

**Station 1:**  
*Where did the apple originate?*



**Crabapple**

*A small, tart apple not suitable for eating, but can be used for jellies, preserves, and cider.*

*Crabapple trees are native to North America and Asia.*

Can you imagine life without sweet, delicious apples? In the early years of America, there was no such thing as the apple we are familiar with today.

The crabapple is the only apple native to North America.

Most of us know the story of Johnny Appleseed, a bare foot nomad who traveled across the United States randomly dispersing apple seeds. However, the real story of Johnny Appleseed (John Chapman) is a little different.

1

Read the story of John Chapman

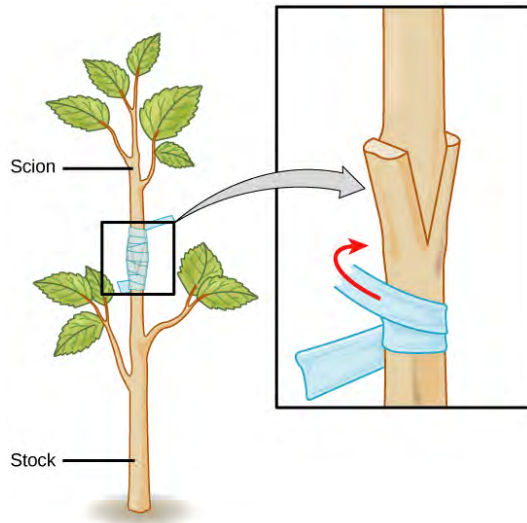
2

Answer the Challenge Questions on your handout.

3

Crabapple taste test.

Station 2:  
*Why aren't apple  
trees grown from seed?*



### Grafting

*When a shoot or bud of one tree is inserted into or joined to the stem, branch, or root of another tree so that the two grow together.*

Apples today are not the same as the native crabapples that grew hundreds of years ago.

Apples have been selectively bred to produce the varieties that we know today. Apple breeders plant apple trees from seed **ONLY** to find and develop new traits.

The apples we eat were grown on farms from trees propagated by grafting.

# 1

Watch the video,  
*"How Does it Grow?  
Apples"*



# 2

Answer the Challenge Questions on your  
handout.

# 3

Find the answer to these questions:

1. Could you use grafting to create 1 apple tree with multiple varieties of apples?
2. Could you use grafting to create 1 tree that has multiple varieties of fruit?

### Station 3:

## *What changes apples from a solid to a liquid?*



### Food Processing

*The  
transformation of  
foods from one  
form (raw) into  
another.*

Apples are made up of 85% water and 10% sugar. How do you think *temperature* and *time* can be used to create a “sauce” or liquid version of apples?

The main difference between the solid and liquid phase of an apple is due to the amount of energy and the arrangement of molecules. Solids have tightly bound molecules that vibrate due to their packed nature and lower energy. Liquids have freely moving atoms and a higher energy state than solids. Explore the difference between liquids and solids by making applesauce!

1

Browse the  
*Guide to the Most Popular Varieties*



While there are thousands of varieties of apples throughout the world, these 10 are the most prevalent in the United States. What characteristics make an apple ideal for different uses?

2

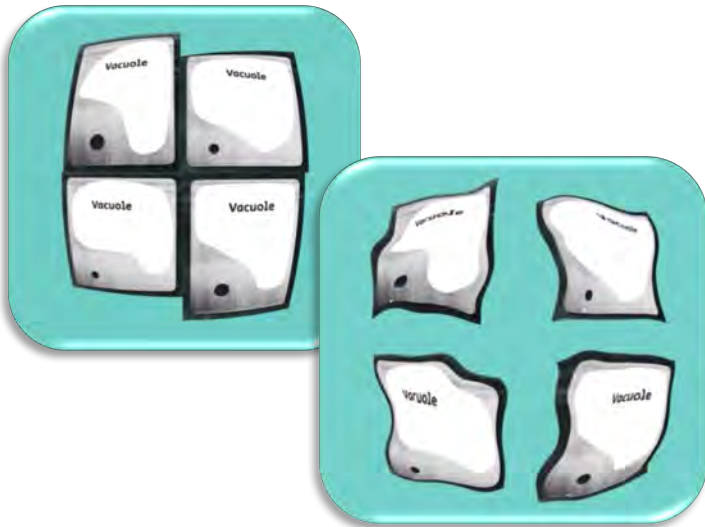
Answer the Challenge Questions on your handout.

3

Applesauce taste test.

## Station 4:

# *What makes apples crisp?*



### **Cultivar**

*A plant variety that has been produced by selective breeding containing specific characteristics.*

Fruit breeding programs have developed many well-known apple cultivars. For example, the **Honeycrisp**, was introduced by the University of Minnesota in 1991.

The crispness of an apple can be explained by evaluating the cells of the apple. The cells of the Honeycrisp are larger than other apples and contain large vacuoles and pockets of sugar. When you bite into the apple, the cells burst open releasing the juices inside. In other apples like the Red Delicious, the cells are smaller and do not burst open when you bite into them.



1

Watch the video,  
*"Have We Engineered  
the Perfect Apple?"*



2

Answer the Challenge Questions on your  
handout.

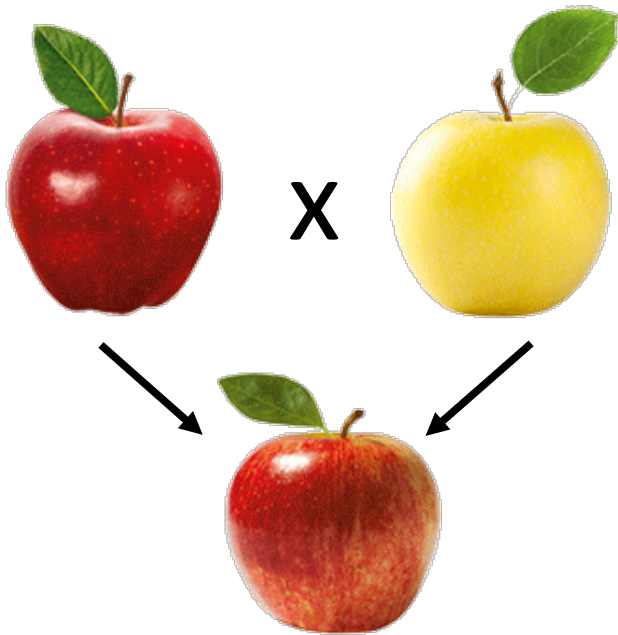
3

Apple taste test:  
Compare the Red Delicious and the  
Honeycrisp apple.



## Station 5:

# *How can a specific trait be added to an apple?*



### **Selective Breeding**

*A process where specific plants or animals are paired for breeding in order to perpetuate specific phenotypic traits.*

The apples we purchase at the grocery store were produced on a tree propagated by grafting. This allows all the apples to be consistent in color, texture, and flavor.

However, in the pursuit of new varieties of apples with improved characteristics, apple breeders cross pollinate apple cultivars in search of new genetic characteristics.

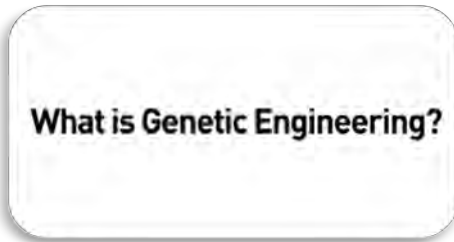
Honeycrisp apples were created through cross breeding. The Arctic apple was developed through transgenesis or genetic engineering.

Watch the following videos:

1

*"What is Genetic Engineering"*

*"How are GMOs Created?"*



2

Answer the Challenge Questions on your handout and taste samples of an Arctic® apple and a Yellow Delicious.

Learn about the new Arctic® apple:

*"Arctic® Apples Explained"*

*"Arctic® Apple Time Lapse"*

3

