Why does the leaf fall?
While the leaf is changing colors, other processes are taking place. A layer of corky material called an abscission layer is forming at the point where the stem of the leaf is attached to the branch. As this layer grows, it gradually cuts off the supply of sap going into the leaf. When the abscission layer completes its growth, the leaf falls from the tree.

The abscission layer grows between the petiole (leaf stem) and the branch, cutting off all life supporting fluids which cause the leaf to die and fall off.

Why do leaves change color?

Native American legend holds that the leaves change color because the great celestial hunters had slain the Great Bear constellation, and the bear’s blood, dripping on the forest, changed the leaves on many trees to red. Other leaves turned yellow from the fat that splattered out of the hunter’s kettles when they cooked the bear’s meat.

Today we understand that autumn coloration is a process triggered by the cooler temperatures and shorter days of autumn. Sunny, warm days and cool nights promote the most brilliant coloration.

Leaves play an important part in the lifecycle of the forest. After they have finished serving as food producer for the tree, they fall and accumulate on the ground until they decay and become a part of the soil.
How the “Leaf Factory” works

During the growing season, leaves manufacture their own food in a process called photosynthesis. Within the leaf cells are chloroplasts, small structures containing chlorophyll, an energy harnessing pigment that gives the leaf its green color. As sunlight is collected by the chlorophyll, it activates a reaction that combines carbon dioxide from the air, and water from the roots, to create food in the form of sugar (glucose), and oxygen as a byproduct. As cooler weather arrives, chlorophyll production stops and the pigments that were previously hidden become exposed.

Colors from chemicals

Carotin is responsible for orange and xanthophyll for yellow pigmentation in the leaves. Although they are present in the leaf all summer, they are only seen after the chlorophyll has broken down. Red and purple are produced by anthocyanin, which is not present at any other time. The formation of anthocyanin is caused by the build up of carbohydrates in the leaves. Cold temperatures cause the carbohydrates to become trapped in the leaves where they react with other chemicals already present, producing red and purple foliage. Anthocyanin is produced in the vacuoles of the cell. High sugar content plays a major role in the production of red pigments.

Try This!

You can separate the pigments in a leaf with an easy process called chromatography.

You will need:
• a jar
• rubbing alcohol
• a coffee filter cut into long strips
• a pencil
• tape
• a coin
• a green leaf from a tree that has nice fall color, such as maple, sassafras or cherry; spinach leaves also work well

Directions:
1. Fill the jar with just enough alcohol to cover the bottom of the jar.
2. Transfer pigment from the leaf to the coffee filter strip about a half inch from the end of the strip. Do this by placing the leaf on top of the filter strip and rolling the edge of the coin over the leaf, pressing the pigment into the paper.
3. Rest a pencil across the rim of the jar. Hang the filter strip from the pencil with a piece of tape so that the pigment end of the filter strip touches the alcohol. However, do not allow the pigment to become submersed in the alcohol.
4. Allow the filter strip to draw up the alcohol for about a half hour. Then take the filter strip out of the jar and allow it to dry.

Check your results:

Notice the different colors that were drawn out of the pigment by the alcohol. The green colors are chlorophyll, which make the food for the plant. The yellow colors are xanthophyll and the orange colors are carotin. Xanthophyll and carotin are pigments that are always in the leaf, but are only revealed when chlorophyll is broken down in the fall.

Try this experiment with leaves from different species of trees. Which leaves show the best colors on the filter paper?