A silverback mountain gorilla named Segasira walks in the Volcanoes National Park, Rwanda.
Imagine stepping out of your camper to see this! This symphony for the eyes happens over Lapland, Finland. It’s the Aurora Borealis—the Northern Lights. What causes the light show? Electrically charged gas particles from the Sun crash into Earth’s atmosphere. It happens in an off-center oval region above the north and south poles. But what do the mysterious lights mean? In medieval days, people thought they signaled war or famine. Native Americans believed they showed the location of spirit giants—great hunters and fishermen. Inuit people in America’s north saw them as spirits of animals they had hunted. And other peoples believed they were the spirits of ancestors. Those beliefs are as colorful as the Aurora Borealis. But God’s word tells us what the lights really mean. The heavens show us the Creator’s handiwork. Can you think of a psalm that says so?
Four friends went snowboarding. They are taking a break in the warming hut. Read the clues to figure out which board belongs to each friend. Fill in the spaces for each of the quizzes.

**QUIZ 1**
- Cole's is the zebra board.
- Ann's board is to the left of Cole's.
- Web's board is on one end.
- Which board is Mika's?

**QUIZ 2**
- Web's board is on the left end.
- Mika's board is on the right end.
- Cole's board is to the left of Mika's.
- Ann's board is to the left of Cole's.

**QUIZ 3**
- Cole's board has no letters.
- Mika's board has letters.
- Web's board is to the right of Mika's.
- Anna's board is to the left of Cole's.

**QUIZ 4**
- Cole's and Web's boards both have letters.
- Web's board is on one end.
- Mika's is the zebra board.

**QUIZ 5**
- Cole's board is 3 to the left of Mika's.
- Ann's board is to the left of Mika's.
- Web's board is to the left of Ann's.

HINT! Friends do not always get the same boards in each quiz. Making a grid will help.
In Finland, an entire sports event has been run on horse manure. The Helsinki International Horse Show happened this fall. People collected 100 tons of manure from competing horses. They used machines to turn that manure into energy. The poo powered the whole crowd-packed arena for four days. It fueled lights, scoreboards, and cell phone charging stations. The manure even made extra energy. This was used to heat homes in the Helsinki area.

Horse manure contains methane gas. Machines separate that gas from solid waste. They change it into electricity. Could manure be a good fuel option in countries with a lot of horses? Each year, an average horse produces eight to 10 tons of manure. Manure from only two horses is enough to heat a single-family house for one year.

Germain Kalubenge wakes up at five in the morning. He’s waiting for phone calls. When someone calls Mr. Kalubenge, it can be a matter of life or death. Callers might say, “I’m running a fever. I might have Ebola.”

Ebola is a scary and very contagious disease. Many people in Africa have died from it. No one has found a cure yet. But Mr. Kalubenge is in an unusual situation. He already had Ebola. His body knows how to fight off the disease now.

When people think they might have Ebola, they often don’t want to call an ambulance. Imagine you feel very sick. You see a dozen jeeps carrying doctors wearing head-to-toe protective gear. Will the doctors take care of you? False rumors in Congo say doctors will actually hurt sick people so the disease doesn’t spread. People wonder: Should I go to the doctor—or am I safer at home?

Mr. Kalubenge tells people they can rely on doctors. He can’t catch Ebola again. And people trust him to take them on his motorcycle to get help. He loves to see people recover from Ebola as he did. Someone who has truly been healed feels grateful. He or she wants others to experience the same thing. That’s why we tell other people about Jesus.

Go home to your friends and tell them how much the Lord has done for you, and how He has had mercy on you. — Mark 5:19
Done with your lunch? Give it to the pigs!
In Maine, eating like a pig could be a good thing.
A new law there says schools can give food scraps away to pig farmers.

Why is this good for Maine schools? It gives them a use for spoiled food that might otherwise end up in landfills. They’ll have a lot less garbage to get rid of, which means they won’t have to pay as much for trash disposal. And what garbage they do have will be a lot less stinky without all that rotting food.

“In Maine, that was a common practice when I was growing up,” says Republican Senator Stacey Guerin. “Hog farmers would come to the back door and take the waste at the end of the day. I’m glad school administrators can do that with confidence now, without fear of breaking the law.”

It’s not a bad deal for pigs either. Pigs, unlike most other kinds of livestock, can digest human food waste easily. And they aren’t picky. They’ll eat whatever you put in front of them.

A painting was hanging in the home of an elderly French woman. She thought it was of little importance. But an auctioneer told her, “Take it to an expert!”

It’s a good thing the woman did. The eight-by-10-inch painting made her a multimillionaire! Art specialists studied the masterpiece closely. They pored over facial expressions, buildings, and the way the painter showed light and distance. All the signs pointed to one artist: 13th-century Italian painter Cimabue. People call Cimabue the father of Renaissance painting.

The painting is Christ Mocked. It shows Jesus surrounded by an angry crowd. It sold for $26.6 million. No one knew exactly how much a Cimabue painting would sell for. No one has ever found one to sell!

The painting hung on a wall between the kitchen and dining room in the woman’s house. And it was painted using a food item she may have kept in a nearby fridge: eggs. Cimabue painted the work with egg tempera. Tempera paint was made by grinding pigment (colors) into egg yolks.
Gulp. The transmitter slides down the athlete’s throat. It’s two hours before race time. The red-and-white capsule squeezes past the esophagus. It tumbles into the stomach. Then it is nudged into the small intestine. The “pill” holds a transmitter and a battery. Those tools will help researchers study heat and body temperature. About 200 world-class athletes will join the science experiment.

After swallowing the capsules, athletes have one thing to do—run. The pill-sized computers record the temperature deep inside their bodies. Exercise heats up the body. Sweat cools it back down. Across the finish line, a receiver is hung around the runner’s neck. It downloads data from the computer capsule. (Wondering how the pill leaves the body? Well—ahem—after the athlete has run her course, nature simply runs its course.)

There couldn’t have been a better time or place for the experiment. Doha, Qatar, is a sweltering place. It was the site of the elite 2019 IAAF World Athletics Championships. Doha’s climate is similar to the climate in Tokyo, where the 2020 Olympics will take place.

Athletes and their trainers know the importance of core temperature. They want to understand: What happens to a body while running in extreme heat? How hot is too hot for a race? How does a body stay at a safe temperature? The study will help runners train for Tokyo.

Paolo Emilio Adami works for the track federation. He says, “Our body is the most perfect machine that exists.” He’s right! God designed the human body with incredible care.

For you formed my inward parts; you knitted me together in my mother’s womb. — Psalm 139:13

Christian Taylor competes in the men’s triple jump final at the World Athletics Championships in Qatar.
Your body can control its own temperature. Sizzling heat turns on the body’s air conditioning system. Frigid temperatures trigger the body to turn up the heat. No matter how scorching or chilly it gets outside, our bodies have great climate control. The brain’s hypothalamus regulates body temperature. If it senses your body getting too hot, it sends out a message for help. The muscles, organs, glands, and nervous system answer the call. They work to keep the body just right—between 98 and 100 degrees Fahrenheit.

A thermostat is a switch that keeps temperatures steady. It turns heat on and off. Your body has something even better than a thermostat. It has thermoregulation. Thermoregulation balances the body’s chemicals and hormones. It asks the organs to kick in to keep the internal temperature safe. It makes sure the body has enough fluids. It changes the size of blood vessels. Large vessels cool the body. Small ones heat it up.

Have you ever felt too hot? Fever can raise body temperature. If someone gets an infection, the hypothalamus resets the body to a higher temperature. This helps the body fight off germs. A fever causes blood vessels to narrow. This pulls more heat inside the body and raises the temperature.

Too hot? Cool down. When temperature rises, blood paths to the skin widen. This allows blood to rush quickly to the skin. The extra blood flow lets heat escape through the skin in the form of a liquid. Do you know what the liquid is called? You bet—sweat! First, liquid sweat pours from pores. It quickly turns to a gas and evaporates. This process cools an overheated body.

Too cold? Get moving! Shake, stomp, or run around. Movement makes heat. During exercise, muscles burn body fuels like fat and carbohydrates. This creates energy for muscles. As muscles work hard, the blood inside them warms up. The more work muscles do, the more heat they make. Did you know that if you are cold and you don’t move to stay warm, your body will do it for you? Shivering is when your muscles are clenching then expanding rapidly to generate heat in your body. Exercising in heat also raises body temperature. It’s a double-whammy! A hot day makes hard exercise a big challenge for thermoregulation.

Our bodies were created to keep a healthy temperature. Our internal “climate control” keeps our temperature safe while we use our bodies for God’s glory.
Along the Burnt Mesa Trail in New Mexico, a seed crew goes out hunting for perfect pine cones: No curves. No holes from insects. No sap.

The crew is outfitted with spurs, ropes, and hard hats. They’re ready to scale hefty tree trunks and use long clippers to snip branches loaded with prickly ponderosa pine cones. The seeds inside each cone will be cleaned and sorted. Some will be saved. Others will be grown into seedlings. Either way, the seeds will help bring new life to fire-scarred hillsides. The goal: one million seeds.

Pines produced a bumper crop of cones this year. The huge crop shows God’s design for new growth. Every decade or so, trees produce extra seeds, which hide protected inside pine cones. Their bounty is a welcome gift. The extra seeds promise new growth in forests ravaged by natural disasters such as fire. If people collect the seeds, they are making sure destroyed areas can become forests again.

Some trees depend on fires for growth. God uses something that seems harmful to a forest for its own good. For example, Jack pines have thick, hard cones covered in dense resin. The resin seals the seeds inside. When fire consumes a cone, intense heat breaks the resin seal. The seeds are let out. Sequoia trees also have this unique fire-caused seed release.

But not all trees are like this. Many trees and seeds are ruined by flames. And a forest will struggle to recover from fire damage if its trees can’t produce seeds.

For years, people have helped manage forests by collecting, saving, and propagating seeds. In New Mexico, the Santa Clara Pueblo community has gathered seeds from about 2.5 million trees! The group has a seed bank of ponderosa, Douglas fir, spruce, and other pine variations. South Dakota, Colorado, Nevada, and Utah have similar seed banks.

Trees loaded with cones can take a long time to harvest. But that’s OK. Precious seeds are worth the investment.
Say you just picked up a pine cone on a nature hike. Did you know that very pine cone may have been hanging out in that tree for 10 years before falling down? Trees are never in a hurry. They grow gradually, and let seeds out slowly.

All coniferous trees—including spruces, pines, firs, and cedars—produce cones. (Coniferous = cones. Get it?) But pine cones come only from pine trees. And pine cones’ scales make them good for more than just winter ornaments. In cold weather, the scales close up to protect the seeds inside from wind, icy temperatures, and hungry critters.

Unlike many trees, pines don’t produce flowers or fruit. (Though the white pine cone is Maine’s state flower . . . even though it’s not technically a flower! And some cones do hold edible treasures used in fancy cooking—pine nuts.)

Insects don’t pollinate pines. The large, hardy pine cones you recognize are females. Male cones are much smaller and don’t last very long. You may never have noticed them at all. The male pine cone produces pollen. Wind carries the pollen to a female cone on the same tree or on another tree. Seeds develop inside the female cone—but it takes a few years. When summer comes, these cones let seeds out into a warm world where they can drop into soil. The seeds often have wing-type structures. They float and flutter out away from the parent tree. They land a good distance from the shade of the parent tree where they can grow in sunlight.

Pine cones also act as barometers—weather predictors. Find a close-scaled pine cone on the forest floor? That means the forest is damp and safe from fires. Open scales warn: A wildfire could wipe this forest out. Did your pine trees produce extra cones this autumn? They may have been gearing up for a longer, more severe winter. Your pines will provide food for all those hungry squirrels and birds and have enough seeds left to make future pines.

**Science Soup QUIZ**

1. sweltering
   a) very hot
   b) congested
   c) popular

2. regulates
   a) turns off
   b) controls
   c) increases

3. hefty
   a) leafy
   b) large
   c) dry

4. gradually
   a) all at once
   b) little by little
   c) rarely

Closed scales indicate damp conditions. Open scales indicate dry warmth.

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Would you know a dam if you saw one? Dams are huge concrete structures built to hold back water. Each includes a spillway—a channel to keep water from overflowing. Maybe you’ve seen dams but didn’t notice. Someone is noticing them. Journalists just spent two years digging deep into information about U.S. dams.

Here’s what they found: The United States has more than 90,000 dams. And many are old and damaged. Their foundations are cracked. Their spillways are too small. Lots don’t have the strength to hold back extra water. When rivers swell with floodwaters, dams are strained. Nebraska’s Spencer Dam failed last year. It unleashed a wave of water carrying ice chunks the size of cars.

“When they fail, they don’t fail with warning. They just fail, and suddenly you can find yourself in a situation where you have a wall of water and debris racing toward your house with very little time, if any, to get out.” That’s Craig Fugate’s description of dam failure. He was an administrator at the Federal Emergency Management Agency.

In 1978, the Corps of Engineers began the first nationwide dam check. It took four years to inspect 8,818 dams. One third were declared unsafe. One of those dams was in a New York state park near Sloatsburg. It’s been 40 years since then. Nothing has been done to fix the dam.

Many other dams also aren’t safe—but they are still in use. Most dams are privately owned. Not all owners are able or willing to pay for repairs. Some states can’t even figure out who owns certain dams. In Rhode Island, there are 32 dams with safety concerns whose owners are unknown. Different states have different inspection rules for dams. Some states check their dams yearly. Others inspect dams once every five years. A compromised, broken, or leaky dam is bad news, but repairs are costly and complicated. It would cost $70 billion to fix all the nation’s dams! But just ask people who live near them. To them, a fix may be worth every penny.

God held back walls of water to protect the Israelites as they crossed the Red Sea. Imagine the pounding waves and sheer force of water that swelled against God’s mighty hand. Exodus 14:29 says, “But the people of Israel walked on dry ground through the sea, the waters being a wall to them on their right hand and on their left.”
Rain dumps into swollen lakes and rivers. Waves surge as water levels spike. Extra water has nowhere to go. Rapids pound against a dam. Its packed sand, clay, and dirt become soggy and loose. Patched cracks spring leaks. The South Fork Dam is in trouble.

Finally, the dam crumbles.

Fifty-seven minutes later, rushing water ravages Johnstown, Pennsylvania, 14 miles downstream. The current that slams into the city is as powerful as the Mississippi River.

The South Fork Dam was built between 1838 and 1853 by the Commonwealth of Pennsylvania. The dam was later sold to the Pennsylvania Railroad. It changed hands again in a sale to private investors. They thought the dam’s location was a prime spot for a private resort. The property became South Fork Fishing and Hunting Club. As its owners changed, so did the dam. It was widened so a road could be built across it. Leaks were mended with mud and straw. Necessary pipes and valves were not maintained. The changes made the dam unsafe. It couldn’t withstand the heaviest rainfall ever recorded in the area. On May 31, 1889, the dam failed, causing the famous Johnstown Flood.

Over 2,000 people died in that deluge. Even more lost their homes. The dam’s owners were never held legally responsible for the damage.

The failure of the South Fork Dam was catastrophic. How could it have been avoided? People still disagree about that. What we do know is that before it failed, the dam had frequent leaks. Its repairs were not well-engineered. An added fish screen clogged the spillway. Pipes that could have relieved water pressure were removed. There were warning signs. But no one heeded them. And when the dam failed, the community of Johnstown was broken into pieces.

A few years before the flood, Clara Barton founded the American Red Cross. She was a nurse who wanted to help people in distress. Miss Barton quickly joined the disaster relief efforts at Johnstown. She stayed for months helping provide shelter, food, and medical care to people hurt by the disaster.

Hear instruction and be wise, and do not neglect it. — Proverbs 8:33
Imagine carefully testing several thousand recipes for a beloved cookbook. Then imagine coming up with 600 brand new ones. Now imagine doing all that in your home kitchen—without a dishwasher.

That’s what John Becker and his wife, Megan Scott, did. They started almost a decade ago. Why? They wanted to fix up a family heirloom. That treasure was *The Joy of Cooking*.

Mr. Becker is the great-grandson of Irma S. Rombauer. She self-published *The Joy of Cooking* in 1931. That means Mrs. Rombauer handled the business and expense of writing, editing, printing, and promoting herself. People have loved the book ever since. Twenty million copies have been printed. Some call the book “the Swiss Army knife of cookbooks.” For decades, Americans have relied on this old book to show them what it means to be a home cook.

But times have changed. People’s tastes have changed. So *Joy of Cooking*
When it comes to cooking, following directions is a must. But would you know how to follow these directions?

Heat water until it is hotter than milk comes from a cow.

The people who read a 16th-century British cookbook did. For them, milking cows was an everyday reality. They didn’t need a thermometer to tell them when the water had heated enough.

But would those readers know how to follow the most modern of recipes—ones the length of a Tweet? (Tweet recipes are a real thing. They use abbreviations to shorten ingredients and cook times to only 280 characters.)

Cookbooks mirror the times in which they are used. And they reflect the kinds of people who use them. Early cookbooks in Europe existed so royalty could show off their elegant banquets. These old recipe collections came from palaces, and they were not for sale.

Mr. Becker and Mrs. Scott tested out the old recipes. They wanted to make sure each still worked. “Really, ingredients do change,” says Mr. Becker. For example, he says pork loin is not as fatty as it used to be. Changed ingredients will work differently in recipes.

The couple added 600 new recipes. Readers from 1951 may remember old American favorites like Banana Bread Cockaigne—banana bread with lemon zest in the batter. But Guyanese pepperpot, Thai-style wings, lamb shawarma, and kimchi mac and cheese? These new global additions might make readers scratch their heads... and hopefully lick their lips.

Mr. Becker calls Joy of Cooking “a living book.” Hebrews 4:12 calls the Bible “living” too—but for a different reason. A cookbook might “live” because it adapts and changes. God’s word stays the same. It lives because it transforms hearts and minds.
“If you see a lion, stop and look it straight in the eyes—you must never run.”

Saitoti Petro points to a fresh paw print in the dirt. He walks a few more yards, reading tracks. One smudge in the dust tells him a lot: A large male lion passed here within the past two hours. “Here he’s walking slowly, then you see his claws come out in the tracks. Perhaps he’s running after prey, or from something else.”

Mr. Petro belongs to a people called the Maasai. He lives in Tanzania. Beneath the folds of his thick cloak, he carries a sharpened machete. Only a few years ago, men of Mr. Petro’s age would most likely have been stalking lions to hunt them. They wanted revenge. The big cats had eaten their cattle. But now they have another problem. Lions are running out.

Now Mr. Petro is one of more than 50 lion monitors. He walks daily patrol routes to help shepherds guard their cattle in pasture. Others working with him help people build fences to keep their animals safe. Safe livestock means no revenge lion killings. So in this case, protecting the prey also means protecting the predator.

Mr. Petro stops suddenly. The tracks he’s been following have veered off the road. He thinks the lion moved toward a stream in the gorge. The footprints must be recent. No bits of grass are strewn on top.

Cow bells jingle nearby. “We should go and check if anyone is coming this way,” he tells the other lion monitors with him.
“Good fences make good neighbors”—especially if your neighbors are lions!

In most corners of the planet, humans and big predators don’t live together easily. People use land for cities and farms. They don’t want predators around. No one likes a neighbor that can eat people and their cattle for breakfast! People who live near lions start thinking about lions as the bad guys—and even kill them.

On the plains of northern Tanzania, zebras, buffalo, and giraffes munch grass and leaves. In the same space, lions, leopards, and hyenas stalk these beasts. What a wild neighborhood! But it’s tame too. Pastoralists—people who graze animals for a living—have lived there for a long time. Their cows, goats, and sheep roam the same broad savannahs that lions do.

Tanzania may be one of the few places left on Earth where people and predators can keep coexisting. And what happens in Tanzania could save lions—or wipe them out. About 22,500 African lions are left. One out of every three of those lions lives in Tanzania.

Are people and lions living together well there? It seems like it. People build new corrals to keep predators out. Fewer livestock attacks take place. Lion hunts do still happen. This summer, people snapped a photo of a dead lion with its four paws and tail removed. This kind of killing is an old ritual. Still, people hunt lions less often than they used to. The local lion population is starting to bounce back.

Lions need to be rescued. The big cats have disappeared from 94 percent of the land they once wandered. Will the lion monitors’ work save the species from the “vulnerable” list—or even from extinction?

“It will be shameful if we kill them all,” says Mr. Petro. “It will be a big loss if our future children never see lions.”

The lions are doing what comes naturally to them. And the hunger for revenge comes naturally to fallen humans. Only the grace of God can change us. We’re thankful anytime we see people turn away from vengefulness.

The Bible says our enemy, Satan, prowls around like a lion. He wants to get people to stop living like they’ve been spiritually transformed. He wants people to have a “me-first” nature—just like animals. But the Bible encourages God’s people: Stand firm! Keep loving each other with sincerity. See 1 Peter 5:8-9.
The Maasai Change Their Ways

You might belong to the Maasai people group if . . .

. . . your mom built your loaf-shaped house (Inkajijik) out of mud, sticks, grass, cow urine, and cow dung.

. . . your dad is a warrior whose job is to keep your community (kraal) safe.

. . . your big brother’s job is herding livestock.

. . . your dad helped build a huge acacia thorn fence around your kraal.

. . . your neighbors drink cow’s blood to celebrate big events.

. . . milk and meat is what’s for dinner.

. . . when you grow up, you’ll keep your wealth as a herd of cattle instead of in a checking account.

The tribal Maasai people live in southern Kenya and northern Tanzania. Unlike many other peoples, their customs look almost exactly the same as they did hundreds of years ago. But one custom is changing: lion hunters are becoming lion rescuers.

Maasai warriors have killed lions for a long time to protect their herds. In the past, boys have had to slaughter a lion to become warriors. Avenging the death of a prize cow won a warrior respect. Lately, the killings have gotten worse. Herdsmen used to just spear lions. Now some leave out poisoned animal carcasses. These can kill a whole pride of lions and any other creatures that eat the tainted meat.

Conservationists knew the killings were a big problem for lions. So they got the best gamekeepers to help—the Maasai themselves. These Wildlife Warriors rise early, eat a breakfast of chai and porridge, and start their work tracking lions. Paw prints found inside the kraal can anger the Maasai people fast. Wildlife Warriors remind their neighbors: Don’t fight back. Protect your livestock with good fences. But don’t kill lions.
**The Lion King** is the name of a movie. It also names that animal’s place in creation. *Panthera leo* is an apex predator. Lions hunt other animals but other animals do not hunt lions.

Lions attack to steal food. They **brawl** among themselves. When male lions win a battle to take over a pride, they want to kill the cubs. Female lions fight to protect their young. With such a life, only one of eight male lions reaches adulthood. Of those, most will not die of old age. Male lions are more likely to die of injuries from combat.

You might be thinking, “With such a violent life, it’s no wonder there are fewer lions!” You would be right about the numbers. (A century ago, there were about 200,000 lions. Today there are no more than 40,000.) But you would be wrong about why lion populations have shrunk. By God’s design, when lions are left to their violent and wild life, they actually thrive. Lion populations are actually shrinking because of habitat loss and hunters.

Lions kill because it is in their nature. They have no choice. But people do have a choice. People can find ways to live where lions live without destroying one of God’s most magnificent creatures.

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**Citizen Ship QUIZ**

1. gorge  
   a) hill  
   b) valley  
   c) stream

2. ritual  
   a) custom  
   b) animal type  
   c) superstition

3. tainted  
   a) tinted  
   b) contaminated  
   c) expired

4. brawl  
   a) hug  
   b) fight  
   c) rest

Answers p5
Move over, Red Delicious. Cosmic Crisp has come to town. Cosmic Crisp is a new variety of apple. It arrived on grocery shelves December 1. It is the first apple ever bred in the state of Washington. What do growers think of the new apple? They have planted 12 million Cosmic Crisp apple trees. Now that’s confidence!

The apple is called Cosmic Crisp because the bright yellowish dots on its skin look like stars.

“I’ve never seen an apple prettier in the orchard than these things are,” says Aaron Clark. He lives in Yakima, Washington. His family owns several orchards. They have planted 80 acres of Cosmic Crisps.

Researchers at Washington State University developed the apple. Apple growers funded their research. Now the apples are getting a lot of attention. And that will pay off for Washington growers. Only Washingtonians are allowed to sell Cosmic Crisps for the first 10 years.

How do you breed a new apple? To create Cosmic Crisps, experimenters combined genes from two apple types: Enterprise and Honeycrisp. Farmers like Enterprise. It resists disease. Eaters like Honeycrisp for its crunch. (Growers nickname this older apple “Moneycrisp.” People love to buy it.) Cosmic Crisps keep for a long time in storage and in the fridge. They are crisp but juicy. They’re tart but sweet.

Nearly 140 million boxes of apples are grown in Washington every year. If you live in America, six out of every 10 apples you eat come from this state. Washington apple business is booming! Cosmic Crisp helps create even more apple wealth.


Is your mouth watering for a starry apple yet? Don’t worry. The new apple won’t be hard to find once it hits shelves. Marketers will make sure everyone can get their teeth into the new fruit. They want money for their innovation—including yours.
How many kinds of apples can you think of? It probably won’t take long to make a list. We have Macintosh, Golden Delicious, Red Delicious, Granny Smith, Honeycrisp, and more. When you walk through the produce department in your grocery store, you might even feel like you have too many varieties to choose from. But did you know that in the 1930s, people in just the United States were growing 10,000 different kinds of apples? That’s right—10,000!

Have you ever bitten into a yellow Maiden’s Blush apple? Have you tasted jelly made of the Black Ben Davis apple? Not many people have. These days, we recognize about 25 kinds of apples. But some old-timers remember the taste of extinct varieties. And they will tell you: The apples we have now just don’t taste as good.

In today’s world, most seeds are mass-produced. That means companies make lots of them at one time. The companies try to choose the best seeds available. They want their crops to last a long time. They want them to travel well. That way they can sell them at markets around the world.

People have always depended on seeds for survival. But now they depend on very few kinds of seeds. You can see that if you compare lists of seeds for sale at different times. In 1903, you could order 544 different kinds of cabbage seeds. Eighty years later, you could order only 28. Tomato seeds have a similar story. In 1903, you could choose from 408 kinds. In 1983, you could choose from only 79.

God has made people caretakers of His good world. Sometimes that means giving the world large amounts of food using mass production. Sometimes it means working to keep rare apple varieties alive.

Every good gift and every perfect gift is from above, coming down from the Father of lights. — James 1:17
Gurgle, growl, lub-dub, rumble. Bodies are noisy under the skin. Thankfully, doctors are trained to distinguish healthy and not-so-healthy sounds. A life-saving tool called a stethoscope carries sound waves straight to a doctor’s ears. But new tools are life-savers too. Mini-computers make it possible to hear and see inside the body. Will doctors swap old stethoscopes with smart technology?

The word “stethoscope” is made up of two Greek words. “Stethos” means chest. “Scopos” means examiner. A stethoscope helps doctors give chest examinations. Using the tool, their ears pick up sounds that tell about a body’s health. But are stethoscopes the best instrument for the job? Cardiologist Dr. Eric Topol doesn’t think so. “There’s no reason you would listen to sounds when you can see everything,” he says. He calls stethoscopes nothing more than a pair of “rubber tubes.”

In the beginning, the stethoscope wasn’t even that. René Laennec invented the first stethoscope in the early 1800s. His invention was a hollow piece of wood about a foot long. Pressed against the chest, it helped doctors hear heart and lung sounds. Rubber tubes, earpieces, and a metal disk were added. Sound waves make the disk vibrate. The waves travel through the tubes to the earpieces.

Today, doctors can see inside the human body with hand-held mini-computers. A mini-ultrasound is pressed against the chest just like a stethoscope. But the two devices work differently. The hand-held device uses ultrasound waves, artificial intelligence, and a smartphone app to make a video of the organs. Doctors can hear AND see problems.

Soon medical school students will be trained to use hand-held ultrasound devices. Does that mean it’s time to trade in the stethoscopes? Not yet. New technology is pricey. Until the cost comes down, pediatrician Dr. Dave Drellicharz thinks a stethoscope is the best tool. Dr. Paul Wallach agrees. He thinks new doctors will wear, “a stethoscope around the neck and an ultrasound in the pocket.”

Jesus is the great physician. He sees what no one can see inside our hearts. He came to heal our brokenness.

Those who are well have no need of a physician, but those who are sick.
—Luke 5:31

WORLDkids • January/February 2020
Stethoscopes have been around for a long time—and the idea that makes them work has been around since creation. You could think of a stethoscope as two drums connected by a tube. One drum creates sound waves. One feels sound waves. The first drum is the chestpiece of the stethoscope. The second drum is your eardrum. Both drums have a thin diaphragm, like the head of a drum. Anything that moves the stethoscope’s “drumhead” causes that diaphragm to vibrate.

This vibration pushes air molecules into waves. These pressure waves move outward like ripples when you throw a rock into a pond. But unlike pond ripples, these sound waves can’t keep spreading wider and wider until they disappear. They are trapped inside a stethoscope. In fact, the waves are magnified as they are forced through the stethoscope’s narrow tubes.

The sound waves finish their journey by escaping out the holes of earpieces. The waves travel down your ear canal to your eardrum. They bang into your eardrum’s diaphragm. It vibrates. Tiny bones touching the other side of your eardrum feel the vibration of your eardrum. Nerve endings attached to those little bones send the vibration information to your brain. Your brain interprets the vibrations as sound. Isn’t it incredible that God created our brains to be able to figure out which sounds are your dad’s snoring, the cat meowing, your sister playing violin, or your brother practicing Spanish?

**Take Apart Smart QUIZ**

1. What is Cosmic Crisp?
   a) a new star  
   b) a new apple  
   c) an orchard in Washington  
   d) none of the above

2. Which apple is commonly known today?
   a) Maiden’s Blush  
   b) Granny Smith  
   c) Golden Delicious  
   d) b and c

3. Stethoscope is from two Greek words meaning ___.
   a) chest and examiner  
   b) heart and listener  
   c) double and hearing  
   d) sound and magnifier

4. Sound waves act like ___.
   a) gusts of wind  
   b) ripples in a pond  
   c) warm air rising  
   d) a dripping faucet

5. How are a traditional stethoscope and an ultrasound device different?

Answers p5
Movies sometimes depict gorillas as aggressive brutes. But Pato the silverback doesn’t act much like King Kong.

Like all gorillas, Pato eats bugs and plants. He moves slowly. He lives in a family. Pato walks on all fours toward a squirming infant gorilla, Macibiri. He sits beside her and runs his long fingers through her fur. He’s looking for insects or other things caught in her glossy black coat.

Again, biologist Jean Paul Hirwa is watching. He notices a fresh wound on Pato’s chest, a small red slash. He guesses the wound means Pato was jousting with another male. That sometimes happens when male gorillas are trying to prove who’s boss. Mr. Hirwa tells veterinarians that Pato is hurt.

The vets rarely intervene in gorilla life. Once in a while, they dart a gorilla with antibiotics. But
Kurudi the gorilla feeds on wild celery deep in the rainforests of Rwanda. She uses her long careful fingers to open the plant’s succulent inside.

Someone watches: biologist Jean Paul Hirwa. He is hiding behind some stinging nettles. He notes her meal on his tablet computer.

A large adult male gorilla, known as a silverback, sits next to Kurudi. He looks at the scientist. But Mr. Hirwa isn’t nervous. He speaks gorilla. He makes a low hum—“ahh-mmm.” To a gorilla, that means, “It’s OK. No reason to worry.”

Do gorillas have reason to worry? Not as much as they used to—and that’s because people worried about them. A few decades ago, some thought mountain gorillas would go extinct by the year 2000. But the animals were removed from the “critically endangered” list last fall. Now they’re just “endangered.” “Endangered” still means trouble, of course. But it’s trouble with hope attached.

To get to this point, people used what some call “extreme conservation.” Researchers have monitored every single gorilla in the rainforest. Once in a while, veterinarians clean gorillas’ infected wounds. People have saved the gorillas’ homes by sending money into nearby communities. Now locals no longer feel the need to destroy forests for farming to make enough money to survive.

Instead of shrinking, the number of mountain gorillas has grown. A decade ago, there were 680. Now there are just over 1,000. They live in Congo, Uganda, and Rwanda. Mr. Hirwa and the two great apes are all part of the world’s longest-running gorilla study. The project started in 1967. “The gorillas are still here,” he says. “We celebrate that as a victory.”

they almost never remove the animals from the mountain. Reuniting gorillas can be difficult.

“Our hospital is the forest,” says Jean Bosco Noheli, a veterinarian for the Gorilla Doctors project. When his team goes into the field, they must carry everything they might need in bags weighing up to 100 pounds. They even tote portable X-ray machines.

Biologists have learned that, over time, gorillas can get used to having people around. That means scientists get a front-row seat for gorilla research. It also means Rwandans can make money from gorilla tourism—if they are very careful.

In Rwanda’s Volcanoes National Park, tour groups are limited to eight people at a time. They can observe the gorillas for only an hour. And they follow rules: No food. No water bottles. (If a curious silverback snatches these items, it risks being exposed to human germs.)<br>And if a gorilla acts aggressive—which is rare—tourists must look down and bend a knee. This shows the gorilla he’s still in charge.

Once, people thought the best way to save animals was to keep local people away from them. But now many believe the opposite. Their new idea is to make locals want to take care of gorillas. People must know that preserving the animals is good for their human communities too.

Each gorilla tour costs $1,500 per person. Rwandans make much more money selling tickets than they would if they had cleared the rain forests and started farms. That’s a win-win-win: win for the rainforest, win for gorillas, and win for people.

Whoever is righteous has regard for the life of his beast. — Proverbs 12:10

Jean Paul Hirwa walks down a trail to observe mountain gorillas in the Volcanoes National Park.

Pato the silverback mountain gorilla sits in the Volcanoes National Park.

AP Photos
The clock is ticking, and bison are changing. Or maybe we should say they’re becoming less different than they used to be.

Researchers in North America gather tail-hair at bison roundups. They shoot bison with small, flesh-biting darts. Sometimes they collect blood from bison killed by hunters. All these samples give scientists a peek at bison DNA. Information from a tiny hair or drop of blood contains all the bison’s genetic information. And what happens when scientists read the DNA? They say, “These bison have a problem.”

Wild North American bison wander in small herds. The herds are isolated from each other. When a herd is too small, not enough genetic variety exists in its gene pool. When it is isolated, new genes can’t mix in from other bison groups. This makes animals less able to fight off disease.

“Some of these herds that lost the most genetic diversity do have a high probability of going extinct,” explains Cynthia Hartway, a conservation scientist.

Bison have been in trouble before. Once, tens of millions of wild American bison existed. In the 1800s, people hunted and killed too many. Fewer than 1,000 survived.

Now U.S. government officials try to protect bison. Their programs support about 11,000 genetically pure bison. (Well—these bison are almost pure.)
Have you ever seen bison up close? They’re big. Some stand six-and-a-half feet tall at the shoulder. They can weigh up to a ton and run 40 miles per hour. You don’t want a sharp-horned creature like that barreling across the plain at you! But no worries—these big fuzzy animals just want some grass to munch.

God’s creatures—both people and animals—are made to live in community. Often, the more variety in a community, the healthier its individual members are. Bison are supposed to live in small groups. But in summer, these groups should come together in huge herds to mate. Bulls (males) lock horns in fights for cows (females). Nine months after mating time, baby bison are born. Will the calves have good enough genetics to survive disease and bad weather? It probably depends on the size of the summer herd.

Genes determine an animal’s size and color. They might decide whether a cow will be better for dairy or beef, or whether a dog will be better for guarding sheep or hunting ducks. That variety is good. Sometimes scientists breed all the members of a population to be genetically identical. They do that so they can see clearly how substances (like new medicines) affect an animal. But in regular life, the more variety the better.

Over time, a species’ genetics change. Animals adapt to their conditions. That’s one reason people have to be very careful while they’re doing “genetic rescues”—trying to improve the gene pool of a group of animals in trouble. It’s important that animals with strong genes survive and animals with weaker genes die off. Humans need to make sure they help without interfering with God’s design for strong animals.

People watch the bison herds change. What new genes will help the animals thrive? One thing is sure: The bison will always be bison. God made animals “according to their kinds.” (Genesis 6:20) Genes never change so much that an animal becomes a new species.

**Critter File Quiz**

1. succulent  
   - a) tasty  
   - b) wet  
   - c) slimy

2. depict  
   - a) color  
   - b) show  
   - c) erase

3. isolated  
   - a) separated from others  
   - b) frozen  
   - c) balanced

4. identical  
   - a) slightly different  
   - b) almost the same  
   - c) exactly the same

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Their genes do show that some bison have had calves with cattle in the past. That happens sometimes when bison herds aren’t big enough. Other groups work to save bison too. What will help bison? People have to plan. They can exchange a few bison between herds every 10 years. That will help keep small herds from deteriorating.

But Ms. Hartway says that’s not enough. “We’re kind of putting a band-aid on the problem,” she says. In the long run, she thinks, bison must live in bigger groups.

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Riders herd bison during a roundup in Utah.
"DON’T build!"
That’s what Chinese officials say to people in Qinghai. Qinghai is a vast region where exotic animals like snow leopards and Chinese mountain cats slink. Asia’s three great waterways—the Yangtze, the Yellow River, and the Mekong—all begin in Qinghai. What will happen to this remote place?
It will become a national park.
“This is one of the most special regions in China, in the world,” says Lu Zhi, a biologist.
Qinghai is on the Tibetan Plateau. People sometimes call this spot “the rooftop of the world.” The planet’s tallest mountain ranges surround it. Workers busily build in other parts of the Tibetan Plateau. But construction in Qinghai stops. No building means the pristine ecosystems stay as they have always been. People will be able to enjoy them for years to come.
Still, a question hangs in the air. Can Chinese officials make a national park work for everyone? The new park must protect land and animals. It must bring tourists in. And it must allow people who live nearby to go on with their lives. About 128,000 people live in or near the park area. Many of those people are Tibetan.
Some compare the new park plan to Yellowstone National Park in the United States. Yellowstone was created in 1872. And U.S. officials had the same problem Chinese officials have now. People lived in the place they want to make a park. What did they do about it? The U.S. government forced Native Americans who lived in the area to move. Will Chinese officials do the same to Tibetans?
The Chinese government is giving some of them jobs instead. Some Tibetans are paid to stay and work their land. The “One Family, One Ranger” program hires one person per family. These rangers earn 1,800 yuan ($255) a month. They collect trash and watch for poachers.
Kunchok Jangtse is a Tibetan herder. He raises livestock and collects caterpillar fungus to make folk medicines. This earns him just $2,830 a year. But now he also earns through the program. He cleans up garbage. He maintains motion-activated camera traps, which help scientists keep track of endangered species in Qinghai. For now, the extra money helps. But Mr. Kunchok watches. He waits. Will he have to leave eventually too?
Going to eastern China? You’ll see granite and sandstone cliffs rising against the sky. Going southwest? You’ll find the lush forests where giant pandas make their homes. If you’re headed northeast, you’ll see the boreal forests where endangered Siberian tigers roam. China is huge. It’s the world’s third-biggest country, and it has a lot of natural wonders to save—or lose.

Chinese officials have a big task ahead of them. They’re getting ideas for their national parks from the fourth-biggest country, the United States. Imagine discovering the United States little by little. Pioneers moved west in America in the 1840s and 1850s. They were stunned by what they saw. Deserts, mountains, forests, canyons, and plains stretched before them. Some wanted to preserve what they found.

Yellowstone National Park takes up more than 3,000 square miles in the American West. Most believe it was the first national park in the world. Before Yellowstone, most Europeans and Americans thought of nature mainly as a way to get food, clothing, and shelter. But that changed. Conservationists encouraged others: Protect some wild lands. Preserve the creatures that live on them. They didn’t want future generations to say, “What scenery? What animals? I just see buildings!”

President Ulysses S. Grant set aside more than a million acres of land for parks in 1872. That included Yellowstone. This land wouldn’t belong to anybody. It would belong to everybody. Everyone would be able to enjoy it. (Well, almost everybody. Sadly, the plan didn’t include Native Americans. And they had lived on the land for centuries!)

Theodore Roosevelt became president in 1901. He loved to hunt. But as President Roosevelt hunted in the American West, he became discouraged. Bison, elk, sheep, and deer were being wiped out. Yet it seemed that people thought resources would last forever. He encouraged Americans to ask: What will happen when forests are gone? What will people do when they have used up all the coal, iron, oil, and gas? What will happen when soil is poor and rivers are polluted? During his presidency, Theodore Roosevelt protected about 230 million acres of public land.
A 10-year-old boy calls for the dawn Muslim prayer in a village in Morocco’s Atlas Mountains. The people who hear the call know what’s coming next: a day of hard work harvesting the most expensive spice in the world.

Older women make their way out of Askaoun village and its mud-brick homes before the Sun rises. They’re headed to fields of purple saffron flowers. One by one, they’ll pull out the flowers’ thread-like crimson stigmas.

“There isn’t the flower just calling to be picked? Look at it, it gives itself to your hand,” says villager Biya Tamir. The women’s bent backs ache. Their hands are blistered by the morning cold. But they sing and chat as they work.

The saffron flower thrives in only a few places on Earth. Most saffron comes from Iran. But Morocco is among the world’s top five saffron producers. The saffron plants bloom for only two weeks a year. The flowers each contain three crimson threads called stigmas. They become useless if they blossom. So the women must work quickly and steadily.

Every step of saffron harvesting is done by hand. The intense labor gives saffron its nickname: “red gold.” People have valued saffron for a long time. Persians used it to make paint for cave art and wove the threads into royal rugs. Romans used the spice to make eyeshadow and to dye fabric and leather.

Few crops can thrive in the dry soil of the lower Atlas mountain range. The village depends on saffron to survive. But the harvesters don’t make big money on the precious spice. The people who sell it around the world get the wealth.

Bad weather can mean serious trouble for the harvesters. This year, rain was irregular, snow was scarce, and the cold season didn’t last long enough. Saffron harvesters are gathering just half of what they harvested last year.

After picking, the women sit at tables pulling the stigmas from flowers. They talk about how the hard work makes their bodies hurt. But then their talk is interrupted by singing heard in a nearby house.

“The saffron season is hard, but it is still a time for us to forget our sorrows,” says Khadija Safieddine. “We come together and have a good time, and for that alone we love the saffron.”

"Everyone should eat and drink and take pleasure in all his toil—this is God’s gift to man. — Ecclesiastes 3:13"
Twirl a fork into a pile of steaming noodles with oregano-flavored sauce. Sip hot cocoa with whipped cream sprinkled with cinnamon. You’re not thinking about the difference between an herb (oregano) and a spice (cinnamon). But since you mention it . . . it all depends on which part of the plant is being used. Herbs come from the green, leaf parts. Spices like saffron come from these other plant parts:

**Bark**

Cinnamon gets its flavor from the sap of a type of evergreen.

The inner bark of a cinnamon tree is sliced and peeled. Flat sheets curl into quills as they dry in the sun. The bark is also ground into powder. This spice is named in the Bible. Enjoy a sprinkle of cinnamon. But never eat a spoonful. It can burn your throat.

**Roots**

Gnarly roots of the horseradish plant are peeled and grated to release their oils. One good sniff will make your sinuses tingle and eyes water. Shredded horseradish is mixed with vinegar to prevent it from getting bitter and browning. Roots can also be dried and ground into powder. Horseradish has been used for 3,000 years. Like other spices, it was first used as a medicine as much as a flavor.

**Flower**

Clove get their name from the French word clou, meaning nail. These “spice nails” are the pink flower buds of the evergreen clove tree. They are picked and dried before they have a chance to open. Chewing a few cloves will give your mouth a tingly, numb feeling. In fact, clove oil has been used for centuries to deaden tooth pain.

**Fruit**

Vanilla comes from the fruit pod of a member of the orchid family. Growers get one chance! If *vanilla planifolia* flowers are not pollinated within hours of blooming at sunrise, the flowers wilt, close, and fall to the ground by the next morning. Vanilla pods take months to vine ripen. To add vanilla to a recipe, pods are scraped with a knife. Liquid extract is made by soaking pods in alcohol.

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**Jet Balloon QUIZ**

1. Who lives on land used for national parks in China?
   a) Native Americans
   b) Tibetans
   c) U.S. government officials
   d) none of the above

2. Which president made Yellowstone a park?
   a) Theodore Roosevelt
   b) Ulysses S. Grant
   c) Xi Jinping
   d) George Washington

3. Why was the saffron harvest sparse?
   a) shortage of workers
   b) bad weather
   c) no demand for saffron
   d) no saffron planted

4. Cinnamon comes from __.
   a) a cinnamon flower
   b) a cinnamon tree
   c) a cinnamon bush
   d) a cinnamon pod

5. How does God want us to think about our work?

Answers p3
**Panda Twins**

Introducing . . . Meng Xiang and Meng Yuan!

Berlin Zoo’s giant panda twins finally have names. Meng Xiang means “long awaited dream.” Meng Yuan means “dream come true.”

The two are the first pandas ever born in Germany. In keeping with an old Chinese tradition, they got their names 100 days after they were born. Their gender was revealed too. The two are both boys.

Giant pandas are endangered. People guess that fewer than 2,000 live in the wild. At first, these two cubs were bottle fed. Now they feed from their mother on their own.

*A desire fulfilled is a tree of life. — Proverbs 13:12*

**One Good Tern Deserves Another**

Least terns have flown right off the endangered species list. The terns faced extinction because people hunted them for feathers for ladies’ hats. As more U.S. rivers were dammed, valuable beaches were lost. Surviving terns struggled to find beaches to nest on. But now there are 10 times more terns than there were 30 years ago.

What saved them? Biologists worked with the Army Corp of Engineers to better manage the Mississippi River. This increased the number and size of its islands. Terns had more space to nest. The population exploded from a few hundred to at least 10,000.

Terns live around 15 years. Every fall, they migrate south. One tern was tagged in South Dakota and later found in Japan. Talk about a world traveler! Now more terns can take flight.

**Violin Comes Back**

Someone swiped Roman Totenberg’s beloved violin. That was in 1980. He had just finished playing a concert in Cambridge, Massachusetts. Now the violin is coming alive again—in the hands of another virtuoso.

The violin is a Stradivarius, one of the best violins ever made. Long after the theft, someone found the violin in a California attic. It was returned to Mr. Totenberg’s daughters four years ago. It is very likely worth millions of dollars.

Now Nathan Meltzer is holding the bow. He is a star violinist and only 19 years old. “Our father would have been so pleased to hear Nathan, a gifted young violinist, breathe life back into the violin,” says Jill Totenberg.

Mr. Totenberg didn’t live to see his instrument again. He died in 2012. He was 101. Did he think the instrument would ever be found? He said, “After I have kicked the bucket.”
In Cambodia, elephants are moving down the road—with no riders on their backs. It’s time for them to go home to the jungle.

Once, elephants were used for logging in Cambodia. Now machines do most of that work. So elephants have a new job: attracting tourists. Elephants at the famous Angkor temple have given rides there for almost 20 years. But some of the 14 elephants living and working there are old and ill. One died after giving a tourist a ride. Her loss caught a lot of attention. People demanded, “No more elephant rides!”

The ancient temples at Angkor are a UNESCO World Heritage Site. People travel from all over the world to see them. Now if they want to see elephants too, tourists will have to make an extra trip. The elephants’ new home is 25 miles away. The elephants will be trained to put on shows there—but still, no rides.

Rides End

How do you make sure the best-qualified people rule your country? Long ago, people in Korea held gwageo [GWAH-go] exams. This fall, Koreans reenacted the tests. Men sat on the ground. They wore old-fashioned Korean clothes. They answered questions and wrote essays to be judged.

In the old days, test takers earned positions in the government or military with their high scores. Now winners take home money prizes. Real gwageo exams haven’t happened for 125 years.

But Koreans still take tests very seriously. Each year, exam scores decide what university high school seniors will attend. These tests often determine how the rest of their lives will unfold. That’s a lot of pressure for one day! Do tests make you nervous? In Korea on college test day, people are expected to go to work one hour later so traffic doesn’t disturb test takers. Drivers must not honk while passing schools. Noisy planes even delay landing and taking off!

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It’s not every day the carcass of a giant blue whale washes up on the Oregon coast. In fact, it may happen only every 200 years! But this whale washed ashore near Gold Beach, Oregon, in 2015. It was as long as two school buses. Scientists saw an opportunity. They removed 58 tons of flesh from the carcass. They placed the bones back in the water. Underwater scavengers picked the bones clean.

All 365 bones were brought back to land in November. That includes an 18-foot-long jawbone and a skull weighing 6,500 pounds. Blue whales are bigger than even the largest of the dinosaurs.

And now? It’s time to reassemble. Cleaning and rebuilding the giant whale’s skeleton will take about a year.
Will the Cosmic Crisp apples sell? (page 18) Will their price go up or down? Here are two pictures taken on day one and day two of the farmers market. Which things cost the same on both days? Mark S. Which cost more on day two? Mark M. Which cost less? Mark L.