Less Is More

The ups and downs of learning in a six-kid schoolhouse

Eighth grader Kendra King, 14, jumps over a puddle on the way back to class after recess.
Finally! It’s a chance to look really closely at the Sun—without even shading your eyes.

A telescope in Hawaii has produced its first images of the Sun. They show its stormy gas surface in detail never before seen by people. The surface is covered with bright cell-like areas. They look like tiny kernels. But tiny couldn’t be further from the truth. Each is about the size of Texas! The cells are formed by moving heat inside the Sun. The dark borders around the cells show where Sun plasma is getting cooler and sinking.

Why is the Sun’s corona (outer atmosphere) so much hotter than its surface? How does space weather work? The scope might help people learn these answers and more.

The telescope’s 13-foot mirror gets incredibly hot. Its heat could pop a bag of popcorn in three seconds! But the scope doesn’t melt. More than seven miles of underground refrigeration tubing keeps it cool.
Often it seems like the only news about creatures is bad news. But here’s good news. Six species of fish that were once disappearing are now thriving in waters from the Bering Sea to the Atlantic Coast. Solve the word math problems to learn the names of the six species.

1) Northern California coast: _______ salmon
2) Pacific coast: widow _______
3) Bering Sea: snow _______
4) Atlantic coast: summer _______
5) Gulf of Maine: _______
6) Washington coast: _______ salmon
Winter storms swept along Israel’s coast. Dust blew. Winds uncovered a huge, ancient wall. What was it used for? Researchers just published their guesses. Did the wall defend against enemies? No. Enemies would have attacked from land, not sea. Researchers think the wall protected the community from surging waters and storms.

The wall stretches more than 110 yards. The researchers guess it was built by villagers out of riverbed boulders. They believe the ancient village, Tel Hreiz, was abandoned and eventually swallowed by the sea. Tel Hreiz was buried in thick sand. Storms in the last few years exposed the wall. Archaeologists have also dug up pottery and animal and human remains they believe come from Tel Hreiz.

In December, Christina Koch set a record. She became the woman who had spent the longest time in space on a single flight: 289 days. At the time she broke the record, Mrs. Koch had about two months left in her mission. She returned to Earth in February. Altogether, she spent 11 months in space.

Mrs. Koch is 41 years old. She is an electrical engineer. When she’s not in space, she lives in Galveston, Texas, with her husband. She arrived at the International Space Station on March 14, 2019.

Space missions normally last about six months. NASA officials have reasons for keeping Mrs. Koch above the atmosphere extra-long. Her mission will help them prepare for travel to Mars. They will study her to learn how long space flights affect astronauts.

This isn’t Mrs. Koch’s first record. In October, she was part of the first all-female spacewalking team. The U.S. record for longest space flight—by a man or woman—is 340 days. She will almost match it.

Seas were rising when Tel Hreiz existed. Those living there had to make a decision people have to make sometimes today. Water is taking over land. Should we stay or go?
Photo Treasure Trove

Sitting Bull stares into the camera lens. Geronimo poses before being captured. A woman hoes potatoes in a Michigan garden. These snapshots are part of a treasure trove of old photos of Native Americans.

Eric Hemenway is the director of archives and records for the Little Traverse Bay Band of Odawa Indians. The woman hoeing potatoes is his ancestor. “We were here before Columbus, and we are here after Columbus. Not many tribes can say that,” he says. “How do you prove that to somebody? Photos are a really powerful way.”

A collector donated the photos to the University of Michigan. The photos show members of 80 different Native American groups. Some of the pictures are famous already. People have seen them on the internet or in books. Others have been unknown until now. When were the photos taken? Who are the people in them? What was going on at the time? Before making the photos public, officials at the University ask for help from Native Americans such as Mr. Hemenway. They will help get the stories right.

Too Blue River

“Oooo—pretty!” Tourists say that when they glimpse Asia’s Mekong River. It has turned a lovely shade of aquamarine. River experts say, “Yeah, it’s pretty. Pretty bad.”

The Mekong usually has a yellowish-brown shade. That’s because it carries sediment (rocks and mud) downstream. But now it runs clear. Its blue-green hue is a reflection of the sky. Why is this happening?

A large dam was built upstream in the country of Laos. The dam supplies electricity to some people. But what about others living downriver on the Mekong? Around 70 million people depend on the river. It gives them water and food. They need the river for businesses, irrigation, and transportation.

Since the dam came, Mekong water levels have also become unusually low. Fishermen and others watch in worry. People can stand on sandbanks in the middle of the river—and the dry season hasn’t even started yet!
Shimmering dark clouds hang on the horizon in Kenya. But these clouds don’t bring needed rainfall. They’re clouds of locusts.

Locusts are short-horned grasshoppers. The ones swarming over Kenya measure about the length of a finger. They fly together by the millions and devour crops as they go. In some spots, the locust clouds are so thick people have to wade through them! A camel herder near the town of Isiolo, Kenya, swings a stick at them. Others try to shout them away. Nothing seems to help.

This is the most serious outbreak of locusts in 25 years. The insects spread across East Africa. One swarm measured 37 miles long and 25 miles wide! Locust swarms migrate with the wind. They can move more than 90 miles in one day. And as they move, they’re eating. Their feasting can mean the people’s famine. In one day, they can destroy food crops that would feed 2,500 people.

The locust outbreak has affected parts of Somalia, Ethiopia, Sudan, Djibouti, and Eritrea. Parts of South Sudan and Uganda could be next. People in those countries were already in danger of not having enough food. Now hundreds of thousands of acres of crops have been destroyed. Authorities study satellite images of the invaders. They stockpile pesticides. Workers spray the locust-killing chemicals from the air.

Locust swarms have grown so huge because of unusual floods in Africa. The extra wetness creates good breeding conditions for locusts. How long will these winged troublemakers be hanging around? The huge locust swarms could last until June.

Do you remember reading about locusts in Exodus 10? God sent the bothersome bugs to Egypt to show His great power. A large group of locusts is actually called a “plague.” Another meaning for “plague” is “disastrous affliction.” People in Kenya today will tell you that’s exactly what it feels like to live with locusts!
All locusts are grasshoppers, but not all grasshoppers are locusts. Locusts are a type of grasshopper that changes appearance and behavior when individuals group together.

The Food and Agriculture Organization of the United Nations keeps a close watch on locusts. Satellites can detect very large clouds of locusts. But the best way to predict where locusts will swarm is by putting together a variety of information. If it all seems like a lot of fuss, consider the swarms of 2004. After several quiet years, many nations quit paying attention to locust activity and prevention . . . until too late, that is.

Here’s what happens: In a band across Africa south of the Sahara and into India, eggs hatch and nymphs grow into hoppers, then fledglings, and then adult insects. At first, they are quiet and solitary. But conditions change. Locusts start crowding after food and water. In bumping and nudging, a sensitive area on their back legs gets “tickled.” That triggers a chemical change. Locusts change color, size, and behavior.

In 2004, desert locusts in Africa began to make those changes. The once-solitary insects formed swarms of up to 80 million bugs per square mile. The locusts ate their body weight in plants each day. They chewed crops down to the ground in vast regions. Food became scarce and people went hungry. Up to 60 countries were affected.
The Taal volcano shoots ash into the sky. Underground magma cracks roads. Philippine government officials warn residents: You can’t live here anymore. It’s just too dangerous.

Taal roared into action one day this January. People fled their island homes in boats just hours before it blew. They waited in emergency shelters, knowing a bigger eruption could still happen. Now officials are thinking hard. They need a new plan to protect these Filipinos.

Can the people go home? Officials say no. Around 6,000 families live in four villages surrounding Taal. Or, we should say, lived. These people worked mostly as tour guides, farmers, and fish pen operators. Where will they live now? For safety, a new living spot needs to be at least 10 miles away from the volcano.

Landing on the volcano island has been off limits for a long time. But poor villagers have lived and worked there for decades anyway. Now officials want to make sure people obey the rules. The island should be turned into a “no man’s land.”

Many islanders don’t want to give up their homes. But God gave government officials the job of keeping their people safe. They won’t budge on their decision. Maybe someday people will be allowed to work on the island again, they say. But they should never be allowed to live there.

The Philippines lies along the Pacific “Ring of Fire”—a string of cracks in Earth’s crust. Many of the world’s earthquakes and volcanic eruptions happen along the Ring of Fire. Taal towers 1,020 feet in the air. It’s the second most active volcano in the Philippines.

Still, it’s no wonder people want to live there . . . when Taal isn’t erupting, that is. It’s beautiful and peaceful. Dozens of craters dot the lush island. It sits in the middle of a shimmering lake. People escape there from Manila, the country’s smoggy, busy capital city. They make money working at hotels, restaurants, and spas.

But going home isn’t a good idea. One man snuck back to the island to check on his pigs just after the eruption. He says, “Almost everything was destroyed.”
Science Soup Quiz

1. Locusts are as long as __.
   a) a car  
   b) a finger  
   c) a camel  
   d) a flea

2. Which is true?
   a) All locusts are grasshoppers.  
   b) All grasshoppers are locusts.  
   c) Satellites cannot detect locust clouds.  
   d) Adult insects are called nymphs.

3. Why do people want to live on the Taal volcano island?
   a) They can make money from tourists.  
   b) The island is peaceful.  
   c) The island lets them escape Manila.  
   d) all of the above

4. What can clog an airplane’s engine?
   a) volcano smoke  
   b) liquid lava  
   c) purple clouds  
   d) plants near a volcano

5. Why did God send a plague of locusts to Egypt in Exodus 10?

Answers p5

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Stay away from someone who’s coughing, or you might end up in the little town of Saranac Lake, New York.

At least, that used to be true 100 years ago.

Tuberculosis is a disease. It spreads through coughs and sneezes and usually attacks the lungs. It was one of the deadliest diseases a century ago. People with tuberculosis felt tired all the time. They had terrible coughs. And to get well, they looked for a “rest cure.” They thought fresh air would help. That’s why many traveled to Saranac Lake. There, they reclined on cottage porches. They breathed in the crisp Adirondack Mountain air. Even if it was cold, they sat outdoors, bundled up in fur coats.

Saranac Lake grew into a little city full of sick people and doctors. A dozen trains chugged in and out daily, dropping new patients off. Hotels and a famous mountainside tuberculosis sanatorium (place for sick people) were established. Many people who got tuberculosis died. The newly-busy city also had three undertakers.

“It was a bustling place,” says 89-year-old Howard Riley. He worked more than seven decades ago as a “tray boy” in Saranac Lake. He delivered food to patients. He says the town was “Very, very upbeat.
And that might sound funny to somebody else, because the whole place was built on a disease.” Yep—a disease put Saranac Lake on the map!

Patients say they loved living in the busy town, even though they were sick. Anne Irene Remis came at age 23 in 1939. She called her decade there some of the happiest years of her life. She made friends. She liked the kind doctors. One “prescribed” her lipstick to match her pajamas.

Once, an estimated 2,000 or more patients at a time would stay in the town. Hundreds of old “cure cottages” still stand along the hilly streets. Many are homes. But Saranac Lake is not the same bustling city it used to be. What happened? Antibiotic treatment for tuberculosis was discovered. That was great news for humanity. But it ended the boom in Saranac Lake.

An image of a tuberculosis patient’s lungs at a museum in Saranac Lake

Tuberculosis has been around for a long time. Even ancient Egyptians and Greeks caught it! Way back then, the Greeks had ideas about what caused the disease. They thought, Maybe diseases are spread by tiny particles. Maybe these particles are alive. But did these “little animals” really exist? The Greeks had no way to prove it.

During the Industrial Revolution, cities crawled with tuberculosis. It got the nickname “the white plague.” That was because infected people turned so pale. People didn’t really know what tuberculosis was. For a long time, they just called it “consumption.” And the idea to cure it with fresh air? It sounds wholesome. But it just didn’t work.

By the 1830s, people had good compound microscopes. They used them to look at microbes. Thirty years later, French biologist Louis Pasteur studied a disease that was killing silkworms. He caught the silkworms red handed. The disease came from microbes! Later, he tracked down bacteria that caused human illnesses. He came up with germ theory: Microscopic living things invade the body, and this is where many diseases come from.

Now we know that human beings are covered in bacteria. Some of these living microbes are good. Some are bad. But back then, some French doctors argued with Mr. Pasteur. He said, “I shall force them to see; they will have to see!”

And people did see. But it didn’t happen all at once. People discovered penicillin, the first antibiotic, in 1928. (Antibiotic means “against life.” Antibiotic medicines fight the microscopic “little animals.”) At first, penicillin was used mainly for soldiers in World War II. It became widely available when the war ended. But even that didn’t help people with tuberculosis. Penicillin couldn’t kill the tuberculosis microbe.

And then Russian scientist Selman Waksman came to the rescue. He discovered another medicine. It was made from mold living in soil. The white plague had finally met its match: the antibiotic streptomycin.
Six-Kid Schoolhouse

What do the kids at Elm River Township School want for lunch? The lunch lady knows. She is related to all of them.

This school in Elm River, Michigan, has just six students. All of them are siblings or cousins. On this day, they’re having panko chicken, dressing, and mashed potatoes and gravy—all made by Raquel Bramble. To three of the students, she’s mom. She’s aunt to the other three. She tells the Detroit Free Press, “I know what they like and what they don’t.” When she’s not making lunch, Ms. Bramble leads recess. Today she’ll take the kids on a hike to the woods to visit beavers in a nearby pond.

Elm River Township encompasses 100 square miles. Just 170 people call it home. Its tiny elementary school has one teacher, Bruce Matson. He’s also the administrator. (An administrator is in charge of how a school is managed.) He’s the bus driver too.

All the students are taught in one room. At nine in the morning, class is in session. Mr. Matson stands at the board. He’s writing out complex math equations for the eighth graders. The kids in the other grades sit at their desks, working quietly in their grade-level books. During the day, each spends a little one-on-one time with the teacher. (To some, all this sounds like something from Little House on the Prairie. But if you’re a homeschooler from a big family, it may just sound like everyday life!)

This unique school has survived for 113 years. And each new year is a struggle to stay open. Young people have been moving away from the rural parts of Michigan for decades. As young people leave to look for work, mostly elderly people stay behind. In 21 counties in Michigan, the average age is above 50. The people at Elm River School want neighbors to know their school still exists.

Mr. Matson says in their school they are able to build relationships. He says, “Here, it truly becomes a family.”
A Timeline of Education in the Young United States

1620
Pilgrims land at Plymouth.

1635
The Latin Grammar School opens in Boston, Massachusetts. It is America’s first organized education outside the home.

1638
The first printing press in America is set up. This happens at Harvard College in Massachusetts. Harvard is another first—the first place of higher education in America.

1642
Massachusetts Bay Colony makes a law: Parents and employers must teach youngsters to understand laws and religion. And another law is made, called the Old Deluder Act. It says every town of more than 50 families should hire a schoolmaster to teach reading and writing. Every town of 100 families should have one to teach Latin.

1683
William Penn, writing about the Pennsylvania Colony, says the government should organize and run all public schools.

1690
The New England Primer textbook teaches that knowledge without righteousness is worthless.

1698
The first publicly supported library is established in Charles Town, South Carolina.

1775-1776
American Revolution

1801
James Pillans hangs a slab of slate and invents the blackboard.

1804-1806
Lewis and Clark

1808
Pennsylvania’s Constitution says schools should be set up in each county. Teachers begin using The McGuffey Reader.

1821
First high school paid for and organized by the government opens in Massachusetts.

1828
Noah Webster completes his dictionary. The Christian scholar says, “The heart should be instructed with more care than the head.”

1834
Pennsylvania law says taxes may be used to pay for public schools.

1848
California Gold Rush

1849
German Immigrant Margarethe Meyer Schurz starts the first American kindergarten.

1856
The Wright Brothers make their first flight.

1861-1865
Civil War

1866
Union General O. O. Howard says freed slaves must be educated.

1872
The U.S. government forms the Department of Education. The New York College for Training Teachers is organized.

1873
Teacher groups from 10 states start the National Teacher’s Association.

1887
The Wright Brothers make their first flight.

1890
Pennsylvania law says taxes may be used to pay for public schools.

1895
The state of Kentucky makes a law: Parents and employers must teach youngsters to understand laws and religion. And another law is made, called the Old Deluder Act. It says every town of more than 50 families should hire a schoolmaster to teach reading and writing. Every town of 100 families should have one to teach Latin.

1901
James Pillans hangs a slab of slate and invents the blackboard.

1908
Pennsylvania’s Constitution says schools should be set up in each county. Teachers begin using The McGuffey Reader.

1921
First high school paid for and organized by the government opens in Massachusetts.

1928
Noah Webster completes his dictionary. The Christian scholar says, “The heart should be instructed with more care than the head.”

1934
Pennsylvania law says taxes may be used to pay for public schools.

1948
California Gold Rush

1956
German Immigrant Margarethe Meyer Schurz starts the first American kindergarten.

1963
The Wright Brothers make their first flight.

1987
The U.S. government forms the Department of Education. The New York College for Training Teachers is organized.

Quiz Answers

1. bustling
   a) disease-filled
   b) mountainous
   c) busy

2. infected
   a) sick
   b) healed
   c) consumed

3. encompasses
   a) covers
   b) excludes
   c) removes

4. righteousness
   a) understanding
   b) blamelessness
   c) wickedness

Time Machine Quiz

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Tough to Tally

One, two, skip a few . . . ninety-nine . . . one hundred?
The 2020 census is coming. That’s when the United States government counts all the people living in America. But when the U.S. Census Bureau starts counting in Detroit, Michigan, people could get skipped . . . and not just a few. Census day is April 1. Are the people of Detroit ready?

Edith Floyd lives in Detroit. She understands why being counted matters. Working in a community garden, she digs up dirt for composting. A cold, stiff breeze blows across scores of empty lots. Only a few homes still stand. “We need all the money we can get for the city and for ourselves,” she says. “There’s very few people over here, and everybody counts.”

Most people in Detroit live in neighborhoods where it is tough to get a headcount. Many people are poor. Thousands of houses stand vacant. Detroit doesn’t have good internet access. That matters this year. For the first time ever, the internet will be used in the census. Officials hope it will make counting easier. But in Detroit, many people won’t be able to submit census forms online. A census helps government leaders learn about who is living in the country. The census asks questions like: “What is your job? How old are you? How many people live in your house?”

Does it really matter if the census skips large groups of people? Yes. The government gives out $800 billion every year. The census helps leaders fairly divide that money. The numbers also decide which states gain or lose seats in Congress. They determine which cities will get hospitals and schools.

Once, Detroit was a lively place. In the 1950s, people could get good jobs there. But as years passed, families couldn’t afford to move out of the city. Detroit grew poor. Today, city leaders are working hard to fix problems. They know a correct census count will help provide necessary money for their city.

But in a city that has had hardship, people lack trust. Volunteers have knocked on nearly 130,000 doors in Detroit neighborhoods. They want people to know: You count too.

Why, even the hairs of your head are all numbered. Fear not; you are of more value than many sparrows. — Luke 12:7
Caring to Count

For most people, it’s easy to be counted. Fill out a census form. Mail it back, or return it online. But the U.S. Census Bureau sends walking workers out to find people in hard-to-count areas.

United States officials take a census every 10 years. The Constitution says they have to—and for good reason. When people respond to the census, they’re helping their community get everything from hospitals to roads. Business owners also look at census information. They may build factories or stores in areas where a lot of people live. That means more jobs. Local governments use census data to make sure their towns and cities have what they need for emergencies.

But censuses are much older than the U.S. Constitution. Read about the very first census in the Old Testament book of Numbers. This census was taken to figure out who was old enough to serve in the military. Forty years later, the Israelites were counted again. That census (Numbers 26) counted the people and divided up lands. (That happens in the United States too. Census numbers are used to divide states fairly. Government leaders are chosen to represent each area.)

David takes a census in 2 Samuel 24. Solomon takes one in 2 Chronicles 2. Ezra 2 lists the names and numbers of the people of Israel when they returned to Jerusalem. And if you read about these counts, you’ll run into long lists of hard-to-pronounce names. But each name has value. In the Old Testament, lists of names remind us of God’s faithfulness to Israel. In the New Testament, recorded names connect the Old Testament promises to Jesus Christ.

A census shows care for every single person. As the Israelites wandered, God counted them. He counted them to prepare for battle. When they returned from exile, He counted again. And the most famous census of all was taken the year of Jesus’ birth. (Luke 2:1) But census takers didn’t come to Mary and Joseph. They had to travel a long distance to be counted. Their trip from Nazareth to Bethlehem was 90 miles long!
We know people have enjoyed cheese for thousands of years. Cheesy residue left in clay pots shows us that ancient Egyptians made cheese. The Bible tells us David’s dad asked him to carry 10 cheeses to the battlefield. (1 Samuel 17:18) What we don’t know is how people first made cheese. Was it an accident? Maybe milk was stored in a sheep stomach. Sheep stomachs contain rennet—the enzyme that turns milk into cheese. Or maybe someone sprinkled some salt or fruit juice in milk and noticed the milk curdling. In any case, the first cheesemaker invented a genius way to keep milk from going to waste.

The Romans were the first to manufacture huge amounts of cheese. They made hundreds of kinds, and their armies carried the cheeses as they marched through Europe. Roman cheese making spread. But it always mixed with local ways of making cheese. Everyone had their own style: Soft or hard? Yellow or white? Holey or solid? Some cheeses were moldy, some melty, some spreadable, and some sliceable. No two tasted the same. And so we came to have English Cheddar, Dutch Gouda, Swiss Gruyère, Spanish Manchego, French Camembert, Italian Parmigiano, Indian Paneer, Mongolian Byaslag, and many thousands more varieties. What makes the difference between types? Cheeses vary depending on how much moisture they have, what molds and bacteria are added to them, and how long they age. Ancient processes of cutting, heating, stirring, and pressing cheese curds also determine the final product.

For serious cheesemakers in each country, cheese is big business. But it’s also personal. When a food is tied to a certain place—especially an old one—people tend to believe it’s the real deal and the best quality. Like the Cypriots, cheesemakers from all around the world will defend their products: It’s ours. Don’t pretend it’s yours!
Dairy farmers on Cyprus have a nickname for their halloumi cheese: “white gold.” The salty, rubbery cheese is made from goats’ and sheep’s milk. Slap it on a grill, and it doesn’t melt.

Right now, halloumi is looking for protection. Cypriot authorities have spent years trying to get the European Union (EU) to guard halloumi. They want it stamped with the “Protected Designation of Origin” label. That label would mean only Cyprus cheese would get to be called “halloumi.”

People in other countries make halloumi-like cheese too. But are those cheeses the real deal? Farmers and cheese producers in Cyprus say no. They want to be sure makers of inferior cheeses in other countries won’t get a slice of their market. And now is the time for Cypriots to defend their cheese rights. They say people are getting hungrier for halloumi—especially as a replacement for meat.

But halloumi has a problem way bigger than cheese. Cyprus is a small island nation in the Mediterranean Sea. Some Greek people live there. Some Turkish people live there. The two groups do not always see eye to eye. The Greek part of the island joined the EU in 2004. The EU is a group of 28 countries in Europe that work together. In the Turkish part of Cyprus, the EU’s rules do not apply. Cheese is made in both parts of Cyprus. But the two sides do not agree about following the rules for cheese making and selling set by the EU. Turkish and Greek Cypriots do not even agree about the name of the cheese. Greeks call it halloumi. Turks call it hellim.

To get the Protected Designation of Origin label for halloumi/hellim, the cheese must contain at least 51 percent sheep’s and goats’ milk. That follows a 500-year-old recipe. Back then, cows were rare on Cyprus. Now many in Cyprus make the cheese with mostly cows’ milk. That’s another huge problem for Cypriot cheese makers. How can they follow the old recipe when they have mostly cows? Protecting Cypriot halloumi with the fancy label may bring prosperity to some. But it could put many dairy makers out of a job.

### Citizen Ship QUIZ

1. For the first time, the U.S. census will use __.
   a) door-knocking  
b) paper ballots  
c) questionnaires  
d) the internet

2. How do people take the U.S. census today?
   a) fill out a form and mail it in  
b) fill out a form online  
c) travel by donkey to the city where they were born  
d) a and b

3. What quality makes halloumi unique?
   a) It’s salty.  
b) It’s white.  
c) It’s made of gold.  
d) It doesn’t melt easily.

4. What is rennet?
   a) sheep milk  
b) camel milk  
c) a cheese-making enzyme  
d) a kind of salt

5. People-counts in the Bible show God’s care for His people. When did God tell His people to be counted?

**Answers page 5**
How do you measure something as large as the United States? Measure by the foot, and use the official measuring stick. But there’s a problem. That stick is two different sizes.

Some people measure land using the U.S. survey foot. It is a 12-inch measurement. Other people measure land using the international foot. It is also technically 12 inches. But really it’s a tad shorter. One stick, two sizes? It’s time for one foot to get the boot!

The difference between the U.S. survey foot and the international foot is tiny. Don’t bother looking at a ruler. The difference is so small it’s pretty much invisible. It adds about an eighth of an inch for every mile. Think about how wide the United States is. Say you measure with the international foot. America will be 28.3 feet wider than when it’s measured with the survey foot.

In 1959, U.S. government officials decided to stop using the survey foot. But the survey foot didn’t disappear. Some still measure land with it today. Others don’t.

“This is a mess,” says Michael Dennis. He’s a land surveyor for the National Oceanic and Atmospheric Administration. He knows the chaos the two feet create. They made bridge work in Oregon and Washington messy. Oregon uses the international foot. Washington uses the U.S. foot. The feet caused trouble planning a high speed railroad in California. They wreaked havoc when a contractor put a building near an airport. Airport workers and the contractor used different sized feet to measure. The building ended up too close to the airport’s flight path.

Why are the two feet different sizes? In 1893, the U.S. government defined a foot: 1,200 meters divided by 3,937. That makes the exact measurement of a foot 0.3048006 meters. In 1933, the international foot arrived. It was simpler. The last three digits were dropped. This foot measured 0.3048 meters, exactly. Think three digits don’t matter? Think again.

In 2022, the U.S. survey foot will be history. Ever heard of the “cubit”? The cubit was about 18 inches, or around the length of six human palms. It’s another unit of measurement that became history—biblical history, that is. The house that King Solomon built for the Lord was sixty cubits long, twenty cubits wide, and thirty cubits high. — 1 Kings 6:2
SIZE IT UP!

How far did you throw? How long till we go?
How big is the box? How deep is the snow?
How full is the jug? How much does that weigh?
How many do you have? How tall, would you say?
How spicy is that pepper? How much salt should we add?
How much time before dinner? How old is that lad?

Baker’s Dozen: Thirteen loaves of bread for the price of twelve? This tradition started in the 13th century. A medieval English law said a baker’s hand could be chopped off with an ax if a customer was cheated. Yikes! Better throw an extra free loaf in that order just to be on the safe side!

Blink: A blink is a unit that measures time. It is 0.864 seconds. That’s actually twice the speed at which an eye blinks.

Cubit: This is the distance between a man’s middle finger and his elbow. If you use a ruler to measure a cubit, it would equal about 18 inches. Cubits are a biblical unit of measurement.

Bead-second: This is a very short unit of length. Its name comes from the length an average beard grows in one second.

Fortnight: This 12th-century word means two weeks, or 14 days.

Googol: An eight-year-old was asked what he would name a really, really, really large number. His answer? A “googol.” This number is 1 followed by 100 zeroes.

Jiffy: This is a unit that measures time. It means very, very fast. It is 0.01 second. Faster than a blink? Yes!

New York Second: This is a short unit of time. Its name comes from the period of time between a New York traffic light turning green and the cab behind it honking. In other words, it is nearly instantaneous!

Units of measurement have changed over time. Today we calculate distance with feet. In ancient history, it was measured in cubits. We tell time by minutes. In medieval times, it was measured by moments. We count days. Our ancestors counted fortnights. Cooks measure ingredients with teaspoons. Seasoned chefs use smidgens.

Etymology is the study of the history of words. It tells us where fun units of measurement came from. Find a new favorite unit and use it! See if you can stump a friend.

March/April 2020 • WORLDKids
The Spitzer Space Telescope scans the universe with infrared eyes. It has done this job for 16 years. But now NASA is pulling the plug. Goodnight, Spitzer. You’re going to sleep for good.

For years, Spitzer peered through dusty clouds. It did a lot of good work. Spitzer saw untold stars and galaxies. It uncovered a huge, nearly invisible ring around Saturn. Spitzer even helped discover seven Earth-size planets around a nearby star. Altogether, Spitzer observed 800,000 space objects. It took more than 36 million pictures.

Spitzer stands about 13 feet tall. It weighs 1,906 pounds. Its detectors and telescope have to be very cold—negative 450 degrees Fahrenheit. This cold temperature makes it possible for Spitzer to observe super cold space objects. That way, its own heat doesn’t interfere with measurements.

Spitzer circles the Sun just like Earth does. The telescope gets more difficult to operate as it drifts farther behind Earth. Right now, it trails Earth by 165 million miles.

Spitzer was designed to last no more than five years. NASA launched Spitzer in 2003. Its infrared instruments can sense heat coming off space objects. The instruments act like night vision goggles. They show objects invisible to regular telescopes. That includes stellar nurseries. (Awww . . . look! Baby stars!) It also includes failed stars. (Nice try, huge star-like objects. You didn’t have quite enough mass to burn like stars do.)

It would be great if people could keep using Spitzer forever. But that’s not possible. Spitzer will continue to fall even farther behind Earth. It will get harder and harder to use. And Spitzer costs big money to operate—about $12 million each year.
The Spitzer space telescope orbits 353 miles above the gasses that blanket our planet. But if you want to look at the stars, you’ll have to settle for looking through Earth’s atmosphere. The amazing thing is—you can with a telescope, a tool for collecting lots of light! The light makes up an image. Lenses or mirrors inside a telescope squeeze lots of light down to a size the human eye can handle.

**The reflecting telescope** is good for viewing faint galaxies, nebulae, and star clusters. Albert Einstein used this type.

**The refracting telescope** is good for viewing at distances on Earth or for large objects above, like planets, moons, and stars. The telescope Galileo developed 400 years ago was this type.

1. **havoc**
   - a) chaos
   - b) orderliness
   - c) construction

2. **seasoned**
   - a) old-fashioned
   - b) experienced
   - c) innocent

3. **untold**
   - a) silent
   - b) indescribable
   - c) far away

4. **orbits**
   - a) circles
   - b) rises
   - c) races

**Eye Can See Clearly Now**

The small mirror directs the image to the eye lens. The large, concave mirror collects light and creates an image at the focal point. The tube keeps the lenses the right distance apart. The objective lens collects light and bends it into focus. The eye lens magnifies the image from the focal point to fit your eye.

This galaxy has a spiral shape.

Take Apart Smart

**QUIZ**

1. havoc
   - a) chaos
   - b) orderliness
   - c) construction

2. seasoned
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   - b) experienced
   - c) innocent

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   - a) silent
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4. orbits
   - a) circles
   - b) rises
   - c) races

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A Whale-Sized Diet

Ever wonder what it’s like to chase a whale . . . and poke it with a stick? A group of spunky researchers found out. Their experiment showed them why some whale species get larger than others.

Researchers from the American Cetacean (marine mammal) Society chased down 300 whales. They used long poles and suction cups to attach sensors to the creatures.

It wasn’t easy. “You try to go out and put a tiny tag on the back of the biggest animal in the world,” says Terrie Williams of the University of California, Santa Cruz. The sensors showed the researchers each whale’s eating habits.

The study included 90 “filter-feeding” blue whales. All whales are big. But the blue whale is the biggest animal God made—even larger than the most ginormous known dinosaur. Blue whales grow to about 100 feet long. They weigh more than 200,000 pounds. They have no teeth. Instead, God gave them sieve-like filters called baleen plates.

The researchers kept track of toothed sperm whales too. Sperm whales are around half the size of blue whales. But they’re not small by any means. They’re the biggest whale species with teeth. They stretch about 40 feet long and weigh about 100,000 pounds.

Why are blue whales bigger? A blue whale opens its jaws as it swims along. Those jaws take in a huge amount of water. Then the whale closes its mouth. It pushes the water out through its baleen. Many tiny sea creatures stay behind in its maw. This eating method doesn’t take much energy. It’s better than delivery!

But dinnertime with toothed sperm whales is another story. They have to work for it. These giants hunt and capture prey one at a time. They dive deep for squid, octopus, and other victims. The researchers think sperm whales can’t get as big as blue whales because they burn so many calories in the hunt, even if they consume a larger kind of prey.

There’s another reason for the differences: God in His wisdom chose their size. He designed their distinct ways of eating, just as He did for all creatures.

Where were you when I laid the foundation of the Earth? Tell me, if you have understanding. Who determined its measurements—surely you know! — Job 38:4-5
**Animals Fill Up**

*These all look to you, to give them their food in due season. When you give it to them, they gather it up; when you open your hand, they are filled with good things.* — Psalm 104:27-28

God fills animals with the food they need. And we do mean FILLS! Just look at this list of animals God feeds in surprising ways.

► **Anteaters** have no teeth. Good thing ants aren’t chewy! The anteater’s tongue—which can be up to two feet long—helps it eat about 30,000 ants in one day.

**Blue whales** are the largest animals on Earth. Each day, one blue whale downs 40 million tiny crustaceans called krill.

► **Elephants** may spend 12 to 18 hours eating every day. By the end, they’ve put away between 200-600 pounds! And if you have an elephant, don’t bother with a watering dish. Use the bathtub. They drink about 50 gallons a day.

► **Pandas** spend up to 14 hours daily eating up to 27 pounds of bamboo. (The average adult human eats about five and a half pounds of food each day. So pandas eat about five times that.)

► **Certain hummingbirds** eat half their bodyweight in sugar every day. Don’t follow their example!

► **Polyphemus moth caterpillars** can eat 86,000 times their bodyweight in 56 days. For us, that would mean eating 50-200 pounds of lettuce per day.

**Jungle leeches** are blood-sucking parasites. They get their food by delivery . . . but sometimes they have to wait a while for a host to show up. Once they find a host, they can suck up seven times their bodyweight in just one meal!

► **Hippos** normally weigh between 3,000 and 4,000 pounds. They eat around 88 pounds of food each night. They put on weight with a simple vegan diet: short grass and small green shoots.
Some freshwater mussels are the size of a button. Others are as big as a deck of cards. They have charming names like fluted kidneyshell, snuffbox, and shiny pigtoe. Their job is to clean up river water. But mussels in one river are dying. Scientists search for clues to help save them.

The mystery unfolds in the Clinch River in Kyles Ford, Tennessee. More mussels live there than people. The Clinch River winds 300 miles through Appalachia. Forty-six species of mussels make their homes in the river. Each of those species is a family with hundreds of thousands of members.

Jordan Richard is a biologist for the U.S. Fish and Wildlife Service. His job keeps him slogging through water in search of mussels. He’s got a good eye for them. That’s a good thing since mussels are great at hide-and-seek. Mussels bury themselves in the riverbed. They leave only a crescent of their shells visible.

But now the white shells of dead mussels litter the river bottom. Hundreds of thousands, possibly millions, of pheasant-shell mussels have died in the water. No one knows why. Scientists know that pollution, habitat loss, and disease can wipe mussels out. But they haven’t figured out what healthy mussels look like inside. What makes them grow? What keeps them strong?

Tony Goldberg is an epidemiologist. He studies diseases. His latest “patients” are freshwater mussels. He knows rivers need mussels. They may not have a backbone, but they are hard workers. They filter water for fish, amphibians, insects, and even people.

Wisconsin, Michigan, the Pacific Northwest, and Spain have also launched investigations into disappearing mussels. Oddly enough, their mussels don’t appear to be dying from the same problem. In a way, that’s good news. It means one terrible disease isn’t going to wipe out all mussels. But it doesn’t solve the mystery.

Here is the sea, great and wide, which teems with creatures innumerable, living things both small and great.
— Psalm 104:25

Biologist Jordan Richard shows one sign—green algae—that a freshwater mussel has been dead for a while in the Clinch River.

Biologist Rose Agbalog looks through a view bucket to find mussels in the Clinch River near Kyles Ford, Tennessee.
**BIVALVE FACTS:** Who needs a head, two feet, and a spine? Not a freshwater bivalve. These small, headless critters have an enormous impact as water filters in a river’s ecosystem. Their bodies clean algae, silt, and heavy metal out of eight to 10 gallons of river water daily.

Mollusks are a big group of animals that have soft bodies inside shells. Bivalves are a smaller group of mollusks. Some living bivalves include scallops, oysters, clams, and mussels. Most live in salt water, but a few kinds of mussels live in fresh water.

On the outside, bivalves look like two seashells stuck together. Their flat, squishy bodies are protected by a hard shell. The shell’s two parts are called valves. They’re attached by a sturdy hinge. Strong muscles hold the valves closed. Bivalves are usually *symmetrical*. Look closely! If a bivalve is split, it looks the same on both halves.

A freshwater bivalve is a living mini water filter. It strains objects from the water. Most bivalves have two tubes called siphons. One is an entrance, like a front door. One is an exit, like a back door. The entrance sucks in water. The exit pushes water back out. Both siphons have a tiny hole. Big particles can’t flow through the siphon hole into the bivalve’s body. Small particles can. Inside, the particles get stuck on the body’s slimy gills. Next, they move to the mouth. Bits and pieces are digested by the gut. Anything that isn’t broken down goes back out the exit siphon.

Bivalves have many parts that other animals have: hearts, guts, gills, and a foot they use to bury themselves in sediment. What’s unusual about them is that they’re missing quite a few parts other animals have: heads, bones, and eyes. No nose? No problem. Bivalves have all the parts they need to do what they were created to do.
For 13 days, six men fight for a record. They also fight for their lives. Waves as big as buildings hoist their vessel toward Antarctica. They gasp as giant whales breach way too close to their boat. Freezing water thrashes as they row 24 hours a day. At the end, they’ve made history. They have become the first people to go through the Drake Passage with nothing but sheer manpower.

**THE PASSAGE:** The Drake Passage is the body of water between Cape Horn, Chile, and the South Shetland Islands of Antarctica. In this spot, the waters of the Atlantic, Pacific, and Southern Oceans come together. Currents run wild. There is no land nearby to stop them. To get to Antarctica, an adventurer must pass through these fierce waters. And people have, many times... but not in rowboats!

**THE BOAT:** The crew’s 29-foot rowboat, the Ohana, started in South America. It had to move all the time so it didn’t flip over. Three men would row for 90 minutes while the other three rested, still cold and wet. As the rowers worked, 40-foot sea waves splashed in their faces. “It was quite harrowing,” says 34-year-old Colin O’Brady of Jackson Hole, Wyoming. He was one of the six men on the boat.

**THE ROWERS:** By the end of the trip, the men had lost a lot of weight. They were delirious from lack of sleep. On the journey, they had to use a bucket to go to the bathroom. To rest, two men needed to lie shoulder to shoulder in a tiny space. A third would lay balled up in an even smaller area. The boat almost turned over many times.

*Praise the Lord from the Earth, you great sea creatures and all deeps. — Psalm 148:7*
 Historians talk about the Age of Discovery. Those years—from the early 1400s to the late 1600s—are known for historic voyages. Yes, it was an age of finding new places. But it was every bit as much about finding new ways to get to them.

**The Northwest Passage** connects the Atlantic and Pacific Oceans. This sea route flows through the Canadian Arctic Archipelago. It was discovered as rescuers searched for missing explorer John Franklin. Year-round sea ice makes this passage often impassible. But it’s a great shortcut for ships when they can get through. It shortens ship routes from Europe to Asia by 2,500 miles!

**The Strait of Magellan** is a shortcut that flows straight past the tip of South America to connect the Pacific Ocean to the Atlantic Ocean. Portuguese navigator Ferdinand Magellan’s sea voyage to discover it took 99 days. He began in the Atlantic Ocean with three ships. One wrecked. One was deserted. When his ship finally came in sight of the Pacific Ocean, he cried.

Christopher Columbus was convinced that he could find a fast route from Spain to China. He did not want to go around Africa to get to East Asia. In 1492, he tried to go straight to China by crossing the Atlantic. He discovered that the Americas were situated between Europe and Asia. Surprise!

**The Panama Canal** was created as a shortcut for ships crossing between North and South America. It opened in 1914. The canal allows the Atlantic Ocean, the Caribbean Sea, and the Gulf of Panama to flow into the Pacific Ocean. There are three sets of locks in the canal. They are used to adjust the water levels because the Pacific Ocean is slightly higher than the Caribbean Sea. The locks make it possible for ships to cross the canal.

Ponce de León had a mission: find the Fountain of Youth. Was there really a spring that could restore youth? He traveled through the Bahamas along the Florida coast in search of it. He never found it. But he did find lots of turtles on the **Dry Tortugas Islands**.

A British captain named James Cook was sent on an unusual sea route to track the movement of the planet Venus. His ocean voyage took him to Tahiti and then on to Australia. He was the first European explorer to find **Australia**. On this voyage, he checked out “down under” and looked up to see Venus pass in front of the Sun.

People wanted a route between the Red Sea and the Mediterranean Sea for centuries. But they didn’t find it. They had to build it. The work started in 1859. Excavating (digging) the land for the **Suez Canal** took 10 years and around 1.5 million workers. Then the East and West were connected by water for good.
Madeleine Mukantagara hears only the puff of her own breath and the scuff of her shoes. She’s headed to visit her first patient of the day in the quiet countryside of Rwanda.

This spot didn’t used to be quiet. The cries of her patient, Vestine Uwizeyimana, echoed down the hill to the road below. For 15 years, Ms. Uwizeyimana experienced unrelenting pain. Disease was wearing away her spine. She could no longer walk. She could barely turn over in bed. She spent her days in a small, dark room with a dirt floor. Now her cries have calmed. That’s because of what Ms. Mukantagara carries in her bag: morphine.

Morphine is a medicine for severe pain. In wealthy countries, most people can get this medicine if necessary. Often, they can get more expensive versions of it too. But Rwanda is poor. Millions there have no access to these kinds of drugs. Why? Companies don’t make much money selling cheap morphine to the poor and dying.

Rwandans came up with an answer. They started making their own morphine. It costs only pennies. Health workers like Ms. Mukantagara deliver the morphine in plastic bottles to homes across the country.

Often, people with life-threatening sicknesses need relief from pain. That relief is called palliative care. Making morphine in Rwanda means all citizens can get palliative care for free.

“Without this medicine I think I would die,” says Ms. Uwizeyimana. She smiles when Ms. Mukantagara arrives. The nurse settles on the edge of Ms. Uwizeyimana’s bed. They begin with prayer. “Now I think everything is possible,” says Ms. Uwizeyimana.

Many Rwandan patients using morphine eventually die of the diseases that cause them so much pain. Ms. Mukantagara says the work is never easy. But with morphine, she says, at least her patients can die with dignity.

“He heals the broken-hearted and binds up their wounds.”
— Psalm 147:3
Relief for Rwanda

Nurse Madeleine Mukantagara arrives at the bedside of Athanasie Nyirangirababye. She lives on a mattress in her son’s home. She sleeps under a poster of the words of Psalm 23: “The Lord is my shepherd; I shall not want.” She has been sick for five years and has taken liquid morphine for three.

“With pain relief I can eat. I can go outside,” Ms. Nyirangirababye says. “I can greet my neighbors. I can walk slowly. . . and go to church.”

Rwanda isn’t the only country in Africa making its own morphine. Rwandans got the idea from people in Uganda. There, people were making liquid morphine from powder. For nearly two decades, Ugandans mixed the medicine in a kitchen sink! Now people in African countries Kenya and Malawi make morphine too.

On a map, you’ll find Rwanda near the middle of Africa. It is one of the smallest countries on the continent. Rwanda has a past full of trouble. In 1994, people from the Hutu people group there killed people from the Tutsi people group. Around 800,000 people died. That’s a lot of pain for any country—much less a tiny one. Many Rwandans who survived that time were left with terrible injuries. But many doctors in Rwanda didn’t know enough about morphine back then. Some were scared to use it.

Now the bottles of liquid morphine are given to hospitals and pharmacies. They are kept under lock and key. Then community workers like Ms. Mukantagara pick them up. They are carried to the homes of the suffering.

Some survivors of the tragedy in Rwanda believed people should suffer quietly. They thought telling someone you were in pain was showing weakness. The Bible says God comforts His people when they suffer. He does this so they can comfort each other. (2 Corinthians 1:3-4) We don’t have to hide suffering. We share it with others so we can get help.

Surely He has borne our griefs and carried our sorrows. — Isaiah 53:4
Rough Night at the Olympics?

Olympic athletes beware. The bed frames at this year’s Olympics will be made of cardboard. The entire Athletes Village complex should be completed in Tokyo, Japan, in June. The Olympics open on July 24. The cardboard beds can handle about 440 pounds. The single bed frames will be recycled into paper products after the games.

Takashi Kitajima, the general manager of the Athletes Village, says the recyclable beds are stronger than wooden beds. And the mattresses aren’t made of cardboard. But he warns: Don’t come back to your room and jump on the bed for joy if you win the gold. The bed will break.

“Mountain lions, party of five!”

Five mountain lions were seen together on a home security video. These big cats usually like to be alone. What were so many doing together on this cam near Sacramento, California?

Several wildlife biologists watched the footage. None could remember ever seeing five mountain lions together in the same spot.

One of the cougars is bigger than the others. Scientists think it’s the mother lion. The others are likely her cubs from different litters. We mean it when we say mountain lions like their solitude. Normally, mothers chase off their cubs after a year!

No Telescope Needed

Stargazers in New Mexico are going back in time . . . kind of. A new steel instrument there can pinpoint the path of stars and planets across the night sky. Watchers don’t need a telescope. They just need their eyes.

This instrument is newly made. But it is based on a device used centuries ago.

Astronomer Tycho Brahe thought of the idea for it in the 1500s. It’s made of four rings that lock together. They line up with the North Star and equator. A sliding viewfinder measures angles between objects in the sky, the equator, and the horizon.

None of Tycho Brahe’s original instruments have survived. People who look inside the replica get an idea of how people used to study astronomy. They’re doing it in a way few have in 300 years.
Twenty years ago, trawling was booming. Trawler fishing boats drag nets through deep ocean waters. The weighted nets sink far below the surface. They scoop up as many fish as possible. But on the U.S. West Coast, too many trawlers trawled too much. Nets damaged underwater habitats. Groundfish (bottom-dwelling fish) couldn’t hide from nets. Rockfish almost ran out.

Could people protect fish and still allow fishing? Yes! Ocean officials met with fishermen. They listened to each other. They shared ocean maps and ideas. They found better places to trawl. Now rockfish have rebounded. Teamwork saved sea life.

The Suez Canal connects the Red Sea to the Mediterranean Sea. That’s great for trade and travel. But sharing invasive animals? That’s not so great.

The famous waterway was opened 150 years ago. As years have gone by, about 400 kinds of animals that don’t belong have snuck into the Mediterranean Sea. Toxic jellyfish damage power plants. They scare away beach-goers and tourists. Aggressive lionfish make permanent colonies. The silver-cheeked toadfish moves in. This bony fish is extremely poisonous.

The new species wipe out local mussels and other species. People in Israel rely on the Mediterranean Sea for drinking water and fishing. They say: Stop the toxic spread!

Smallest Coin

Lean in close to study this coin. It’s tiny. Early this year, Switzerland minted a coin so small you’d need to look very closely to see Albert Einstein sticking out his tongue at you.

The coin measures just 0.12 inches—about twice as wide as a spaghetti strand is thick. The gold coin is the smallest in the world.

Only 999 of the coins were made. Swissmint will sell them for 199 francs each (around 204 U.S. dollars). But the tiny coin won’t buy much. It’s worth about $0.26.
Little Miss Muffet sat on her tuffet, eating her______ (1 across) and ____ (19 down).

**ACROSS**

1. Not down
2. Same as 7 across
3. Short for Doctor
4. Mark 9:50 says this mineral is good. A little is added to stop the milk-thickening process, to serve as a preservative, and to add flavor.
5. Home for a pet bird
6. Thicken, become clumpy. This happens to milk as starter bacteria turns milk sugars into lactic acid.
9. Sixteen ounces in a ___
11. Not happy
12. This living organism added as a starter gets a natural process going.
13. Main ingredient in cheese, can come from cows, goats, donkeys, and more
16. Bacteria originally made from the lining of the 4th stomach of a cow
17. Short for Florida
20. Candle material often used to form a coating to seal a block of cheese
22. Halloumi is a type of cheese that does not do this.
24. Even score
25. Personal computer

**DOWN**

1. 16 tablespoons in one ___
2. Same as 7 across
3. Short for Doctor
4. Mark 9:50 says this mineral is good. A little is added to stop the milk-thickening process, to serve as a preservative, and to add flavor.
5. Home for a pet bird
6. Thicken, become clumpy. This happens to milk as starter bacteria turns milk sugars into lactic acid.
9. Sixteen ounces in a ___
11. Not happy
12. This living organism added as a starter gets a natural process going.
13. Main ingredient in cheese, can come from cows, goats, donkeys, and more
16. Bacteria originally made from the lining of the 4th stomach of a cow
17. Short for Florida
20. Candle material often used to form a coating to seal a block of cheese
21. Container that finished curds are pressed into
22. Halloumi is a type of cheese that does not do this.
25. Personal computer