

BROOKLYN BOTANIC GARDEN

FERNS AND FERN ALLIES

by

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Ferns are among the most beautiful plants we have; and their beauty is not in flowers or in bright-colored berries--for they don't have any flowers or berries. But their beauty is in their leaves, delicate, lacy, and graceful, some of them; others firm and leathery, but handsome, too. Florists often dress up their bouquets of flowers with fern leaves; and what ferns do they use? Exotic ferns cultivated in greenhouses? No. Native ferns collected in the wild and brought in for that purpose. To be sure, they sometimes use the so-called asparagus fern which is not a fern at all, but a member of the lily family. But when they do use true ferns, they use wild ones. And yet many people who know all the common wild flowers can't tell one fern from another; they are all "just ferns".

1. One of the commonest and most conspicuous of our wild ferns is the cinnamon fern (*Osmunda cinnamomea*). It is a large fern, with leaves two or three feet tall; and it grows in quantities in swampy woods. Here are two plants shown in their native habitat. Each plant has a cluster of large feather-like green leaves. Standing up in the middle are several of the "cinnamon sticks"--so called because they are the color of cinnamon; but the cinnamon we use in cooking does not come from these ferns. These "cinnamon sticks" are special leaves set apart for producing spores; the spores and spore-cases (sporangia) are green when they are young, but brown when they are ripe. It is from these spores that new ferns grow; there are no seeds as in flowering plants.
2. Here are a few of the green leaves and some of the spore-bearing leaves of the cinnamon fern seen at closer range. You can see that the spore-bearing leaves have the same feather-like division as the green leaves, but their divisions are contracted and pressed close to the stalk. The green leaves can perform their function of food-making best when they are spread out to the air and light; but the spore-bearing leaves curl up and protect the spores while they are developing.
3. The interrupted fern (*Osmunda Claytoniana*) is another large, conspicuous, and common fern; it grows in somewhat drier woods than the cinnamon fern. Here is a plant growing beside a large boulder in the woods. Its all-green leaves are much like those of the cinnamon fern. It does not have whole separate leaves set apart for spore-bearing; but you can see that some of the leaves have several pairs of brown contracted spore-bearing divisions. The green divisions (or leaflets, or pinnae) are interrupted, about the middle of the leaf, by spore-bearing divisions. That is why the plant is called the interrupted fern.
4. Here are some leaves of the interrupted fern seen at closer range. One of them is interrupted; this picture was taken when

the spore-bearing divisions were young and green, but even here you can see how different they are in form.

5. Closely related to the cinnamon and interrupted ferns is the royal fern (*Osmunda regalis*), so called because it is so handsome. The leaves grow in large clumps in swampy woods, often along a brook or at the margin of a pond, as in this picture. The leaves are more elaborately divided than those of the cinnamon and interrupted ferns. The spore-bearing leaflets are at the tips of the green leaves; this makes the plant look superficially as if it had clusters of small brown flowers; and for that reason it is sometimes called "flowering fern"; in fact, the family to which these three large showy ferns belong is called the flowering fern family.
6. From a little distance the silvery spleenwort (*Athyrium thelypteroides*) looks very much like the cinnamon fern, and it grows in the same kind of place, swampy woods and banks of streams. But it never has any "cinnamon sticks"; the spores are borne on the backs of the ordinary green leaves. And, as a matter of fact, that is the way the spores are borne in most ferns; only a few kinds have special leaves or leaflets set apart for spore bearing. In this fern the groups of spore cases are protected, when they are young, by shining whitish coverings for which the fern is named silvery spleenwort. The picture does not show this feature.
7. The lady fern (*Athyrium Filix-femina*) is sometimes confused with the silvery spleenwort, which we saw in the last slide. But you can see at once from this picture that the lady fern is lacy-looking, because its leaves are more finely cut. It is an exceedingly common fern in moist woods. The spores are borne on the backs of the green leaves, but their coverings are not silvery.
8. The New York fern (*Dryopteris noveboracensis*) is sometimes confused with the lady fern, and is also very common. The two often grow side by side. But the leaves of the N. Y. fern are not so finely cut as those of the lady fern, and they are usually not quite so tall. The feature by which the N. Y. fern is best known and most easily recognized does not show clearly in this picture, because the leaves are closely clustered, the way they grow. Everyone knows that most fern leaves taper to a point at the tip; but the N. Y. fern tapers to a point at both ends. There are several other ferns, including the lady fern, that taper a little at the base, but this is the only one that really tapers to a narrow point at the lower end. The spore cases grow in small inconspicuous roundish clusters on the backs of the green leaves.
9. The spinulose shield fern (*Dryopteris spinulosa*) is another that is sometimes confused with the lady fern; but it is more finely cut and so more lacy-looking than the lady fern. It is not one of the commonest ferns in the woods; but it is probably more often seen in the city than any other wild fern, because

one variety of it is one of the chief kinds that florists use in their bouquets of flowers. The reason is that this fern combines a lacy appearance with good keeping qualities, while the other lacy ferns wilt too quickly to be useful in this way. Its good keeping qualities are doubtless connected with the fact that it is evergreen. Most of the evergreen ferns are leathery and not at all lacy; but this one is particularly well suited to being shipped and used for decoration. Oddly enough, this fern may also be seen in the windows and counters of butcher shops, adorning the choice cuts of meat. It is called spinulose shield fern because each little tooth on the margin of the leaf is tipped with a fine spine-shaped (though soft) point; and the groups of spore cases on the backs of the leaves are protected by shield-shaped coverings.

10. The crested shield fern (*Dryopteris cristata*) is a more usual type of evergreen fern. Its leaves are thick and firm and leathery, and yet they are divided enough to be ornamental. The leaves are narrower in proportion to their length than those of most ferns; and some of them are almost vertical, while their leaflets are almost horizontal like the steps of a ladder. One of the leaves in this picture shows that feature particularly well, and several others show it less clearly. The crested shield fern grows in swampy woods and is sometimes called the swamp shield fern. It has shield-shaped coverings over its groups of spore cases on the backs of its leaves.
11. The broad beech fern (*Phegopteris hexagonoptera*), shown here, has triangular leaves with the two lowest divisions pointing forward and downward. It has spores in tiny dots on the backs of the green leaves. They can not be seen in this picture. It grows on dry hillsides in the woods.
12. The walking fern (*Camptosorus rhizophyllus*) is a very small fern growing close to the ground. It grows mostly on limestone or other rocks, and is not common. It has simple, undivided leaves, long, narrow, and tapering to a fine point. When one of these slender tips touches the ground, it takes root and sends out new leaves. That is why the fern is called walking fern. The new little plant will eventually become separated from the leaf that started it, and begin "walking" itself. In this way the plants spread and increase, independently of spores. But they have spores too. One of the leaves in this picture is turned wrong side up, and you can see the brown spots which are groups of spore cases.
13. One of the most beautiful and delicate of our wild ferns is the maidenhair (*Adiantum pedatum*). It grows in rich woods; it is much less common than many other ferns, yet it is one of the best known because it is so distinctive. Each leaf consists of a group of feather-like divisions arranged almost in a circle at the top of the stalk. Close to New York City we find very little of this fern; but a little farther out it grows in large masses. Any of the leaves may bear spores--in little spots on

the under side at the margin. These can not be seen in this picture.

14. The sensitive fern (*Onoclea sensibilis*) is not so lacy-looking as many of the others; but the leaves are thin and delicate, and very easily killed by frost. It is very common in moist places. The stiff brown spikes standing up in the left side of the picture are the spore-bearing leaves.
15. Another beautiful and delicate fern and one of the easiest to recognize, is the rattlesnake fern (*Botrychium virginianum*). It has a broadly triangular, much-divided, lacy leaf at the tip of the main stalk; from this same stalk-tip another more slender stalk grows up later in the season, bearing a group of spore cases (sporangia) in which the spores are formed. This is a much smaller fern than the others we have seen; and each plant has only one leaf.
16. Closely related to the rattlesnake fern, but very different in appearance is the adder's tongue (*Ophioglossum vulgatum*). Many people would walk right over it and never notice it; and if they did see it, they would not realize that it was a fern. It has a plain, simple leaf at the end of the stalk, instead of the fancy one in the rattlesnake fern. But it has a very similar group of spore cases at the tip of the special stalk. It will grow almost anywhere, in dry or wet woods or in pastures.
17. When the spores of ferns ripen and fall to the ground they germinate, but they do not directly produce new ferns like the parent plants. They produce tiny heart-shaped green prothalli, which look the same in all kinds of ferns. Here we see a lot of fern prothalli growing on a rock.
18. On the fern prothallus, fertilization is accomplished; and the fertilized egg develops into the new fern as we commonly know it. In this picture some of the prothalli are sending up new fern leaves as a result of fertilization.
19. Here are three prothalli much enlarged: one with a new leaf just starting, and one with two leaves well developed and a third one beginning to unroll. In these very young stages, fern leaves do not look the same as on older plants; and it is very hard to tell the different kinds apart.
20. The so-called club mosses are not mosses at all, but are closely related to ferns; they are in the group known as the fern allies. This is the common club-moss (*Lycopodium clavatum*). The stems bear innumerable tiny leaves. The stems run along the ground and send up branches. At the tips of some of these branches the spore-bearing cones are borne on slender stalks.

21. This is the tree club-moss (Lycopodium obscurum variety dendroideum) named for its tree-like habit of growth. The horizontal stem grows in the ground, rather than on the surface as in the common club-moss; and the upright stem is much branched and graceful, with the cones not raised on long stalks, but growing close to the green leaves.

NOTE TO THE TEACHER

These are only a few fern slides, which we have in duplicate, made up into loan sets. There are numerous other fern slides, of which we have only one of a kind. These can not be sent out on loan in the usual way, but they can be taken to a school by a member of the Botanic Garden staff for use in connection with a talk. So, while we like to encourage teachers to do their own talking as much as possible, a much wider range of fern slides is available by the other method.