

Program 6 - COME ON, WINTER! - October 28, 1940
(How Plants Get Ready for Winter)

SOMETHING TO DO AND TALK ABOUT FIRST

This is a fairy-tale of science - parallel to the story of the Sleeping Beauty, which we all know. For our purposes, this is the meaning of the fairy-tale: the Princess was the earth with its vigor of life. Her youth was the summer; the fatal spindle, the piercing cold; the spellbound sleep, the Winter's long rest; and the Prince's kiss, the strong sunshine of Spring.

But long before the piercing needle is applied, there is preparation for winter. Leaves give back to the tree much of the food they hold, and decay brings on the color. Seeds give up their water so they will not burst with freezing, and their coats harden sometimes to stoniness. Gravity pulls water from trunk and stem to prevent the bursting of cells. Food is stored in bulb, rootstalk, and the crown of herbacious plants.

DO YOU KNOW THESE WORDS?

gravity

deciduous

herbacious

LISTEN FOR THESE IDEAS

1. In what way is the loss of leaves in deciduous trees a protection against winter?
2. How are evergreen trees protected against the loss of water in winter?
3. If an annual plant lives for one growing season only, how does nature provide for its renewal next year?
4. In what way is the seed a protection against winter?
5. Name some seeds that seem to require the freezing temperature of winter to start growth in the spring.
6. How do you account for the coloration of leaves in fall?
7. Is the touch of the frost necessary to produce this coloration, as is commonly believed?
8. When is the best time to prune trees? Plant them? Why?

SOMETHING TO DO AND TALK ABOUT LATER

1. List twenty plants that die when cold weather comes.
2. How does nature prevent their disappearing forever from the earth?
3. List twenty plants whose part above the ground dies, but whose roots keep alive in winter.
4. List five kinds of bulbs planted in the fall. Five in spring.
5. If there are still highly colored leaves on the trees, gather, press, and mount the brightest for your museum corner.

Come On! Winter
(How Plants Get Ready for Winter)

Hello Boys and Girls:

One late autumn night I sat looking down on a village from the hill above, and as I watched, the lights in the houses were put out one by one; though sometimes it was simply that the shades were drawn or the shutters closed. I felt that the day was indeed over. But there rose in my mind the picture of banked-up fires, of things set in order for the morning, maybe buckwheat batter set for pancakes for breakfast, and other preparations made for a new day, and along with them the preparation of rest. This is the usual way we make preparation for the next day before we lie down to rest - which rest is, in itself, a preparation for the day that is coming.

It is the same in the household of Nature. Before Nature draws the curtain on the growing season, she sets her house in order in preparation for the Spring. She packs her seeds in hard coverings, along with a little lunch in each one; she covers the branches of trees and shrubs with next year's buds; she stores food in roots and crowns of plants that are killed by the frosts, called herbacious plants; she dries the seeds to prevent the frosts, from bursting them; she pulls the water out of the cells in the trunk of trees so that the cells will not burst with freezing; she directs bees to store honey to be consumed during the winter, for you know that bees are active all winter; she tells the chipmunk, the gopher, the squirrel to store food; she directs the caterpillar to spin a cocoon in some protected spot; she sets the alarm clock to inform the birds it is time to start for the south - and thus it is that Nature draws her curtain to close her household for the winter's rest.

Next week we are going to discuss how animals get ready for the winter, but today we are going to talk about the preparation that plants make. I think if you listen thoughtfully to these two broadcasts, you will detect that Nature uses a very similar method in both cases.

So far as the life of the plant is concerned, there are three classes - the annuals, the biennials, and the perennials. The annuals are the plants that live but one year. The seeds germinate, the plants sprout; the plants develop their stems and leaves, blossom, develop their seeds and then die - all in one year. The zinnia of our gardens and the ragweed of our fields are good examples of annuals.

The biennials live for two years. Bi - means two; annual means year. The biennials develop the root, stems and the leaf system the first year. In the second year they blossom and develop seeds and then die. The fringed gentian and mullein of the fields, or the Sweet William and Canterbury Bells of our gardens are good examples of biennial plants.

The perennials live through many years. Per- means through. The giant sequoia, 4000 years old, is a perennial. So are all trees and shrubs; so are the asters and the Mayflower perennials.

Now, let's look into the life of these different kinds of plants to see what preparation is made when Nature pulls her curtain on the growing season. First the annuals. If annual plants live for one year only, and are killed each year by the frosts, how does it happen that we have annuals plants at all: How do they renew themselves each year? How do they live over the winter to start again the next spring? The answer is in the seeds. The seeds carry on the life of the race. And to make sure that this is done, annual plants generally have a great many seeds. I suppose the ragweed has all the way from 10,000 to 25,000 seeds on one plant. As I told you last week, a seed is really a tiny plant in itself that has stopped growing. If you have examined a bean seed, you have found this out for yourselves. In that tiny mysterious little satchel, nature has packed just what is needed to start life again when the warm moist days of Spring return. In that small satchel is stored the germ of life, and along with it enough food to give the germ a start in life, that is, to develop some roots by which it can get food and water from the soil and a few leaves by which it can

get carbon from the air from which to manufacture food. If you examine the seed of a bean, you will find that there are two very fleshy leaves packed away in the seed. These are called the seed leaves - or cotyledons, and because there are two of them the seed or plant is called by botanists - dicotyledenous. That is a big word but when you study botany you will use it very often. When the seed bursts in the Spring of the year, these two leaves are the first ones you see. They are very fleshy because they are filled with food for the young plant. They are the nurse leaves that provide food during the tender days of the plant, just as the breast of the mother in a mammal provides food for the developing young animals. You never knew before that young plants are nourished in a way not far different from young pigs, did you?

In some plants, like the grasses, oats, corn, barley and wheat, nature packs only one nurse leaf away in the seed.

Not only does nature pack away the germ and food in the seed but she dries the seed to desert dryness so that the freezing of winter will not burst the seed; and then she covers this precious little bundle with a tough cover, some times as hard as a stone. Sometimes this covering is so hard and tough that it takes more than one season to soften it sufficiently for the young plant to start growing. This is true of the walnut, black locust, hickory nut, the witch hazel, and many others.

Now, let's see how the biennials get ready for the winter. The biennial plant is one that lives two years only. The first year it does not blossom, but to get ready for winter it stores food in the root and the crown of the plant. If you find a mullein plant now, you will find that the bud has formed in the crown. This bud will start growing next spring, using the food stored in the root and the crown. The second year these plants blossom and have seeds which carry them through the winter just as the annuals do.

Now, let's take a look at the perennials. The perennials have seeds like the annuals and biennials, but after the seeds have scattered, the plants

live on. Some of the perennials are herbacious - that is the leaves and stems are cut down each year by the frosts, but new plants grow each spring from the roots of the old, for in those roots nature stores away food enough to give the plant a good start each spring. But some of the perennials are not herbacious like the trees and shrubs. So if you are willing, suppose we spend the rest of our trip afield talking about how the tree gets ready for winter.

When the North part of our earth begins to dip away from the sun, and the rays of the sun start to hit the northern hemisphere at a slant, then nature begins to pull her curtain on another growing season. Then it is that the leaves stop their food manufacturing activities. When you go home to dinner this noon, look at a branch of a tree. At the end of each twig and along the branches the tree has fashioned buds, within which tightly folded and protected are the new leaves for another year. Winter blasts may sweep the forest and bitter cold grip the woods, but through it all the tree waits dormant and the buds rest. Now, right below the bud, you will find a scar. Maybe you will have to remove the leaf now to find the scar. On this scar you will find some solution passed into the leaf and the food manufactured in the leaf passed back into the tree to supply the food for growth. This scar is covered over with a hard tissue - a kind of corky tissue. It is this tissue that pushes the leaf off the tree. When the tree begins to prepare for the winter, before summer merges into autumn, something is starting to happen. Right where the stem of the leaf is attached to the twig, this thin layer of tissue starts to grow on all sides of the leaf stalk. By the time that the first frosts come, this layer has grown completely across the place where the leaf is attached to the twig. The leaf is now cut off from the tree which it nourished. This is a part of the tree's preparation for the winter. Only a few dried strings now hold the leaf to the tree. These strings are the ducts that carried the water to the leaf and the food manufactured in the leaf back to the tree. This attachment is not very strong in most trees and a strong gust of wind may sever the connection and the leaf falls. But in some of the oaks this attachment is very strong, and the leaves, dried and shriveled, stay on all winter to be pushed off

in the spring by the new growth.

This falling of the leaves is one of the tree's preparation for winter. Evaporation takes place at a very rapid rate from the leaves. A good sized tree gives off many tons each year through its leaves. But when the ground is frozen in the winter, water is not available to supply this evaporation, so the tree protects herself by shutting off the facets in that little thin layer of corky tissue that causes the leaves to fall. This is a wonderful operation that the tree performs. You can see that she heals the wound before she performs the operation. And the scar that you see just below the newly formed bud is the scar left after this operation.

But the tree does another interesting thing before she allows the leaf to fall. Each leaf has stored in it sugars and other necessary foods, such as fats and proteins. These are the foods that form the tissues and structure of the tree. These are too valuable to lose, so these flow back into the tree and are stored away in the trunk. That is another preparation that the tree and all woody plants make for winter. But there are some carbon compounds and some minerals still left in the leaf. These carbon compounds decay and the minerals rust, that is oxidize, and this is what gives us that glorious spectacle - the fall coloring of the leaves.

I am reminded right here that some seeds are very fragrant and sweet to the taste. For instance the Indian maidens used the crushed seeds of the columbine to give a fragrance to their clothing. There is no doubt in my mind that when the plants pack the little lunches in the seed cases, they draw the nectar and fragrance that attracted the bees and store them away in the seed.

But leaves are valuable even in death. They form a protective covering over the ground, holding the moisture, preventing changes in temperature and thus provide clothing for the roots of plants beneath. Then when these leaves decay, they add food value to the soil. Leaves are something like angleworms in that respect. The angleworm is called the first plowman because it digs into the earth and brings up the soil from the lower depths, soil that is rich in minerals. Likewise the roots of trees penetrate deep into the lower depths of the earth. The mineral substances are brought up in solution to the leaves, and when the leaves

fall these minerals are added to the top layer of soil. That is why it is too bad to burn leaves when they might be added to the soil to enrich it.

If a tree were full of sap in the winter as it is in the Spring, the sap would freeze and the tree burst during the low temperatures of winter. The tree must protect itself against that. And this is done by drawing the water from the cells, and gravity pulls most of the water into the roots. That is why you can prune trees in the fall and winter without having them bleed.

One time a little girl was asked to write a composition on how nature prepares her plant creatures for winter and she wrote:

"God sews up the buds of flowers very tight, and
after while He lets the sun and rain open the stitches."

This is a rather simple explanation, but the little girl was about right in what she wrote.

Good Luck!

May the Great Spirit
Put Sunshine into your Heart
Today, and forevermore,
Heap Much!