CHAPTER 1
CRAZY PLANTS

A. UNDERGROUND MIRACLE ROOT

Picture this scene: You're a farmer living in rural China, and you're out digging up medicinal herbs and roots. Most of the roots you find are skinny and stringy and wispy. But today's discovery is nothing like that. The plant that's buried deep in the moist ground in front of you is rounded and heavy. You unearth your prize, which is bigger than both your hands put together, and to your delight you see that this root is . . . person-shaped?!

Can you believe this grew under the ground?

Congratulations! You've just dug up a royal fleeceflower root, known locally as *he shou wu* or *fo ti*. Mainly found in rural areas of northeastern China, this rare and highly prized root is an offshoot of the common tuber fleeceflower, a medicinal herb that's used for liver and kidney health, for better blood circulation, to remove toxins from the body, and more. This uncommon strain, the royal fleeceflower, has similar healing properties but in concentrated form: extra strong, in other words.

But what makes it *really* special? It's shaped like a little person. Specifically, the royal fleeceflower root is distinctive for its limb-like growths that oddly mirror the human form.

Hard to believe? Maybe not. Royal fleeceflower is found in particularly soft yet rocky soil: instead of growing into the flat, bulbous shape of the standard fleeceflower root, its royal cousin pushes around obstructions in its way, giving the fully matured

root its rounded, uniquely doll-like appearance.

While royal fleeceflowers are farmed for medicinal use, a growing number of horticultural exporters are eyeing the roots *not* for grinding, boiling, and extracting of healing properties, but rather for decoration. After all, who *wouldn't* want a little root-goblin brightening up the coffee table. Er . . . right?

Do you see the resemblance?

Now, you should know that not *every* royal root dug up is going to look like your great-aunt Susan. "The truth is, maybe one in four royal fleeceflowers have any human resemblance at all," says Dr. Chen Jie, associate professor of horticulture at Oregon State University, who has published several well-regarded papers on the plant. "Most are closer to a lumpy ginger root." But ever since photos of a royal fleeceflower root with an apparent resemblance to Homer Simpson went viral in 2013, plant lovers worldwide have been falling over themselves to get their hands on the prized tubers. That's not as easy as it might seem. The USDA's Animal and Plant Health Inspection Service classified it as a restricted import in 2014, to the great frustration of exporters and collectors alike.

So for the foreseeable future, at least, the royal fleeceflower will have to go on being admired from afar. Unless you happen to have access to just the right moist patch of earth: by a stream, perhaps, where a certain shoot will spark a burst of excitement. You pull out your gardening trowel and start to dig. . . .

Plants: Fact or Fake?

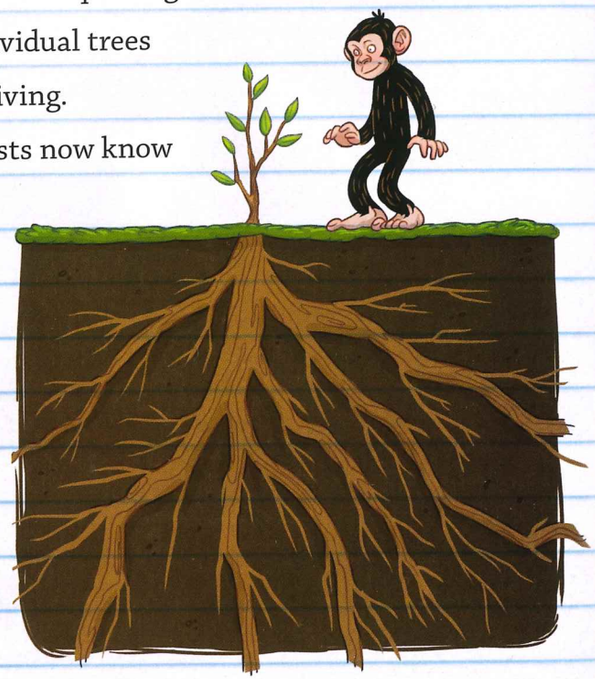
All of these are scientifically true, except for one! Can you figure out the fake?

1. Bananas are not simple fruits. They are berries.
2. Cucumbers are not vegetables. They are fruits.
3. Peanuts are not nuts. They are legumes.
4. A sunflower is not one flower. It is a cluster of tiny florets.
5. Carrots were not originally orange. They were purple.
6. Vanilla flavoring comes from the seedpod of an orchid.
7. Spinach is not a vegetable. It is a fungus.
8. Cashews are not nuts. They are drupes that grow on the ends of cashew apples.
9. Strawberries aren't berries. They are accessory fruits.
10. Peaches, pears, apricots, and apples are all members of the rose family.

B. PANDOMONIUM

Imagine a forest. Now imagine that forest covering more land area than 100 football fields. Next, imagine that the entire forest is actually just one very large, very heavy, and very old tree!

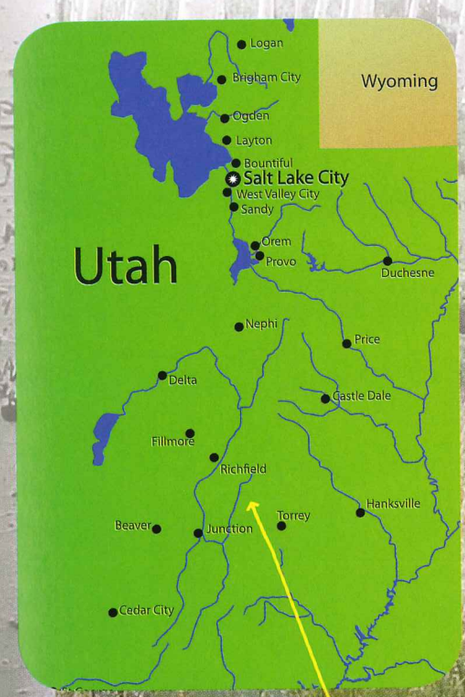
This spectacular tree, called Pando, is very real, and you can visit it in the Fishlake National Forest in Utah. On the surface, Pando looks like a typical forest of quaking aspen, with up to 47,000 individual trees visible. But looks can be deceiving.



Below the ground, scientists now know that all of those trees sprouted from the same connected root system—in other words, the whole forest is really one massive tree—making it one of the largest living things on Earth. The total weight of all the parts of this extraordinary plant is approximately 13 *million* pounds! That makes Pando the heaviest known single organism, too.

Perhaps even more surprising is the fact that every one of those trees is an identical clone of one original tree that spawned them all long, long ago. While that specific tree is no longer alive, its genetic code is in every single tree that makes up the Pando organism today.

Pando, which means "I spread" in Latin, has been spreading from that original tree for a long time. No one knows for sure exactly when Pando started growing, but scientists estimate it was at least 80,000 years ago. Some say it could even be up to a million years old. That would make Pando not only one of the largest and heaviest living things on Earth, but also one of the oldest—it could have started growing before modern human beings even existed!



Since it can repeatedly clone itself and spawn new saplings, Pando has enjoyed a kind of

immortality since it first sprouted. And, because it can extract nutrients from the ground anywhere in its root system and ferry them along to wherever they're most needed across the entire clone network, Pando can survive many negative environmental conditions that would wipe out other kinds of trees.

So, will Pando just keep spreading forever? Unfortunately, experts fear it may now be in danger. Like other quaking aspen groves throughout North America, Pando is suffering from something called "sudden aspen decline" or SAD. Caused by extreme drought and high temperatures, SAD may leave affected trees weakened and more vulnerable to bugs, fungi, and animals—and it may even kill them. SAD and other factors are causing

Cloned trees growing from a single aspen root

Pando to do something it has never really done before: age. The older trees that make up Pando are doing fine, but the younger shoots are no longer thriving. There are no new clones joining the older ones, so the average age of the trees in the Pando forest is rising quickly.

Botanists: scientists who study plants

But some people are trying to help. **Botanists** are studying SAD to better understand its causes and effects. Others are clearing small stands of older trees in hopes of encouraging new stems to sprout, and they're putting up fences there to keep deer and elk from eating Pando's tender young shoots. Will these efforts be enough? Only time will tell. But, hopefully, time won't run out for Pando.

Try This!

1. Invent your own original plant. How tall is it? Does it bear flowers or fruit? If so, what do they look like? What conditions does the plant need to thrive? Draw a color diagram and summarize its most interesting qualities. Then, make a sculpture of your creation using pipe cleaners and colored tissue paper.
2. Start a nature journal. Sketch interesting leaves or flowers you find in green spaces near you. Keep a record of what you find and where you found it. Don't forget to include your personal observations, such as what your discoveries look like, how they smell, what they feel like, and more.

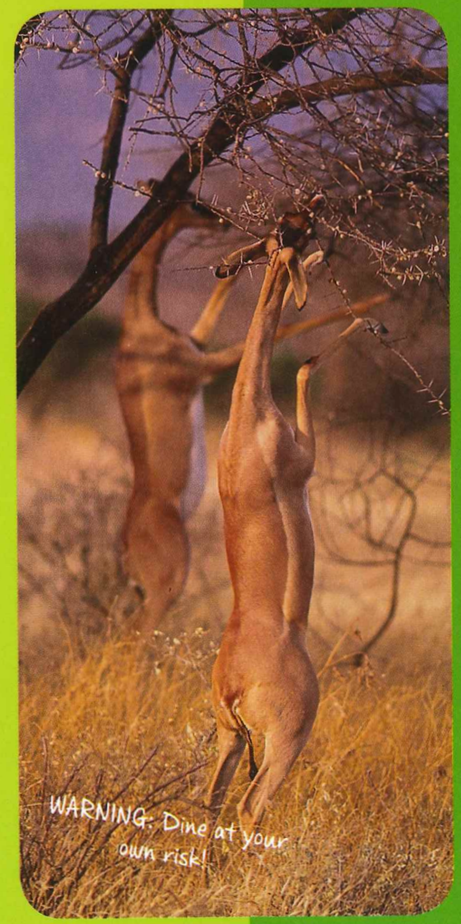
C. THE SECRET LIVES OF PLANTS

You may think that plants just sit there, soaking up the sun and growing ever so slowly. But there's a lot going on inside those roots and stems that you probably aren't even aware of. Get ready for a fascinating sneak peek at the inner life of plants!

First: Plants can sense things that are important to them, like light, water, and nutrients. And they can react, too. Plants can move to seek out sunlight or grow more roots where soil is better. And of course there are plants like the Venus flytrap, which snaps shut when an unsuspecting fly tickles the hairs on its leaves. (Dinner!)

Second: Would you believe that plants can learn? Botanists have shown that the more times a plant responds successfully to a particular sensation, the better it will respond the next time. Practice makes perfect, apparently even for plants! That's a pretty impressive feat for organisms that don't even have brains, don't you think?

Third: As crazy as it sounds, plants can communicate! When an antelope nibbles on an acacia tree, for example, that tree will start to produce a **toxin** that makes its leaves bad tasting and harder to digest. The tree also emits a gas as a warning signal to other acacias! Up to fifty yards away, acacia trees will receive the message and start producing more toxin in their leaves, too. So watch out, antelope . . . the trees are joining forces to ruin your midday meal!



Toxin: a poisonous substance made by a living organism

"Mom was right. It IS a great day to sprout!"

Plants can also communicate with their not-yet-sprouted seeds. Mother plants can pass on information that tells their seeds how soon to sprout based on recent weather conditions. Studies have also shown that plants are somehow able to pass on what they've learned to future generations, including ways to survive extreme heat, resist infections, and combat animals that try to eat them. As usual, mama knows best, even if you're a plant.

Plants even have ways of communicating with other species!

Take Action

Find a plant identification book or website for your region (ask an adult if you need help), and learn to identify some of the plants in your neighborhood. Then take someone with you on a walkabout to show them what you've learned!

Flowers tend to be colorful and smell a certain way to attract the right kinds of birds and insects to pollinate them. And many plants use thorns or toxins to warn herbivores—animals who eat plants—to stay away. But it gets a whole lot weirder than that!

One study showed that trees in a forest can use fungi growing between their roots to tell one another important news about what's happening throughout the forest, such as a drought or insect attack. The trees can also use this fungus "network," sometimes referred to as the wood-wide web, to deliver water and other nutrients from trees that are thriving to trees that are in need. It's almost like they've constructed a fungus telephone system, complete with 911 emergency services.

And, speaking of calling 911, some plants can even rally an animal army to come to their defense! When caterpillars attack plants like corn or lima beans, for example, the plants send out a chemical distress signal. The scent then gets picked up by

wasps, which race in to attack the caterpillars. The plants are saved, and the wasps get a tasty caterpillar dinner. It's nice to have friends you can call on in a pinch!

Plants may not have brains and nervous systems like we do, but they can still do some pretty amazing things in their own special ways: sensing and reacting, learning, and communicating with one another and with entirely different kinds of organisms. They probably have a lot to tell us, too . . . if we're willing to listen.