

meadows and the grass is decorated with spider threads holding drops of dew that glisten in the sun. These are the beautiful, golden days. Yet every season has its rhythm and harmony of life, and we are going to be wonderers and watchers in the wheeling cycle of the year. As the earth makes its annual trip around the sun, it brings us four seasons. Each season brings its changes in life, its changes in scenes and its own beauty. As we follow the trail through the seasons, Ranger Mac hopes he can bring to you some of the pleasure, some of the inspiration that has come to him as a watcher in the wheeling cycle of the year.

Our first five broadcasts will be on trees. If you follow closely on Ranger Mac's heels, you should find an acquaintance with trees that will make them your companions wherever you go. You really should have the help of the Teacher's Manual which has been prepared for you. That manual is an outline of the things we are going to talk about while on these imaginary trips afield. You will find it a help in getting ready for each trip afield. Whenever you go any place you get ready to go. So it should be with these trips afield. In this manual you will find many helpful suggestions on things to do alone and with your schoolmates. Particularly is this true about the Conservation Corner which teachers have found so helpful in years past. This corner is a collection of specimens which Trailhitters collect, and is a great help in developing interest and in getting children to see things just as they are in Nature. Send 25¢ to School of the Air, Radio Hall, Madison 6, Wisconsin, and the manual, this helper will be sent to you.

When we left the trail last Spring, the leaves on the oaks were the size of a squirrel's ear. That's about the planting time for beans, according to the old gardener's guide. These leaves soon grew to normal size, and have been working all summer adding height and breadth to the crown and width to the trunk. To live we must breathe and drink and feed. So must a fox, a mouse, or a snake, or an angleworm. So must a tree. These are needs for all life. Human beings, angleworms, hornets, snakes, butterflies, ants and elephants are all alike in this one respect. But a tree has no stomach or alimentary canal, such as we have and all animals have. Yet it must have food in order to live and grow. It has no lungs, such as we have, and all animals have. Yet it breathes and must have oxygen as all life must have. So a tree breathes. It has no mouth, as we have and all mammals have, yet it requires drink as do all animals. So a tree does all the things that we do in order to live and grow. But a tree develops its own kind of just as we have our own particular kind of organs to do these things. That's the wonder of trees. Leaves, trunk and roots, these are the instruments whereby a tree grows to be a creation of usefulness and beauty.

Let's take a look at the leaf first, the leaf you pick carelessly from a tree and throw away. This leaf is as curious and complex and wonderful as is the eye, or the ear, or the stomach of man. The leaf may look as thin as a sheet of paper, yet it has two coverings of skin. The one above is generally waxy and tough for protection. The one beneath is dull of color, rough and sometimes somewhat hairy. Packed between these two coverings are cells that carry on the work

of manufacturing the food for the tree. For a tree, like all plants, manufactures its own food. This is done by the leaves. All animal life on this planet, be it the earthworm that burrows in the ground, or the hawk that swings at anchor in the sky, depends upon plants to manufacture the food that it lives on directly or indirectly. This makes the leaf the most important factory in the world.

Now follow Ranger Mac closely and we'll see what takes place in the leaf. The underside of the leaf is full of tiny openings. There may be as many as a hundred thousand of these openings. You cannot see them except through a powerful microscope. Then you can see that each opening has a tiny pair of lips that open and close as the need demands. These openings are called stomata. Stomata means "mouth". Through these openings the air passes into the green flesh of the leaf. This air contains a small amount of carbon dioxide gas. The boys and girls studying chemistry call it CO_2 . It is a waste gas from the breathing of all animals. It is the gas given off when wood and coal burn, or when dead plants and animals decompose. Plants use this waste gas and change it into food for the growth of the plant and into seeds and fruit. There is nothing wasted in Nature. So trees and all plants are great purifiers of the air.

So this waste gas is used by plants. It enters the leaf with air through the stomata. During the sunlit days of the growing season water is taken in by the millions of little hair roots in the soil, and is drawn up through the cells of the

sapwood of the trunk into the leaves. Now we have water and CO_2 gas in the leaf. Now the sunlight does its work. The sun is a cloud of atomic fiery gases that pours its energy upon the earth as sunshine. The energy of the sunlight is caught by the green substance in the leaf called CHLOROPHYLL. Chlorophyll is so abundant in the leaf that it gives the green color to the leaf, even though there are other pigments of different colors there. This chlorophyll captures the energy of the sun's rays and makes a little factory of the leaf, changing the water and CO_2 gas into sugar. This sugar is carried by water through the veins of the leaf, through the stem of the leaf to the inner lining of the bark of the tree. This sugar-sweet water is the sap, the blood of the tree, the life-stuff that makes the flesh of the tree. It is carried by the inner bark to all parts of the tree, from the smallest hair root to the topmost bud. This tree-blood, which we call sap, feeds a very thin layer of cells that lies next to the sap wood of the tree. This layer of cells is called the CAMBIUM. This sap feeds the cells of the cambium and the cells multiply; one becomes two, two becomes four, four becomes eight, and so on. When there is plenty of sunshine and water the leaf factories work hard and the cambium grows rapidly. In this way it adds a layer of wood each year to the trunk of the tree. In the spring of the year the growth is most rapid and the ring formed is full of holes, but as the year advances the leaves do less work and the wood that is added is more solid. So by counting the rings on a stump of a tree, or a cross section of a tree, you can tell the age of the tree. In the spring the cambium is rather