

Unit 1: Moon Mystery

Narrator: Jupiter is the largest planet in the solar system. It is so big that 1,300 Earths could fit inside it. Due to its size, it also has a huge number of moons. So far, 79 have been discovered, but there could be more. Of those 79, one moon is especially interesting to scientists—Europa.

It is thought that this mysterious moon might be home to other forms of life. Astronomers have known about Europa for a long time. It was discovered in 1610 by Galileo Galilei. However, scientists still do not know much about it.

Europa is slightly smaller than Earth's moon, but it looks very different. Europa's surface is covered in ice. Long lines across the moon show where the ice has cracked. It is thought that beneath the ice is a salty, water ocean, and it is here that scientists think there might be life. Water is known to be an important ingredient for life to exist.

The ocean water on Europa would be very cold, but scientists have found life in similar conditions on Earth. Future missions to Europa are being planned. Many scientists would like to send a robot to the moon's surface. Once there, a robot could drill through the ice, perhaps even deep enough to reach the ocean below. But for now, the icy moon's secrets remain a mystery.

Unit 2: Science of Taste

Narrator: The way we taste food is not as simple as you might think. It's true that when we put food in our mouths, tastebuds on our tongues help us work out what we're eating. However, the experience of what we call taste doesn't just happen in our mouths. In fact, 75 to 95 percent of what we call taste is really about how a food smells.

And there are other senses, too, that we use when we taste food. Our brains take information from all our senses—even sounds we hear—and create the experience we know as taste. For example, if we see a food that is red, our brain will guess that it is sweet. As a result, it may taste sweeter than it really is. Green foods may taste more sour. Black foods may taste slightly more bitter, and white foods a little more salty.

Even shapes affect the way we taste. For example, a dessert served on a round plate may taste a little sweeter. If it is served on a square plate, it may taste more bitter. By learning more about taste, scientists believe we can develop healthier food that still tastes good, making sure we all have a healthier and tastier future.

Unit 3: Right Dog for the Job

Narrator: This is the Canine Assistants Canine Camp. At the canine camp, animal trainers teach dogs to help people. The trainers teach their students to open and close doors, turn on lights, and even find help when their owner has fallen down or is sick. If their owner is in trouble, the dogs have to press a big button which will call the police.

To teach the dogs to love their jobs, the trainers give them food each time they do something right. One day, these dogs will be given to people who are sick or need help around the house. But, first, they must learn to think for themselves and be trained to want to help their owners.

As Canine Assistants founder Jennifer Arnold explains . . .

Jennifer Arnold: Our dogs have to love what they're doing. And when they leave us and they go home with their recipient—when the recipient says, "Will you pick this up for me?" Well, I mean, it's all up to the dog.

Narrator: Jennifer wants her students to be super-dogs. For the first year and a half of their lives, these dogs go through some very difficult training. Scientists think this kind of training makes the dogs better learners.

Handler: C'mon pups, let's go!

Narrator: Welcome to the puppy room! At the camp, the dogs start training in the puppy room before they are 16 weeks old. The puppies learn things they will keep for a lifetime. This is an important time for them. In the puppy room, they will face situations they will find in their new homes. They learn to play with and be comfortable with lights, other animals, even themselves.

At eight weeks, they hit a time of fear, where just about everything is frightening. If they don't get past it now, they never will. So this is an important time for the trainers to show the pups there's nothing to be afraid of. The trainers take each puppy on a trip outside the camp. They want the puppies to experience the world outside, and get used to all the places they might go with their owners when they grow up, like the supermarket. When the dogs

are old enough and their training is complete, these super-dogs are ready to go into the human world and do their jobs.

Jennifer Arnold: These dogs are such lifesavers. I'm so happy for the people who are getting them.

Unit 4: An Ancient Shipwreck

Narrator: About 2000 years ago, off the coast of the Greek island of Antikythera, a large ship was sailing to Rome, filled with many beautiful and expensive items. As it passed the island, the ship was hit by a storm and sank.

In 1900, some divers found some interesting objects at the shipwreck. Among the items was the Antikythera mechanism: a machine used to study the stars. Some call it an ancient computer. But the story doesn't end there.

In 2017, a new team of archeologists returned to the area where the ship had sunk. There, they dove into the water and searched the seabed. Soon, they had found many ancient artifacts. One of these artifacts was an arm from a metal statue. The archeologists carefully moved the arm off the seabed and out of the water. Later, on their boat, they studied it very carefully. The team think the statue is of a Greek thinker.

Another treasure found from this shipwreck was a metal disk. Just like the statue's arm, the disk was brought out of the water and studied. On the disk is a picture of a bull. But no one knows what the picture means or what the object was used for. In the following days, the archeologists found many more artifacts from the shipwreck. They think Antikythera has the area's largest number of shipwreck artifacts. So they plan to keep looking so they can understand more about the ship that sank here and the treasures it carried.

Unit 5: The Flu Virus

Narrator: Every year, many people get sick from a virus we call influenza or the flu. But just what is the flu? And why do so many people get it?

The influenza virus can be very dangerous. It kills more than 36,000 people in America every year. And has killed thousands more across history. The flu virus is so dangerous because it is hard to cure. And it is hard to cure because it is always changing.

Since just 2004, more than 5,000 different flu viruses have been identified. The types that hurt humans are called types A, B, and C. But it is type A that can spread from one person to another the fastest. Type A flu can also spread from different types of animals to humans. For example, avian flu starts in birds, and swine flu starts in pigs but both can spread quickly to humans.

Between 1918 and 1919, a deadly type A flu virus called the Spanish flu spread all over the world. It made a third of the people on Earth sick, and killed up to 50 million people. Scientists think this flu virus came from birds. And in 2009, a type of swine flu caused 375,000 people to be sick.

Today, scientists are working to identify new types of flu and trying to make new medicines to keep people safe.

Unit 6: Giants of the Forest

Narrator: In the forests of Sequoia National Park in the United States, stand the giants of the plant world—giant sequoia trees. They are one of the largest living things on Earth.

The world's largest giant sequoia, and the world's largest tree, is called General Sherman. It has stood in Sequoia National Park for over 2,000 years. It is over 80 meters tall. Its first branches only start growing 40 meters above the ground. In places, the length around its trunk is over 30 meters.

Why do these trees grow so big? One obvious reason is their long life. But that's not the whole story. The sequoia is also a very fast-growing tree. Given the right conditions, the sequoia is one of the fastest growing trees on earth. In their first ten years, they can grow up to 2 meters every year.

Another secret of the giant sequoia's size is its ability to survive fires. Forest fires can destroy other trees and plants, but a sequoia's thick bark doesn't burn, and it protects the tree from the fire's heat. Also, a forest fire burns away other plants, so the sequoia has more sunlight and space to spread its roots. So with each fire, and each year that passes, the sequoias not only survive, but grow taller and wider. Stretching their branches up and over the forest, until they become the giants they are today.

Unit 7: Parasomnia

Narrator: For most people, sleeping is easy. For others, it can be a real nightmare.

Some people dream of being attacked and might even fight with their partners while they sleep. Other people get up and walk around in their sleep without knowing what they're doing. These sleep conditions—called parasomnia—can be dangerous. Scientists are hoping to find out why they happen.

REM sleep is the stage of sleep when we dream. Parasomnia happens during a time in the sleep cycle called NREM or non-REM. NREM contains four stages.

During stage one, your brain is producing small waves, and you are in a light sleep. In stage two, your body relaxes and your heartbeat and breathing get slower. The brain waves are larger and become further apart. The deepest sleep is during stages three and four. For most of us, our brains shut off sounds and movement from the outside world. But for sleepwalkers, the lower part of the brain wakes up, while the upper part—the thinking brain, or the mind—is asleep. This is why sleepwalkers are able to move around at night, and yet they don't remember it the next day.

With further research, scientists hope one day to fully explain this mysterious condition.

Unit 8: Amazing Narwhals

Narrator: Swimming in the icy water of the Arctic are some very strange creatures.

Narwhals are a kind of whale with one very special feature, their tusks.

A narwhal's tusk is actually one very long tooth. This tooth, which comes out of the narwhal's head, can grow to three meters in length. For many years, people sold narwhal tusks, telling buyers that they were unicorn horns.

Today, we know more about these amazing animals, though scientists are still not certain about the main purpose of their tusks. The tusk is very sensitive. So some scientists think the narwhals may use it find their way around.

Another idea is that narwhals might use their tusk when hunting food. In 2017, some researchers saw narwhals doing just this. The animals were seen hitting fish with their tusk and then eating them whole.

Both of these ideas are possible, but they don't tell the whole story. Most female narwhals do not have tusks. And they survive just fine without them. So it's likely the tusk is something that is most useful to males. Male narwhals have been seen using their tusks to fight. Scientists also believe that the tusk is used to attract females.

Researchers continue to study narwhals. And hope to learn more about this very special creature.

Unit 9: Brunelleschi's Dome

Narrator: Imagine this: It's 1418 in Florence, Italy. Filippo Brunelleschi has been asked to build a dome for the Santa Maria del Fiore, in Florence. Brunelleschi was not an architect. He was a clockmaker. But he loved beautiful buildings and, for him, it was the job of a lifetime. He thought hard and very carefully.

Then he had an amazing idea. He suggested a design for the dome that experts don't fully understand even to this day. At the time, domes were often built as semi-circles. But this dome needed to have eight sides. So it would need to be very tall and very strong. Even worse, the bottom of the dome was shaped like an octagon with no true center point.

But Brunelleschi solved the problem. He would build not one, but two domes: an inner dome and an outer dome. The domes would be held together by giant brick arches and rings of stone and wood. The rings would keep the heavy dome from breaking or changing shape. To move heavy materials up to the top of the dome, Brunelleschi designed new lifting machines. His inventions were far ahead of his time. It seems Brunelleschi had everything he needed to build the dome—a completely new design, amazing inventions, and confidence. But how did he really do it?

One big problem was that while the workers were putting in the bricks, nothing was holding the growing structure together. So, Brunelleschi had his workers put the bricks in a special pattern. This pattern would hold the bricks together. He also asked the workers to give the sticky material between each row of bricks time to dry before adding more bricks. Because of this, the dome was built very slowly. It grew about 30 centimeters a month. But perhaps what's most confusing to experts is how he was able to put every brick in just the right position. No one knows exactly how he did it, but it worked. The eight sides of the dome came together in just the right way.

In all, it took sixteen years to complete the dome. When he died in 1446, Brunelleschi did not leave behind any sketches or details of his amazing design. Today, it remains one of the largest domes in the world, more than 5 hundred years after it was built.

Unit 10: Tornado Terror

Narrator: Sometimes called twisters, tornadoes are clouds of fast spinning wind that can destroy homes and lives.

Here are some facts about tornadoes you might not know. Tornadoes can travel at speeds of over 170 kmph. They can also be very wide. The widest tornado ever recorded, near El Reno in Oklahoma, was 2.6 miles (over four kilometers) wide. That's wider than Manhattan, New York.

Scientists have learnt a lot about how tornadoes in the U.S. usually form. Warm wet air from the sea, cool air from the North, and dry air from the mountains, meet to create the perfect conditions for a tornado. Nearly three quarters of the world's tornadoes occur in the United States. Most of these occur between May and June, in a place called Tornado Alley. But tornadoes have been recorded all over the U.S., and on every continent except Antarctica.

Tornadoes are very dangerous, and they can form very quickly. The average time between a tornado warning and a strike is usually thirteen minutes or less. So people have little time to find a safe place. In the U.S., tornadoes kill sixty people every year. But the deadliest tornado in history occurred in Dhaka, Bangladesh, in 1989. It killed around 1,300 people.

Scientists measure the damage a tornado causes using the EF scale. It ranks tornadoes on six different levels from zero, a heavy wind, to level five, enough wind to pick up a house. In order to save lives, we need to understand tornadoes better. So, many scientists continue to study them, sometimes risking their own lives to do so.

Unit 11: Ichthyosaurs

Narrator: While dinosaurs walked the earth, sea monsters called ichthyosaurs ruled the world's oceans.

Ichthyosaurs were ancient reptiles. They first appeared about 251 million years ago during the Triassic Period, about 20 million years before dinosaurs came about. True to their name, which means "fish-lizards" in Greek, the earliest ichthyosaurs looked much like lizards with fins. Over a period of 100 million years, their bodies changed and they developed fish-like tails. They had long, narrow skulls and jaws with sharp teeth. These teeth were used to catch and eat animals like fish and squid.

Their eyes were the largest ever recorded of any animal. In fact, one species, *Temnodontosaurus*, had eyes that were over 10 inches wide. Large eyes helped ichthyosaurs see through the dark waters of the deep ocean.

Ichthyosaurs were different sizes. Some were only around 60 centimeters long. But the longest were about 26 meters long. Ichthyosaurs had paddle-like fins and a large tail, which helped them swim at speeds of around 35 kmph. Altogether, these qualities put ichthyosaurs at the top of the food chain.

By the late Cretaceous period, about 25 million years before an asteroid wiped out the dinosaurs, ichthyosaurs became extinct. Some scientists believe it may have been a result of climate change, but the exact reason why these early sea monsters died out is still a mystery.

Unit 12: A Social Robot

Narrator: Sophia is a social robot. The word Sophia comes from the Greek word for “wisdom.” Sophia was created by a company called Hanson Robotics. She was activated on February 14, 2016.

Sophia can make around 50 different facial expressions. She can also recognize human faces and can understand a person’s emotions through their expressions. She can even have conversations with people.

In January 2018, Sophia was given legs and the ability to walk. In the future, social robots like Sophia could have many uses. For example, some robots could become friends for elderly people.

Robots could also help manage crowds in busy places. Some airports already have simple robots that can give directions.

Social robots could also provide help to doctors. For small health problems like the flu, they could talk to patients and suggest treatment. This would give doctors more time to treat serious illnesses.

Social robots could also help teachers in classrooms. They could answer students’ questions and monitor their progress.

Today’s social robots are not perfect. But as technology improves and social robots become more advanced, it’s likely they will, one day, play a big part in all of our lives.