

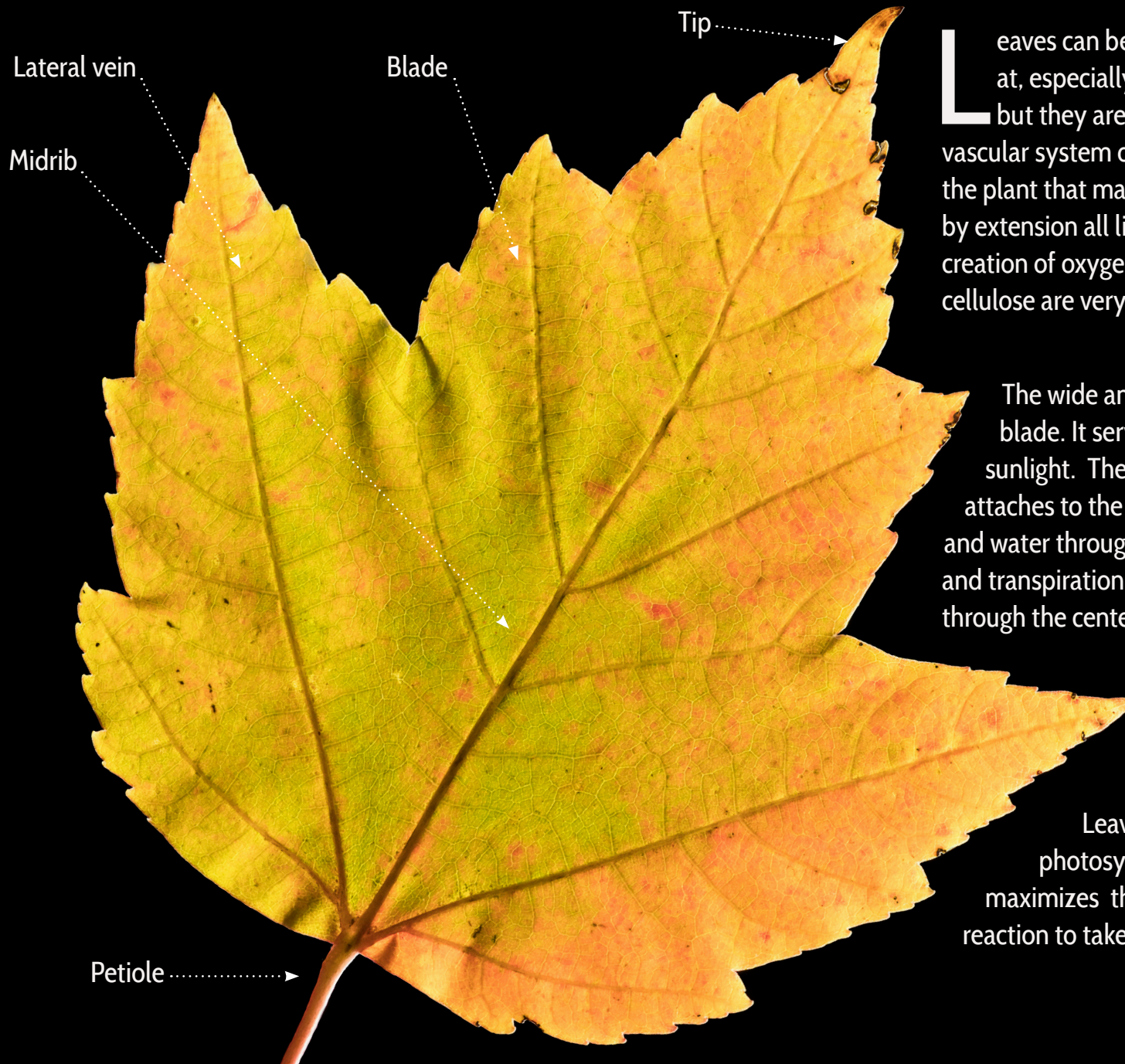


# Falling Colors

Ethan Whitecotton



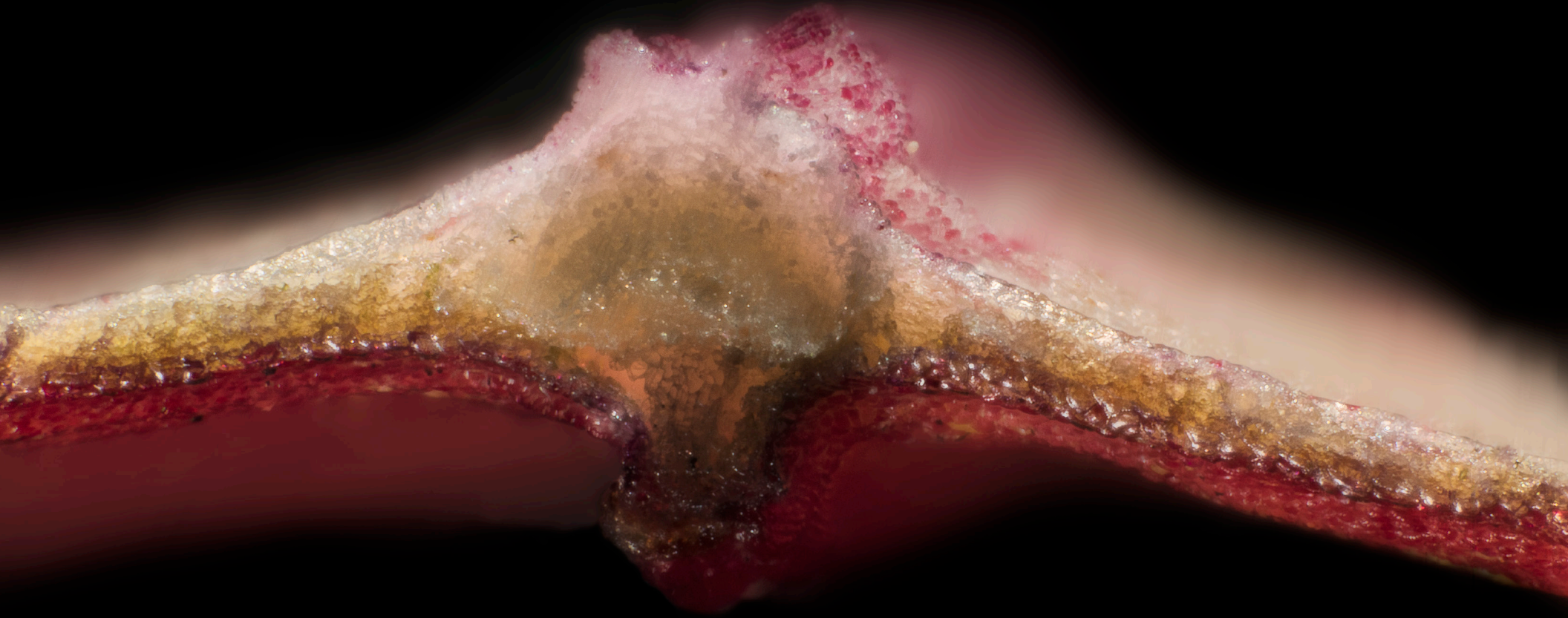
# Parts of Leaves



Leaves can be a very beautiful thing to look at, especially when they change color in fall, but they are also a very important part of the vascular system of trees. Leaves are the part of the plant that make photosynthesis possible, and by extension all life on earth is possible due to the creation of oxygen. As a result, these green pieces of cellulose are very important to life on earth.

The wide and flat area of the leaf is called the blade. It serves as a place for concentrating sunlight. The petiole is a shorter stem that attaches to the main stem. Veins transport nutrients and water through the leaf to allow photosynthesis and transpiration to occur. The main vein going through the center is the midrib. The midrib splits the two sides of the leaf. Lines shooting off of the midrib are called the lateral veins.

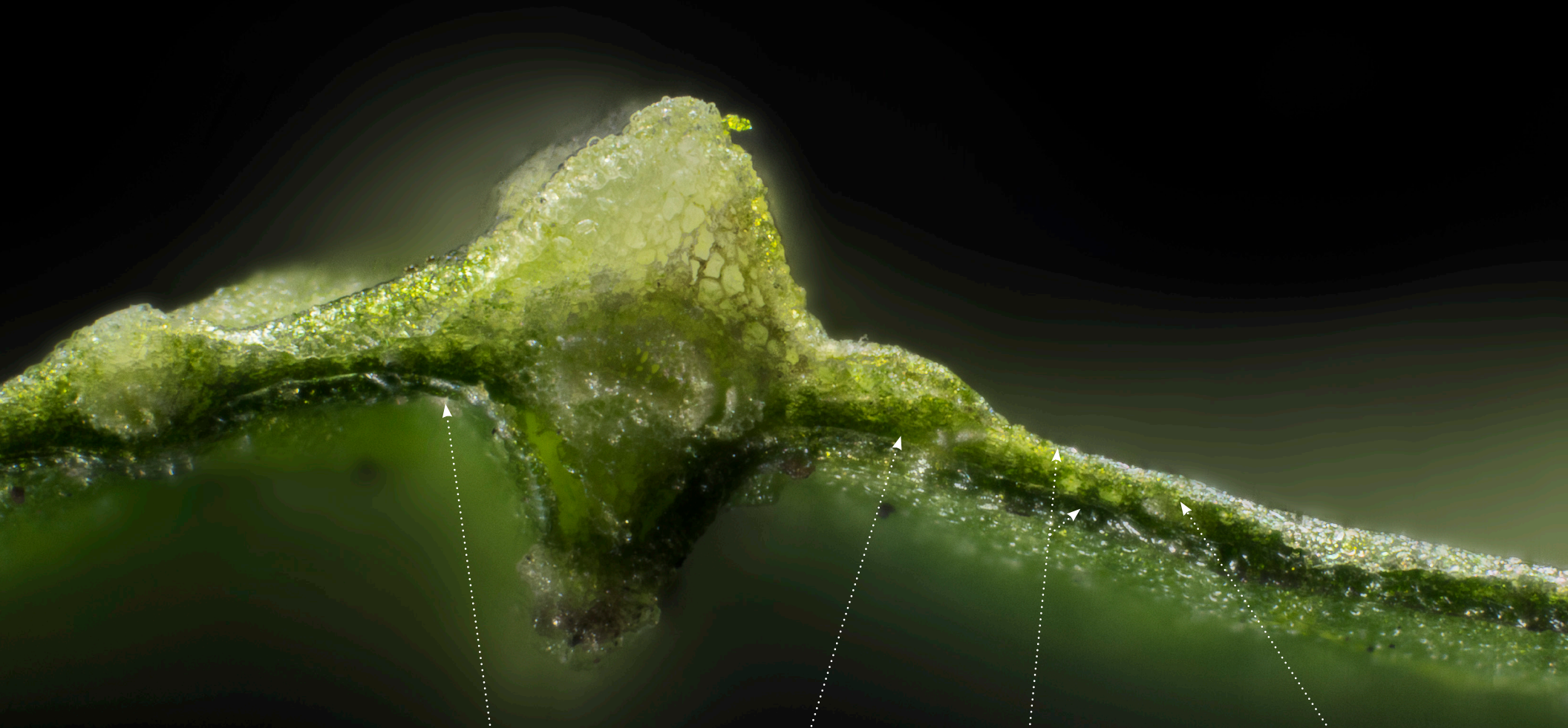
Leaves serve as the location for photosynthesis. The shape of the leaf maximizes the surface area to allow the chemical reaction to take place.



The leaf is also where gas exchange and transpiration occur. Transpiration is the evaporation of water from plants. Water is pulled up from the ground using cohesion and evaporates from holes called stomata on the bottom of the leaf. In addition, other minerals that are needed for the plant to survive are carried up through this process.

Leaves are made up of multiple layers of plant cells. Usually, the outside layer on the top of the leaf is a wax cuticle. Under that is the upper epidermis, then the palisade mesophyll. This is where the chlorophyll are located. Under that is the spongy mesophyll. There is a lower epidermis and then another waxy cuticle. These cross sections of leaves at high magnifications show the different layers that leaves have. The leaf on this page is a leaf after it has changed color.





Waxy Cuticle

Spongy Mesophyll

Epidermis

Palisade  
Mesophyll



# Changing Colors



Have you ever wondered why leaves change color in the fall?

It is because the chlorophyll breaks down when the length of the day becomes shorter. There are three main pigments that are involved in creating the coloration of leaves: chlorophyll, carotenoids, and anthocyanins. Chlorophyll reflects green light. Carotenoids reflect yellow, orange, and brown colors while anthocyanins produce red and dark purple colors.

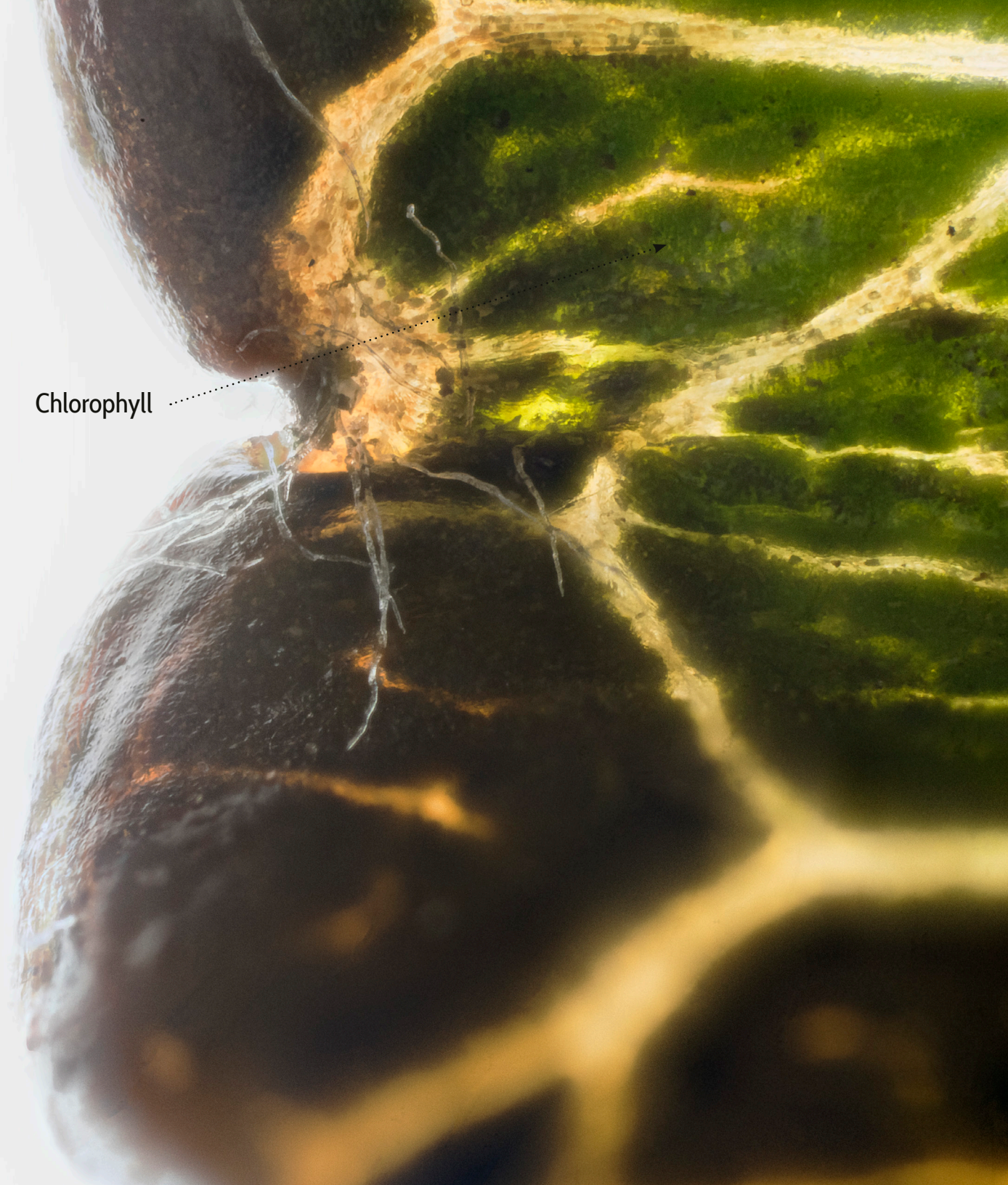
Chlorophyll is continuously produced and broken down, making the leaves appear to be green. But when the nights gradually get longer and days get shorter, the production of chlorophyll slows down and stops. This means that the carotenoids and



anthocyanins are unmasked and become the primary color of the leaf. Both the color and the time that leaves fall can change for different species of trees.

Since the chlorophyll gives the leaves their green color, the color of the other pigments, which are shades of red and yellow, begin to show through and produce the beautiful appearance of autumn. Not every tree changes to the same color, because they have different amounts of the pigments.

In early autumn, the connection of veins between the stem and the petiole begin to close off as a layer of cells forms at the connection. This layer of cells traps sugars in the leaf, causing production of the anthocyanins. After the layer of separation is completely sealed, the leaf is ready to fall when a strong wind rustles through the leaves.





# Types of Trees:



## Red Maple

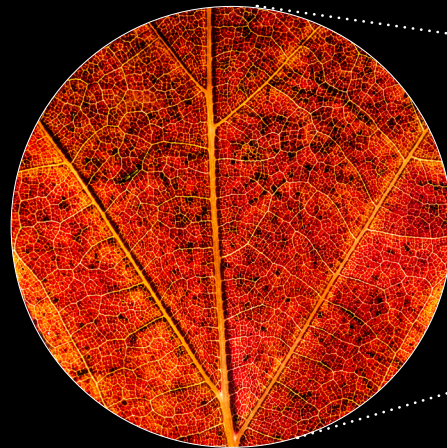
Leaves change color in the fall, and the type of tree is usually a determining factor in the color that leaves will ultimately become.

The red maple is a tree that can grow to 40 to 60 feet, and it grows relatively quickly. It can grow one to two feet per year. The tree features leaves that are medium to dark green and have 3 or 5 irregularly-toothed lobes. These trees are often planted because of their beautiful color. A lot of people consider red maples to be their favorite trees because of the colors they produce during autumn. In the fall, their leaves can turn red or yellow.

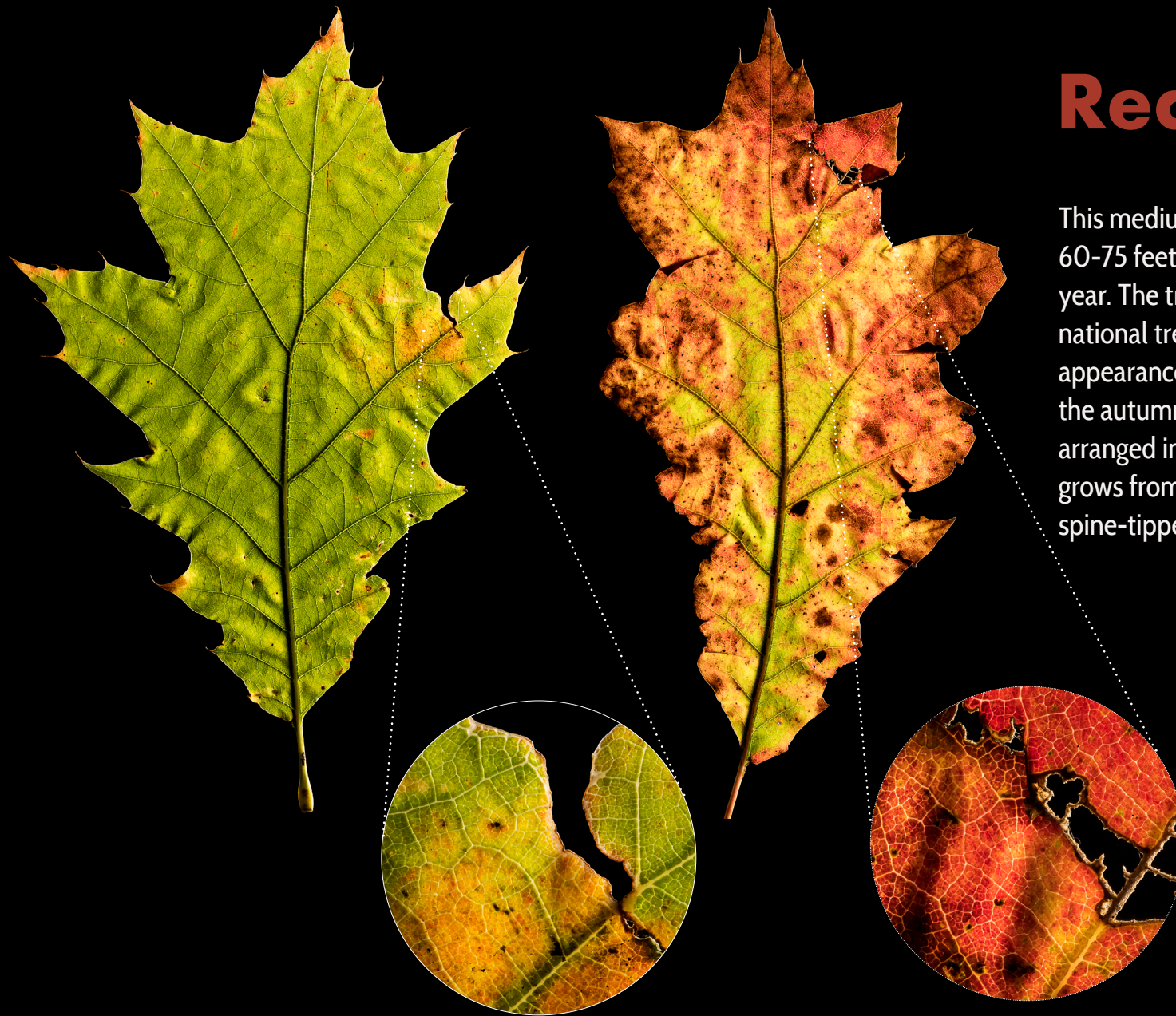


# Silver Maple

The silver maple is a tree that is named for the way the leaves can appear in the sunlight. When a light wind blows through the trees, a shimmery effect can be seen as the leaves float in the wind. In addition, the bark is silvery. It is a fast-growing tree that can reach 50 to 80 feet tall and grows about 24 inches per year. The leaves are 3 to 6 inches long with deep indents. The top is green and the bottom appears silver or satiny. In autumn, the leaves turn red and pale yellow.







## Red Oak

This medium to large tree can grow from 60-75 feet tall and grows 24 inches per year. The tree is considered by many to be a national treasure because of the handsome appearance and vibrant colors produced in the autumn. The leaves of the red oak are arranged in an alternating pattern. Each leaf grows from 4 to 8 inches long with 7 to 11 spine-tipped lobes.



# Golden Rain Tree

The golden rain tree is a small to medium sized tree that grows quickly. The golden rain tree typically becomes 30 to 40 feet tall. This tree originated in China, so it is considered an invasive species in some states. The tree has leaves that grow in alternating stems with about 7 to 17 leaflets per stem. The leaves grow in a way so that they are divided and appear to be feathery. In the fall, the leaves become a golden yellow, giving the tree its name.



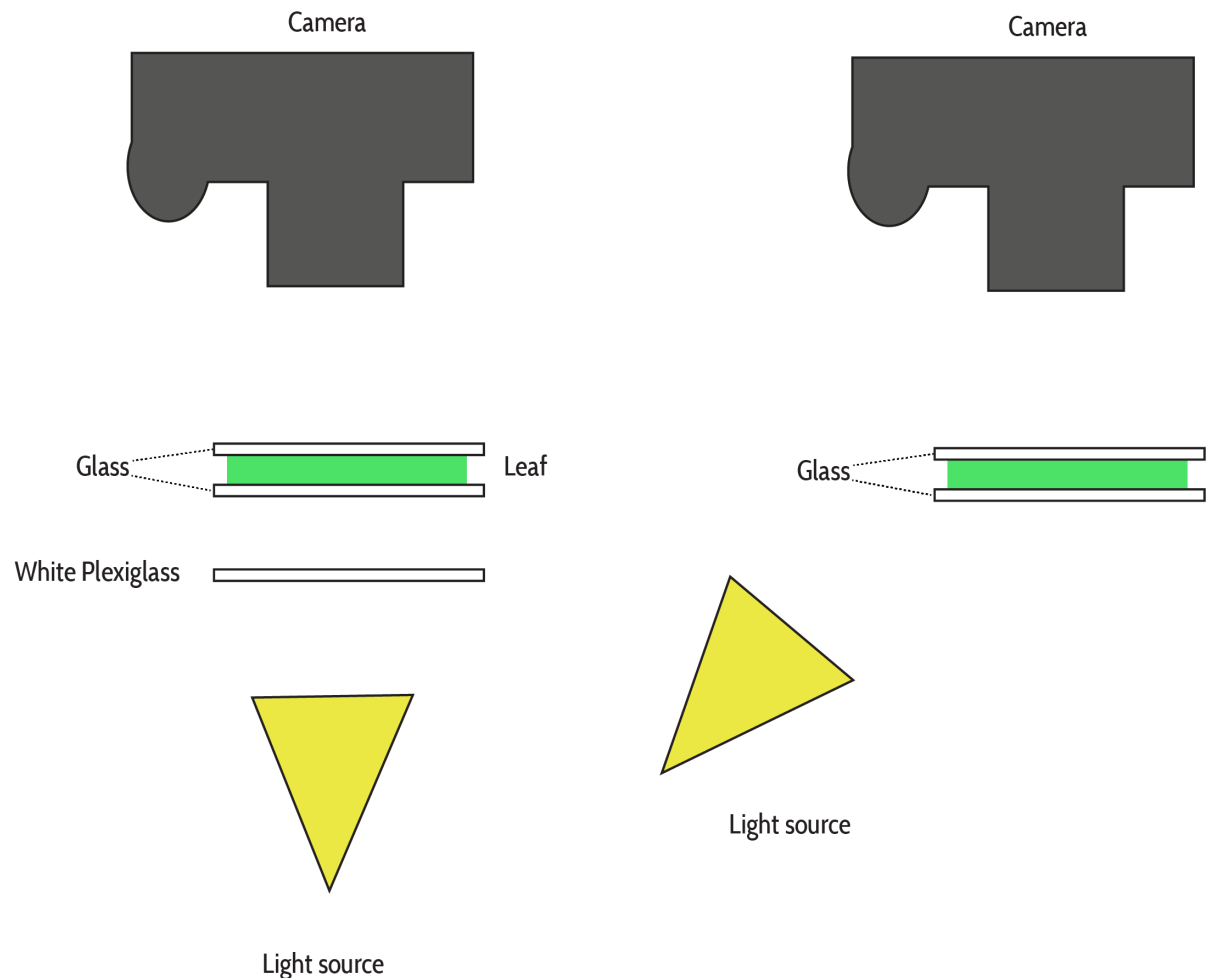


# Photographic Set-up

White Background

Black Background

The leaves were pressed between two pieces of glass to maximize the depth of field. All of the leaves were trans-illuminated, adding a glowing quality to the veins. For the white background, a piece of white Plexiglas with a flash was used to diffuse the light. For the black background, leaves were lit by a large soft box placed at a 45° angle. For the high magnification cross-sections of the leaves, two flashes were placed on both sides of the leaf cross-section.





# About the Author

Ethan Whitecotton is a third-year student at Rochester Institute of Technology studying Biomedical Photographic Communications. He is minoring in Environmental Science and Web Design. Ethan specializes in shooting high magnification images. He has taken classes in underwater photography and is an Advanced Underwater PADI diver. Ethan completed an internship at the Smithsonian Museum of Natural History where he photographed treehoppers and learned more about insects. Once he graduates in 2019, Ethan hopes to get a job that combines his passion of photography with the ocean and the environment.

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