give us the impression that the author is not very well versed in Latin, hence that he is unable to read a diagnosis in Latin with any profit.

When we finally mention the manner of publishing new species regardless of arrangement and without offering any clew to the systematic position of the new species, we believe to have demonstrated the most apparent difficulties involved by establishing too many new species. Systematic botany requires systematic treatment from beginning to end; we must treat the plants as living organisms, we must study the classical works on descriptive botany and on plant geography whenever we wish to deal with "new species." And the more fully that experience teaches us the difficulties in controlling these broad chapters of botanical science, the less we feel ourselves justified in undertaking too much of such hazardous work as that of establishing "new species."—*Theodore Holm in Guelph Herald.*

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 NEEDS OF NATURE STUDY.—What we need in this country, and what we will ultimately have, is a body of teachers who have themselves been properly taught before they have been set the difficult task of instructing the children. Furthermore the daily press requires liberal education in its selection of paragraphs on natural science topics. The attitude of most editors is inexplicable if we assume them to be in any way anxious for truth. The writings of students and observers are set aside for bizarre stories of wonderful tropical plants exhibiting human intelligence, or of trees that poison all who pass by them. The need was never greater for a large and well-trained body of teachers and writers or biological subjects.—*Plant World.*

PILFERING INSECTS.—Flowers secrete honey for the bees, butterflies and moths, and reserve it for them by fencing out creeping insects and other small game. All this of course is intended to promote cross-pollination, but the bees often abuse the trust reposed in them by stealing the honey without transferring the pollen. They bite through the tips of long spurs or make perforations at the base of deep corollas and so get at the honey with less effort than if they obtained it in the way intended by the flowers. It is remarkable how accurately they gauge the location of the nectar, never making a puncture in the wrong place, and seeming to indicate a fair amount of reasoning power in apian brains. Sometimes they bite through both calyx and corolla when this is the most direct line to the sweets. Among flowers oftenest punctured are the jewel-weeds, flowering currants, the lungwort

(*Mertensia*) the columbines rhododendrons and various other heathworts. Nearly a hundred different species have been thus punctured. The bumble-bees (*Bombus*) and the carpenter-bees (*Xylocopa*) are responsible for much of the mischief, though wasps are said to occasionally aid in the work and various other insects visit the punctures for honey but do not make new ones. The insects making these perforations, are those with short tongues that find it difficult to get the nectar in the regular way; but since perforated flowers are likely not to be pollinated, the wily insects seem to be killing the goose that lays their golden eggs.

Flowers of Clematis.—Most botanists know in a general way that the flowers of the common virgin's bower (*Clematis virginiana*) are diœcious, that is, that stamens and pistils are borne on separate plants, but it is doubtful if many of them could describe the flowers correctly. The plant which produces the pollen has flowers possessing only a calyx and stamens, but the pistillate plant has, in addition to the calyx and pistils, two or more whorls of abortive stamens. These stamens are still equipped with rudimentary anther-sacs but the pollen is absent. The stamens are not entirely useless, however, for, as the calyx withers, the filaments broaden, become white and spread out in the plane occupied by the sepals making a sort of corolla. The flowers are visited by multitudes of tiny black flies less than an eighth of an inch long and these are probably the chief agents in pollination, though the blossoms also attract various other insects, especially certain flies about the size of house-flies and a handsome black and white moth of medium size.

The Local Distribution of Plants.—At the extreme southwest corner of Wellington County, Ontario, lies Puslinch Lake, a body of water about a mile and a half long by a mile wide. In the middle of the lake is an island about 350 yards in diameter, with scattered clumps of bushes and trees, and with a patch of swamp on the north side. On this island there are four plants

not found in the immediately surrounding district. These are the skunk-cabbage (*Symplocarpos fœtidus*), for which this is the only station in the county, and which is not found again for about four miles to the south when it becomes common; the northern bedstraw (*Galium boreale*) which is not found for six miles to the south, and for at least twenty miles north, and eighteen miles east; the horse gentian (*Triosteum perfoliatum*) which is absent from the surrounding three miles of territory; and the early golden-rod (*Solidago juncea*) which is not met with again for a mile south, and at least ten miles north, and four miles east. The conclusion to which we are forced is that there is some influence unfavorable to these species on the surrounding mainland but absent from the island.—*A. B. Klugh, Geulph, Ontario.*

Sources of Rubber.—Four families, all of them having representatives in the North Temperate Zone, furnish the rubber of commerce. The Apocynaceæ is familiar through the dog-banes (*Apocynum*) the Asclepiadaceæ by the milk-weeds (*Asclepias*) the Euphorbiaceæ by the spurges (*Euphorbia*) and the Urticaceæ by the nettles (*Urtica*). The great majority of the plants belonging to these families have a milky juice similar to that from which rubber is made but only a few genera furnish species that are commercially valuable. The Euphorbiaceæ probably stand first on the list with the genus *Hevea* which yields Para rubber and *Manihot* the source of Ceara rubber. Both of these are American genera. The rubber producers of the Urticaceæ are found chiefly among the figs (*Ficus*) and the bread-fruits (*Artocarpus*). The Apocynaceæ have an unusual number of genera with rubber yielding species. No less than eight or ten are known to commerce and the number of species is much greater. They are found mostly in the Old World. The Asclepiadaceæ are of least importance, the principal rubber producer being *Cryptostegia grandiflora*. Doubtless there are many other plants with a milky juice that would yield a good grade of rubber, but the expense of extraction prohibits their use.

MAIZE RUST.—Wherever Indian corn is grown it is likely to be infested with a rust called the corn or maize rust (*Puccinia sorghi*). In the case of other rusts several phases of the plant are known and not infrequently these different phases are on different plants. Until the present season the accidium stage of the corn rust has never been seen, and it was conjectured that either this species had dropped this stage from its life cycle or the æcidia were to be found only in the region over which corn once grew wild. All this however, has been changed by Dr. J. C. Arthur's discovery that a rare æcidium on the common yellow oxalis belongs to the corn rust. Spores of this æcidium brought in contact with young corn produced the corn rust within a week.

VIOLET HYBRIDS.—When rash species makers, a few years ago, began to describe as new species every striking form they encountered, there were conservative botanists who suggested the possibility that many of these "species" might be forms or even hybrids. Among them President Ezra Brainerd has been slowly accumulating evidence in support of this view and in the November *Rhodora* shows that many New England violets have characters that indicate that they are hybrids. Apparent hybrids between nearly all the blue violets of New England have been found. Incidentally *V. Porteriana* and *V. melissæfolia* are now believed to be hybrids. The evidence thus far presented is suggestive but not conclusive. The reputed hybrids have characters suggestive of each of their supposed parents but this does not necessarily make them hybrids. It is surprising, however, in view of the fact that the whole problem can be easily settled by the simple process of hybridizing these plants, that anyone should resort to such circumstantial evidence as wild plants possess. Why not hybridize all the species and await results?

Editorial.

After the matter for this issue was ready for the printer, we had the misfortune to lose a large part of it in the mails. As yet we have been unable to get any trace of it but are making every effort in that direction. In the meantime we have added new matter and trust our readers will overlook this additional delay.

* * *

Possibly some of our readers are not aware that the editor, in addition to looking after this journal and *The Fern Bulletin*, is a teacher of biology in a city high school and has just completed a book on the fern allies. It has sometimes happened, in consequence of these various calls upon his time, that answers to inquiries have not been made by return mail, but the delays in issuing the magazine have not been due to the same cause. It may also interest our readers to know that these causes of delay have now been removed and that this magazine will be issued on time by July 1st, and ever afterward. We have two numbers of the magazine made up and waiting for the printer, and others will follow at short intervals until we overtake out dates. It would be easier for us to issue one or two double numbers, but we have never attempted to double up in this way and readers may be assured of getting twelve numbers for 1905 as usual.

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To make up these additional numbers we shall need an extra number of articles and we trust that if any of our friends have thought of sending us an article, they will do it at once. A good time to send in your notes is when sending your subscription.

* * *

This magazine in 1905 will continue along the lines it has always followed. If the botanist or botanizer will stop to think, he will notice that the making of new spe-

cies is not progressing with the rapidity of a few years ago. We are just at the turn of the tide and if we can read the signs, the time is not far distant when the study of the plants as living things will receive a new impetus. Indeed, after one has learned the names of the plants what else is there for him to study in botany? Of course, he may join the ranks of those who dig up dead plant names and wrangle over them, but that is not botany. So we shall continue to publish everything we can find of interest regarding the pollination of flowers and the parts color and fragrance and nectar play in the process. We shall still be interested in the adaptations of plants for protection or agression and solicit articles on these points from every reader. The series of articles on "Botany for Beginners" will be continued through the flowering plant families and in the colored plates we shall soon turn our attention from the fungi to flowering plants. We hope to make this a representative magazine for the flower lover and trust to receive the active encouragement of all who class themselves as such.

* * *

All whose subscriptions have expired or whose subscriptions expire with this number have been sent bills for another year with arrearages, if any, added. If any should not care to continue their subscription we shall expect them to notify us of the fact at once. Notwithstanding the irritating slowness with which some of the numbers have been issued we have lost very few subscribers, and we trust that we shall get a prompt renewal for 1905 from all.

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Last October we asked the readers of *The Fern Bulletin* who had full files of that magazine to inform us of the fact. Up to date we have located but fifteen full files. These files are now worth about twice their original value, if sold, but the owners will not part with them. Although THE AMERICAN BOTANIST is not as old as *The Fern Bulletin*, it will not be long until the

first numbers are out of print and then the price will rise rapidly. If you do not have full files it is worth while to get them merely as a business proposition. Any missing numbers that we can supply without breaking volumes we shall be glad to send free. Look over your files and get the missing numbers while you can.

* * *

When a person once becomes a subscriber to a magazine, he seldom drops it except for reason. If this reason is not a lack of interest in the subject, he is usually glad to continue reading the magazine. If any of our readers feel that they cannot take the magazine for 1905, we suggest that they ask their nearest library to order it. There are few librarians who will not order it if requested.

BOOKS AND WRITERS.

The Mycological Bulletin, which, under the editorship of Professor W. A. Kellerman, is doing excellent work in popularizing the study of fungi, has changed to a semi-monthly issue.

Last spring Mr. Edwin C. Jellett read a paper on the rare and notable plants of Germantown before the Germantown Horticultural Society. This was subsequently printed in a daily paper and from this type the author has made a most delightful little volume of upwards of a hundred pages, printed on deckle-edged paper and illustrated with eighteen photographs of famous persons and scenes connected with the flora of Germantown. The town's title of the most beautiful suburb in America has been earned for it largely by its trees, and these and the people who planted them the author presents to his readers in a charming way. Germantown was settled early in the history of our country by a colony of flower-loving, garden-making Germans and their decendants have retained their love for the beautiful as expressed in flowers and trees.