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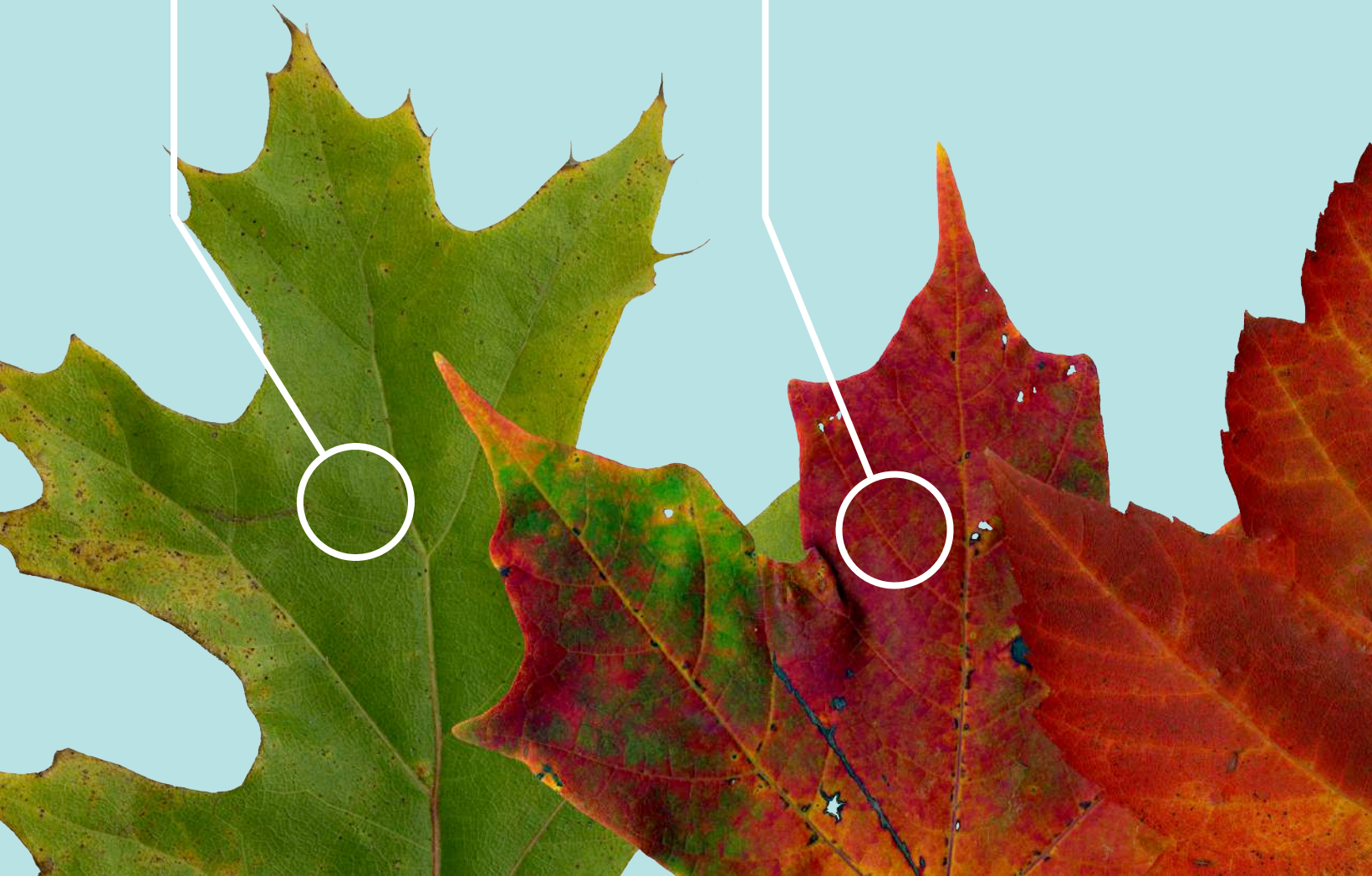
Decorative Deterioration: the science of fall colors

Decorative Deterioration

the science of fall colors

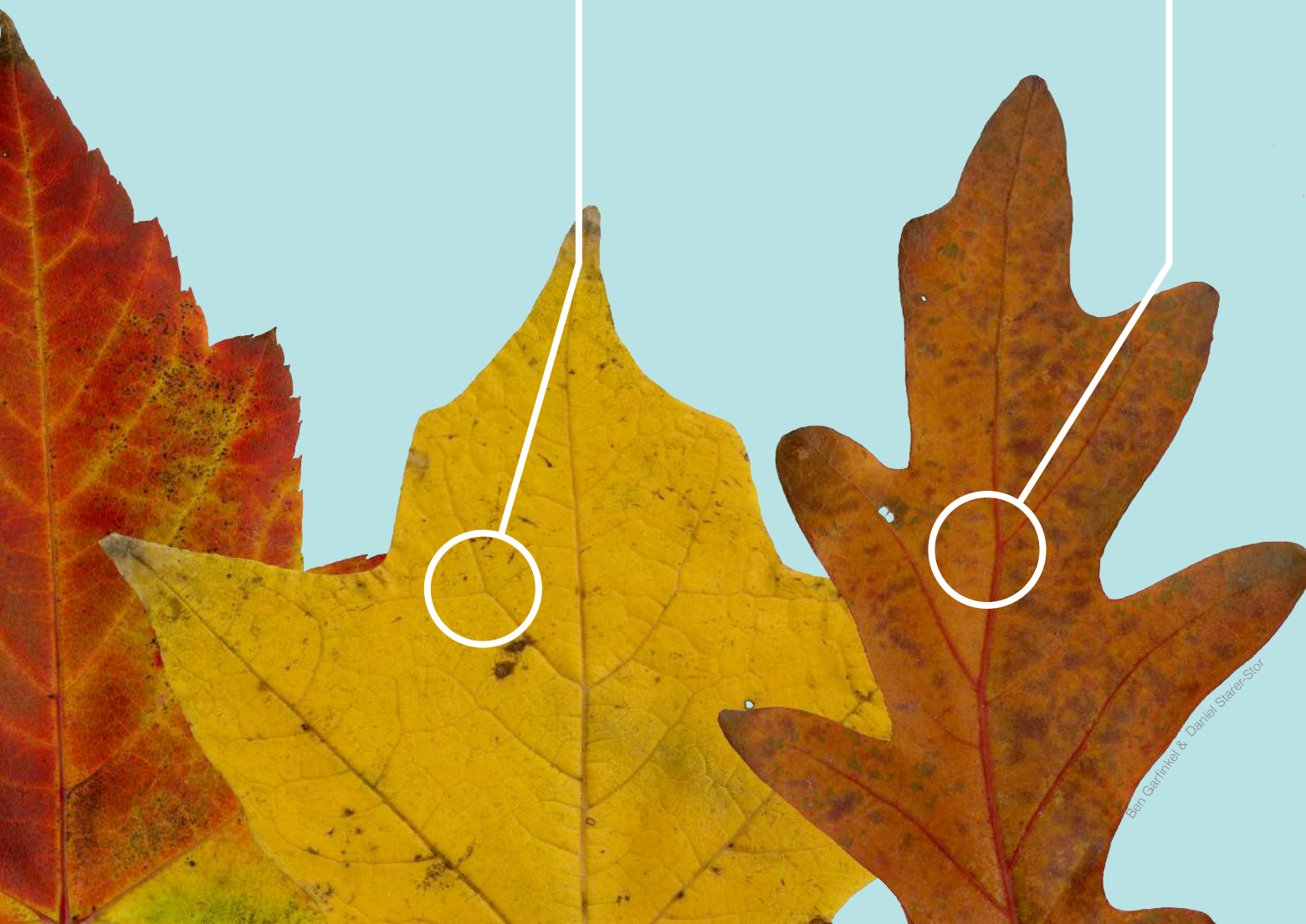
In the summertime, chlorophyll pigments in leaves absorb energy from sunlight for use in the synthesis of sugars. Since the pigments absorb blue and red light, the green light is reflected to our eyes, giving the leaves their characteristic green appearance. The sugar produced by the leaves is transported all over the tree, destined to be broken down for energy or incorporated into sugar based structures, such as cell walls.

As the nights grow longer and the days shorten, the lack of sunlight triggers the plants to cease production of chlorophyll, as the energy return diminishes. Simultaneously, the cold nights restrict the flow of fluids into and out of the leaves, leading to a local build up of sugars. The excess sugar is used to synthesize anthocyanins, pigment molecules that give leaves a deep red or purple hue.



Some species of trees do not produce anthocyanins, or produce only a small amount. For these plants, the dwindling presence of chlorophyll reveals other pigments called carotenoids that are always present in the leaves. Orange and yellow in color, carotenoids are found in many foods, namely carrots.

As the leaf dries out and dies, it becomes brown and crunchy. Most pigments have broken down, and the cell husk remains. As the cell dies, it begins a process in which many molecules, anthocyanins included, are linked together to make melanin - a long polymer that is brown in color. This process is identical to that of fruits, such as apples, that turn brown when left exposed to oxygen.



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