

ing sort of surprise. The mirrors are set in frames. In a panel behind the latter there is an aperture closed by a shutter. As the glass is transparent there may be seen through it, when the shutter is opened, everything that is on the other side. It has occurred to the inventors to utilize this transparency by placing an image or a photograph between the panel and the glass. On exposing the mirror to the light in order to look at one's self, if the shutter be opened, the face will disappear and be replaced by the photographic portrait or the image that has been placed behind the glass. These images are not apparent, and when the panel is closed, the mirror has its ordinary aspect.

The Messrs. Dodé have installed mirrors of the largest size in their manufactory. We represent one of them herewith. When light is thrown in front of the mirror (Fig. 1), the visitor sees himself by reflection. When the back of the mirror is illuminated, he sees by transmitted light the object placed on the other side, which in the present case is the head of a devil, whose body is hidden by two mirrors inclined at an angle of 45°.

The change of illumination is easily effected by means of the electric light.

These platinized mirrors may be used in various ways. Placed in the panels of doors they will light up dark corridors or halls, and, on the other side, they will form reflecting glasses or mirrors. Behind such a mirror one can see without being seen. Platinized glass may be used for making magic eye glasses. Those who wear them can see through them, while viewed externally the glasses look like opaque mirrors.

For the lover of amusing physics there are here very numerous subjects of recreation. It is easy to install a magic mirror in front of a closet. It will suffice to form an aperture in the door and to place therein a platinized glass, which will form a mirror, and which will allow an object to be seen in the closet when a light is turned up in the latter. It seems proper to terminate this note with a description of the process of manufacturing these mirrors.

Platinized mirrors are obtained by a concentrated

nection between the latter and the cylindrical body is covered by a piece of cloth put on shawl fashion. It is worthy of note that, in the whole wrapping, there is no trace of sewing or winding about with cords or threads.

The edges of the single pieces of cloth are carefully turned down, and have, apparently, been pressed with some heavy object, such as a sad iron. The basket work on the front and on the parts around the eyes and lips are also made of strips of cloth with turned down edges. Besides the asphalt a colorless gum is used for gluing the white cloth.

Fig. 2 is a side view of the mummy, and in Fig. 3 we see it freed from its outer wrapper. The body is here closely and uniformly wound with a long cord made of rushes, the long stems being tied together by peculiar but simple knots. When the cord was unwound it was found that the entire front of the body was covered with a layer of rushes cut in various lengths and laid straight so as to fill in the uneven places.

Fig. 4 shows the mummy in its last, or rather first, wrapper. This consists of crossed bandages of coarse material, and under these is a still coarser material resembling sackcloth, which is so saturated with asphalt that it is inseparably combined with the epidermis and the hair, forming a thick black coating. The ears, which are pressed forward on the head, are partly formed of this same layer.

Fig. 5 shows the corpse freed from all its wrappings. The muscles have in the course of time changed to a fine, powder-like dust which lies in the cavities of the body. The skeleton is only held together by the dried and shrunken skin; all ligaments and sinews have disappeared. On the other hand, the bones are well preserved, and the skull (Figs. 6 and 7) is scarcely distinguishable from one which has been recently prepared, but many of the teeth show an inclination to split lengthwise. Judging from its teeth, the dog could not have been more than a year and a half old. One fore leg is somewhat crippled because of a break in the bone which was badly healed.

The size of the skeleton, the form of the skull, etc.,

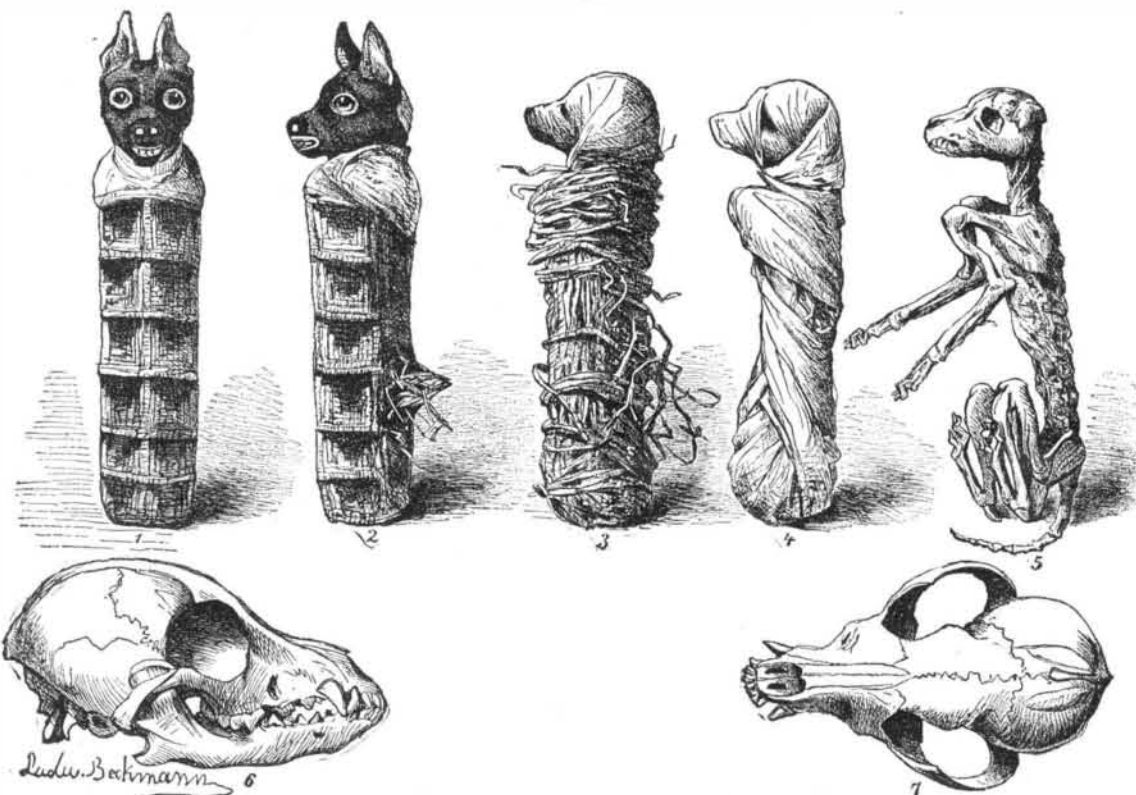
even appear at the top of the branchlets or upon the surface of the leaves. They are composed of a single series of oblique cells with contiguous walls (*parietas*). They are either simple or at length forked, or in fascicles. So-called "creeping roots" are merely subterranean branches, *stolons*, analogous to rhizomes—a continuation of, or shoot from, the base of the plant.

3. *The Stem*.—Though sometimes very short, the stem is present in all the mosses. In the annual *Acrocarpi* it is generally simple; but it becomes compound by repeated simple, double or multiple innovations when perennial. It is truly ramified only in the *Pleurocarpi*, whose lateral fructification does not impede the growth. For in the *Acrocarpi*, the fructifications being terminal and late, the annual development is continued only by lateral gemmules from under the flowers for the vegetation of a second year. As these annual innovations are not always simple, but in twos, threes, or more, the old plants are sometimes simple, sometimes double, or many times dichotomous, or fastigiate branched. In the *Pleurocarpi* the ramification is very varied, diffuse, pinnate, bipinnate, ramulose, fasciculate, etc.

4. *The Leaves*.—The leaves are present in all mosses, in their natural state of development. They are generally horizontally attached to the stems, sometimes obliquely, rarely vertically. Their relative position varies in different species—sometimes even in different parts of the same plant. The characters of the leaves, their mode of attachment, their forms, the divisions of the borders, which are never lobate, but entire, or dentate, or ciliate, etc.—the appearance of the surface—opaque, glossy, papillose, etc., are expressed by common botanical terms. They are generally formed of a simple stratum of cells of various forms, or, in rare cases, of superposed, double or triple layers of cells.

5. *The Organs of Generation*.—The flowers of the mosses, like those of the phænogamous plants, are unisexual or bisexual; they are polygamous or synœcious when male and female organs are mixed in the same involucre; monœcious or autœcious when in separate buds on distant or separate branches; parœcious when the antheridia are free in the axils of the perichædial leaves; androgynous or hypogynous when the male and female flowers are close to each other or separated by a single leaf. In the *Acrocarpi*, the flowers, either female or bisexual, are produced at the top of the stem or of the innovations. The male flowers are sometimes similarly placed, but more generally on the sides of the branches, especially at the base of the female flowers, which throw them aside in their growth. In the *Pleurocarpi*, the flowers—always lateral—are upon stems or branches. Polygamous as well as female flowers are inclosed into a kind of involucre of imbricated leaves, of which the inner ones, originally the smallest, gradually increase in size during the evolution of the fruit, forming a peculiar envelope, *perichætium*, which surrounds the inflated oval support of the pedicle, the *vaginule*. The involucre of the male flowers, *perigonium*, is not subject to a modification of the same kind, though the inner leaves generally differ from the outer in some characters. The female organs of the mosses, *archegonia* or *pistillidia*, show the greatest analogy to the pistils of the phænogamous plants. They are flask shaped bodies, each with a cellular covering, narrowed upward into a cylindrical tube, *stylidium* or *collum*, which, variable in length in different species, remains closed until the anthesis, when it opens by an enlarging, funnel-like mouth, to receive and give passage to the fecundating matter. The archegones are more or less numerous in the different species—two to thirty or even more—but generally only one is fructified, rarely two or three, the fruits in this case being clustered in the same perichætium. The male organs of the mosses, *antheridia*, inclosed with *paraphyses* in the *perigonium*, are generally composed of two parts, a utricle of an oval elongated form, rarely globose, containing the spermatozoid matter, and a pedicle, either short or somewhat elongated. When replete, the antheridia are swollen, greenish white or hyaline at the apex; when empty they become flaccid, rugose, reddish or dirty yellow, and deformed by compression. At the time of fecundation the subclavate bacillate spermatozooids convolute in spiral, being free from the spermatozoid mass wherein they are mixed, have a spiral motion of their own—like small living animals—and penetrate the archegones through the cylindrical tube. The number of the antheridia is, like that of the archegones, variable according to genera and species. Filamentose organs, *paraphyses*, are mixed with the antheridia and archegones; they vary in their form and their number. They are generally as long or even longer than the antheridia; filiform and slender in gemmaceous flowers, subclavate, spatulate, etc., in discoid or anthoid ones.

6. *The Fruit*.—In ripening, the base of the fertilized archegone gradually enlarges into capsule, *theca*, composed of two walls; the inner, *sporogone*, or *sporangium*, soft, thin, which at maturity contains the spores, and which either adheres to the outer walls, or free, except at its base, is like a small cylindrical bag attached to the outer walls by filaments. In the process of its growth, the cellular part covering the sporangium becoming dry and membranaceous is transversely ruptured at its base, and forms the *calyptra*—a cover which, pushed upward, is either split on one side and thrown up obliquely (*cuculliform*), or is gradually expanded, and sits upright upon the capsule like a conical hat (*mitriform*), either entire or lacerate at its base. In rare cases it remains attached to the base of the capsule, which then passes through by a longitudinal slit of its side. It is also sometimes *dimidiate*, or split on one side in its whole length. The capsule itself, formed of a somewhat hard, solid membrane, composed of two or more series of cells, is variable in size, shape and color in the different species of mosses. It is generally more or less perforated by stomates toward its base. In most species the capsule is gradually narrowed downward to a neck, *collum*, or an *apophysis*. The collum is merely the obconical upper part of the pedicle, while the apophysis is a more or less long prolongation of the inflated base of the capsule, from which it generally differs by consistence and color. In some species it is as long as the sporangium, or even longer, being an intermediate part between it and the pedicle. The *pedicle*, or basilar support of the capsule, is sometimes short or scarcely discernible, though present in all mosses. It is generally filiform, cylindrical, of equal thickness in its whole length, except under the base of the capsule. It is more or less rigid, elastic, generally smooth on its surface, sometimes rough, scabrous or verrucose. The



1. Front view of the complete mummy. 2. The same in profile. 3. The mummy with the outer covering removed. 4. The inner wrapper of a fabric coated with asphalt. 5. The dried corpse. 6. The skull in profile; $\frac{1}{16}$ actual size. 7. Plan view of the skull; $\frac{1}{16}$ actual size.

EGYPTIAN MUMMY OF A HOUSE DOG.

(From drawing taken from a specimen recently found.)

solution of platinum, brought to the state of crystallizable chloride, upon which one pours essential oil of lavender. A liquor is formed in which the platinum is held in suspension, and which is placed upon the glass in very thin layers by means of a pencil. Especial care must be taken to avoid dust, which is very detrimental to an operation of this kind. The mirrors having been thus coated are put into a drying room and then into a muffle of refractory earth or of cast iron. The muffle is hermetically sealed and raised to a red heat. After cooling, the glass is taken out. These mirrors, after being rubbed with a cloth and Spanish white, are very bright and reflectant. Their tone is a little less white than that of mirrors made with silver or mercury, but they give sharper and more faithful images.—*La Nature*.

EGYPTIAN MUMMY OF A HOUSE DOG.

In December, 1890, the writer of these lines received, through acquaintances in Cairo, the mummy of an animal supposed to have been found near Thebes, which was said to be a "mummy of a cat," but proved, on careful examination, to be one of a small house dog about as large as a medium sized greyhound. As mummies of dogs are, to say the least, much more rare than those of cats, and as the technical treatment of the specimen before me differs in many respects from that of the cat mummies, a description of it should be of interest.

The external appearance of the mummy, front view, is shown in Fig. 1. The colors are limited to a yellowish white and a deep asphalt brown. Possibly the lips and eyes were formerly colored, but this cannot be known with certainty. The outer wrapper consists of a fine, closely woven fabric, something between silk and linen. The entire fore part of the body is besides covered with extremely ornamental basket work made of small strips of the same fine stuff. The head, with the long erect ears, is skillfully represented by many layers of cloth glued over the real head, and the con-

indicate that the animal must have been something between a greyhound and a black-and-tan terrier of the present day.—*Illustrirte Zeitung*.

INTRODUCTION ON THE GENERAL CHARACTERS OF MOSSES.*

By Prof. LEO LESQUEREUX.

1. *Mode of Propagation of Mosses*.—Mosses are reproduced by the germination of spores or by propagules. The seminal granule, or spore, is a small, round body, formed of two membranes; the outer, *perispore*, more solid, often granulose on the surface, generally of a peculiar color; the inner, soft, hyaline, and containing the elements necessary for germination. When perfect spores are ripe and exposed to humidity, the inner membrane becomes swollen, the perispore is ruptured, and allows the protrusion of the primordial cell—the first growth of the moss named *proembryo*. This proembryonal utricle is first divided into two cells, which by subsequent subdivisions constitute more or less elongated filaments, which, by anastomosing at various angles, compose a confervoid tissue, *prothallium*, upon which buds of new plants are developed. Another mode of reproduction of the mosses still more frequent is from the development of buds, tubercles or filaments, derived from different parts of mature plants. Effete leaves, branchlets, lenticular granules, *pseudopodes*, attached to the leaves or the stems—all have the property of sprouting into radicals and producing new plants.

2. *The Root*.—This organ, essential for fixing the plants to their place of growth, is found in all mosses. As rootlets, or radicals, they are not only attached to the base of the stems, but often distributed in fascicles along the stems and the branches, which they sometimes cover as with a matting or *tomentum*. They may

* From *Popular Science News*, March.

lid, or *operculum*, also in all mosses except the *Cleistocarpus*, the *Holocarpi*, and the *Schistocarpi*, is the apex of the capsule, which becomes circumscissile, and is at length detached as a kind of cover. It is variable in shape, length, color, and affords very valuable characters for the diagnosis. The *annulus* is a narrow fringe composed of one, two, or three series of hyaline cells at the orifice of the capsule. The cells, contracted by dryness when the capsule is ripe, and abruptly dilated by humidity, force the disruption of the lid. These cells are detached from the orifice in fragments, or else they remain adherent to the lid, or fall together from the mouth of the capsule as a spirally twisted narrow fringe. The *spores* or *sporidia* inclosed in the capsules, deformed by compression when young, become globose in ripening; they are sometimes angular, but generally smooth or rugulose. They are greatly variable in size—from 1-5 to 1-100 μ m. in diameter. They also vary in number; species of *Archidium* have no more than fifteen or twenty spores in each capsule; in the *Hypnaceae* the spores are very small, and, indeed, innumerable.

The Peristome.—When the lid is removed the orifice of the capsule, in most of the genera of mosses, is seen to be adorned by a simple or double, very rarely triple or quadruple, row of small teeth and cilia, called the *peristome*. When simple the peristome is composed of eight, sixteen, thirty-two or sixty-four teeth, attached to the orifice of the capsule or a little lower inside of it; sometimes tubulose, or prolonged above the orifice into a cylindrical tube. The teeth are simple or compound—that is, in this last case they are formed of two or four similar parts adhering or united by the borders, and thus geminate or bigeminate. These parts often separate with age, doubling or quadrupling the number of the teeth. A colored line marks the union of the teeth or the line of division. The teeth are very variable in size, form, and color, affording important characters for the diagnosis. When the peristome is double, the inner is generally composed of a pellucid, yellowish membrane, *processus*, of various lengths; it is rarely entire, sometimes irregularly lacerate, generally cut into segments and cilia. The segments are usually plicate-carinate lengthwise, more distantly and less distinctly articulate than the teeth. The cilia are generally narrow, filiform, distantly articulate, sometimes barred (appendiculate) at the articulations. They are also derived from the inner membrane, and are alternate with the segments.

The *columella* is a cellular cylinder, or axis, which occupies the center of the capsule, from its base to the top of the lid. It is generally fugacious, and soon breaks up or decays. In a few mosses, however, it persists and remains attached to the lid, supporting it above the mouth of the capsule when this becomes dry and effete.

Mosses live everywhere and on various kinds of material. On cricks or on coarse sandstone, to which they are attached by short radicles penetrating the porous matter, are species of *Desmatodon* and *Barbula*; on coarse gravel along roads, *Trichostomeum*; on the sand and naked earth of the plains, the *Cleistocarpus*, the *Pottoidea*, and the *Weisia*; on clay banks, *Fissidens* and *Dicranella*; on the wood of living trees, the *Orthotrichaceae* especially; on that of decayed trunks or branches, the *Dicranaceae*, the *Hypnaceae*; on the dung of animals, the *Splachnaceae*, etc. Their especial province in nature is to absorb and concentrate atmospheric humidity, and to retain it in their texture, either to hasten the decay of the dead woody matter to which they are attached or to retard it when life still remains in the plants. They cover and protect the roots of trees and their base against atmospheric influences, cold or heat; they overspread waste fields, swamps and bogs and by their gradual decay produce peat or humus. They are thus modestly pursuing everywhere a constant work of usefulness, always bearing a pleasant aspect, giving the appearance of life, and hiding the hand of death wherever its decomposition is at work.

Mosses are found in every station, under every kind of climate, and bear an uninterrupted life. They have their seasons for fructification, but even when dry and discolored under the influence of heat, they take life again and continue to vegetate as soon and as often as they receive a sufficient amount of humidity. Hence the botanist is never disappointed in his search for mosses. At every season some species bear their fructification, and are therefore determinable. They need no care for their preservation; heaped in bundles or dried they may be left aside for years, and when needed for comparison and determination, immersion in water revives them, and at once they open their leaves and become as fresh and green as if they had just been gathered.

NOTES ON THE LATER LIFE HISTORY OF THE FLOWERING DOGWOOD (CORNUS FLORIDA, L.)

By M. ALSTON READ

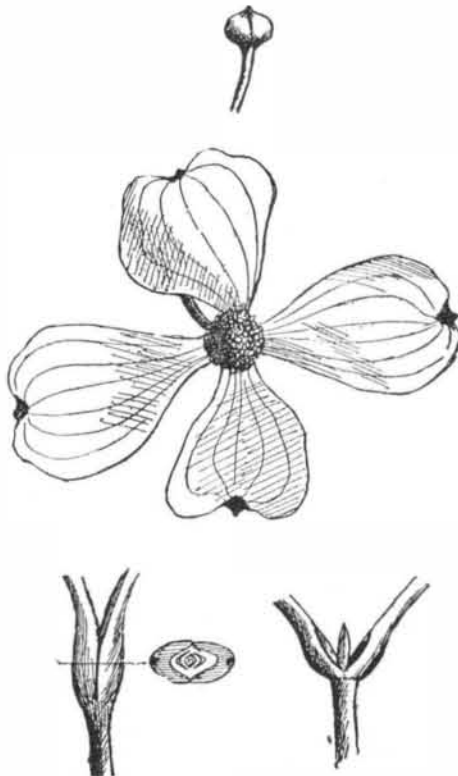
THE genus *Cornus*, to which the dogwood belongs, is divided into two minor groups, one characterized by having "a head, or close cluster of greenish flowers, surrounded by a large and showy, four-leaved, corolla-like, white or rarely pinkish involucre; fruit bright red." The other has "white flowers in open, flat, spreading cymes; involucre none." The subject of this paper is to try and show the derivation of the first group, which consists of the flowering dogwood and the cornel (*C. Canadensis*). The four large, white, petal-like expansions are not petals at all, but merely bracts—altered green leaves that grow near a flower. They form one of nature's many devices for securing conspicuousness, in order to attract the attention of flower-loving insects, that they may effect cross-fertilization for the plant, cross-fertilization being—as Mr. Darwin has so forcibly shown us—the great object of plant economy. This is effected by insects, which transport the pollen of one plant to the sensitive stigma of another. This beneficent act is not intentional on the part of the insect, but is simply a result of his flower-visiting propensities; the pollen becomes entangled in his hairy coat, and thus gets carried to the flower next visited.

The dogwood is a very showy and conspicuous plant in flower, and scarcely less so in fruit, as clusters of red berries gleam through the green foliage. It thus seems well endowed with attractive features. The flowering dogwood and cornel are probably recent offshoots from

the rest of the genus, to which they bear no resemblance to a casual observer; for on the one hand we have what seems to be a single large white flower with a central head, and on the other we have a loose bunch of small white florets.

I said above that *C. Florida* and *C. Canadensis* were derived from the second group of the genus, and not the second group from them, for the following reasons:

1st. These two form a much more specialized group, which means that they are later (the specializations are simply modifications of the family plan) and higher in the scale. They have crowded all their florets in



CORNUS FLORIDA.

Flower bud. Flower head. Terminal bud protected by being inclosed in a sheath of the petioles.

a dense head, so that a large number can be fertilized at one visit—as in the common daisy—and thus a number of seeds set from a single visitation.

2d. In the head the flowers are of different ages, there being some in which the stamens are ripe and others in which the pistils are ripe. When an insect lights on this head, he fertilizes those in the second stage and gathers new pollen from those in the first stage, as he turns round to suck the separate flowers in turn.

3d. Because the majority of the plants of the same genus, as well as those of the allied families, are simpler and display the open cymose type of inflorescence. When you see a general, simpler type prevailing in several allied families, you may be sure that they, or their common ancestor, gained those characteristics before they broke up into separate groups or families. And any small departure from them in the limits of a genus points to a more recent modification.

The steps by which the dogwood and cornel reached their present state were, it seems to me, somewhat like these.

The species which, through some process of natural selection, first started toward the dogwood type packed the florets of its cymose head closer together, and gradually reduced their number. These two steps may be still observed, for in *C. sericea* the cymes are flat and close, and in *C. stolonifera* the cymes are small, flat and few-flowered. In course of time four bracts began to assume the size, shape, and office of petals, in order to increase the showiness of the plant.

There are numerous bracts scattered all through the cymes of the second group; especially near the edge they are larger and more numerous, as they are here less crowded out. (There are bracts surrounding the single florets, even of *C. Florida*.) These bracts are whitish green, which was probably the original color of the white petal-like bracts.

Concomitant with the development of these large



CORNUS FLORIDA.

Flower head, much enlarged, and with some of the florets removed, for greater clearness.

bracts, the florets forming the head come closer and closer together. The bracts now serve both as a protection and an attraction; but at first they were, most probably, protective only, or largely so, and only later attained their white color.*

These bracts are merely brownish gray scales in the bud, folded over the head of the true flowers; and when they open they grow rapidly into a broad white expanse, still bearing the little scale-like part at the tip. The flowers themselves have become quite special-

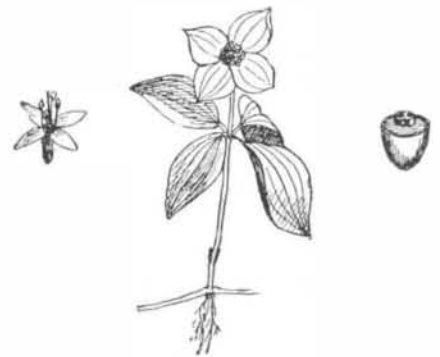
* At present the bracts in some cases show a tendency to pink, and seem struggling toward a higher scale in Grant Allen's scheme of progressive coloring; and if some insects confine themselves to the pinkish ones, we may in time have a pink species evolved.

ized, for instead of having flat, spreading sepals and petals, like their nearest allies and the rest of the genus, they have gone a step farther and have produced their coherent sepals into a tube, which, as in the pinks, holds their petals in a tubular form also.

This excludes a horde of miscellaneous small flies, and courts only those with longer tongues, which are thereby enabled to reach the bottom of the tubes. The plant thus narrows its field, but gains more efficient workers as a compensation for diminished numbers. The anthers are erect and exerted, and can hardly fail to dust any insect of the above description that happens to light on the flower head. At this stage the flowering dogwood and the cornel separated, for the latter, as will be seen in the figure, has not reached the perfection of the former; for, while the flowering dogwood has a perfectly compact head, with all the florets borne on an expanded and modified apex of the stem—which is thus made to perform the offices of a receptacle—the cornel still retains decided traces of the original cyme, and the florets are borne on very short branches.

So much for the flowers; now let us glance at the berries. In these there is no difference throughout the genus, except the comparatively unimportant one of color, which depends on the selective tastes of different birds. Why was there no change in the berries? Probably because the berry of the parent form was good enough without change. To describe one will be sufficient, as they are much alike. The berry is a succulent, two-celled, two-seeded drupe, formed by the union of the calyx (coats) with the ovary. It swells and becomes red on ripening. A fruit in which this union of parts takes place is in advance of one in which the calyx is free.

Plants that have a drupaceous or succulent fruit generally have fewer and larger seeds than those without these facilities for dispersal. For each seed in a fruit that has fine facilities for dissemination stands a better chance of growing and becoming a plant than a dozen seeds that have poor means of dispersal; and the plant that has fewer seeds can store those remain-



DWARF CORNEL.

Single flower. Section of fruit. Flower of dwarf cornel, magnified to show the branched head. a, bract removed.

ing much more effectively than it could a larger number. How did the fruit become drupaceous? Probably by the selection of the most succulent ones by birds. Hence, those that were hard and dry perished, and the juicy ones were eaten by birds and transported by them to considerable distances, and so stood a better chance of hitting upon a good locality for growth and reproduction of vigorous offspring. As long as the seed is immature, the fruit remains hard, green, and inconspicuous, to escape notice; but as soon as it begins to ripen, it advertises that fact by assuming a bright red color. And now any hungry bird, coming along, will be sure to notice it, eat it, and the seeds, which are extremely hard and indigestible, will pass through the bird's body and be deposited in the best possible condition for germinating.

The red color of the berries was produced in the same way as their succulency, viz., by the selection of birds. For if any of these fruits showed a tendency toward a red color it would greatly increase its conspicuousness, and thereby more than double its chances of being seen and devoured by birds—with the favorable consequences above mentioned. On the other hand, the green fruit would be more apt to be passed by, and hence undissemated, so that if it grew at all it would be under the deleterious shade of the parent tree. Thus you see natural selection would tend pretty effectually to weed out the hard, inconspicuous fruits, and foster the attractive ones.

This form of fruit was probably developed before the flowering dogwood and the dwarf cornel branched off from the main group (for it is retained by them in common with the rest of the genus), and after the family *Cornaceae* branched off from the allied families, because the *Cornaceae* have the drupaceous fruit and the allied families have not. The bark of this family is quite bitter, and probably in a measure secures the young plant from the attacks of herbivorous animals.

All these advantages combined—the bitter bark, preserving the tender young plant; the closely packed heads of tubular florets; the conspicuous bracts, which allure the constant attention of the higher insects, and so effect cross fertilization without waste, and also serve as protective caps; and finally the attractive drupaceous fruit—allowed the plant, under certain circumstances, to spring from a shrubby to an arborescent form.

These are only a few of the facts and suggestions