



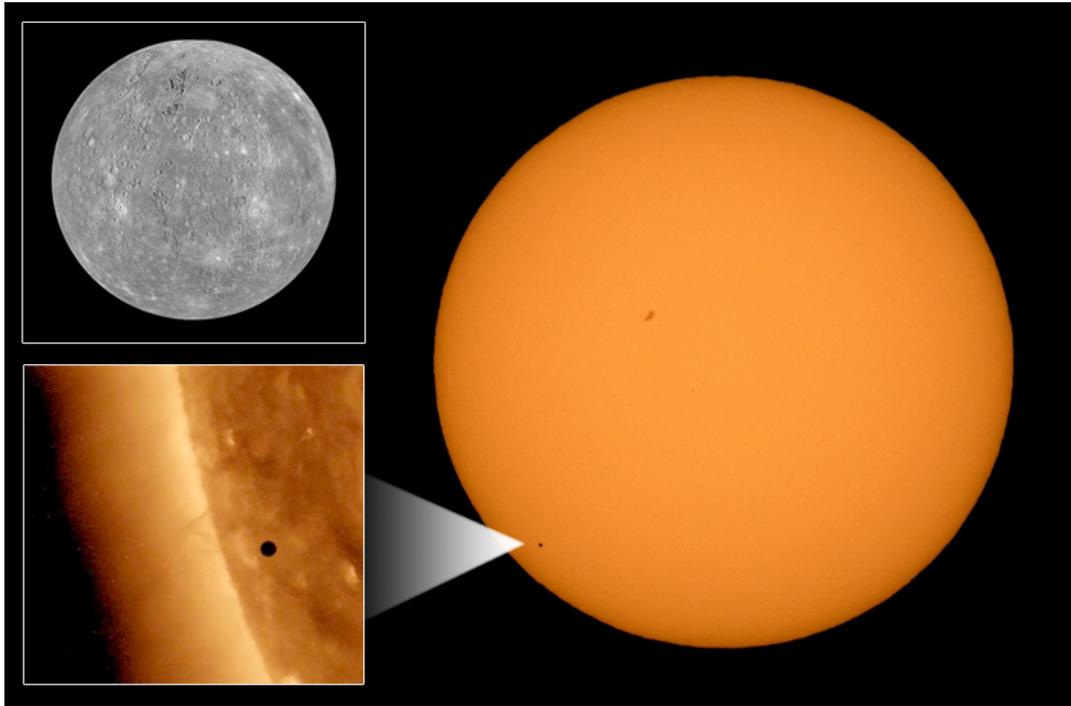
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Mercury as a tiny dot on the face of the Sun. Insets: the planet Mercury: Mercury at the beginning of its transit

TRANSIT OF MERCURY

On May 9, people in many parts of the world watched a rare event. They saw a small black dot move very slowly across the face of the Sun. The event was the Transit of Mercury. Mercury, or the black dot, took seven hours to move from one side of the Sun to the other. These transits occur 13 or 14 times every 100 years. The last one was in 2006.

The Sun is at the center of the Solar System. Of the eight planets in the Solar System, Mercury is closest to the Sun. The other seven planets are: Venus, the Earth, Mars, Jupiter, Saturn, Uranus, and Neptune. The four nearest planets to the Sun, Mercury, Venus, the Earth, and Mars are all 'rocky'. The others are mainly made of gas.

Pluto is beyond Neptune. It was discovered in 1930. At first, Pluto was thought to be a planet. However, years later, because of its size, Pluto

was 'downgraded' to a dwarf planet. Pluto is about two-thirds the size of the Moon.

Mercury is named after a Roman god, or deity. He was believed to speak and communicate with all the other deities. Therefore, for Romans, Mercury was 'the messenger to the gods'. Mercury is the Solar System's smallest planet. It is only a bit bigger than the Moon. Both Ganymede, one of Jupiter's many moons, and Saturn's moon Titan, are bigger than Mercury.

It may be the smallest planet, but Mercury is also the fastest. It takes 88 days to complete one orbit of the Sun. On its journey around the Sun, Mercury overtakes the Earth every three or four months.

Mercury's surface is covered in craters. It has almost no atmosphere, so any heat is quickly lost. This explains

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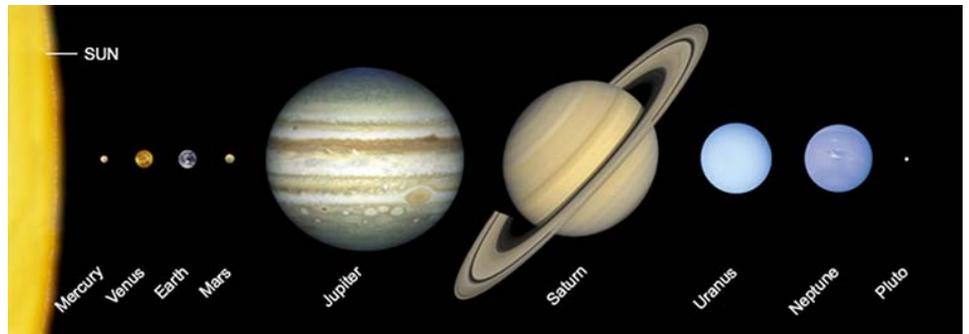
the planet's wide range of temperatures. During the day (as the planet is so close to the Sun) it is four times hotter than boiling water. Yet, at night, temperatures can be colder than -148°F (-100°C). Unlike the Earth, Mercury is not tilted on its axis. Therefore sunlight never shines into the craters around the planet's north and south poles.

Mercury and Venus are the only planets between the Earth and the Sun. Therefore, from the Earth, it is only ever possible to see a Transit of Mercury and a Transit of Venus. Transits of Venus are less frequent. They occur roughly four times every 243 years. They appear in pairs about eight years apart and then not again for either 105.5 years or 121.5 years. The last Transit of Venus was in 2012. The next will be in 2117.

Mercury passes between the Earth and the Sun every 118 days. Yet when compared to the Earth's path around the Sun, Mercury's orbit is tilted. This means that from the Earth, Mercury appears to either pass above or below the face of the Sun. For a transit to take place the Sun, Mercury and the Earth have to be in [alignment](#), or a straight line.

Pierre Gassendi (1592 – 1655) was a French astronomer. He was the first person to watch a Transit of Mercury. It took place in 1631. This was about 20 years after the invention of the telescope. Looking at the Sun is dangerous. Early astronomers used their telescopes to reflect an image of the Sun onto a nearby wall or white piece of paper.

The Transits of Mercury and Venus are historically important. This is because they helped early astronomers to work out the distance between the Earth and the Sun. When this distance was known, people



The Sun and the Solar System's eight planets and one dwarf planet. Planet sizes to scale, distances between the Sun and planets not to scale

began to understand the vastness, or enormous size, of the Solar System.

Edmund Halley (1656 – 1742) was a British astronomer. In 1677 he traveled to St. Helena to see the Transit of Mercury. This small island is in the southern part of the Atlantic Ocean. When he was watching the transit, Halley realized that it could be used to calculate the distance to the Sun. This would be a complex calculation. To work it out, it would be necessary to record the time of a transit from different parts of the world. Halley also realized that it would be best to use the Transit of Venus. Venus is a larger planet and closer to the Earth. Its transit would therefore result in a more accurate figure.

The next Transit of Venus was in 1761. Expeditions were sent from Britain, Austria and France to record the event. The explorers traveled to places such as Newfoundland (now in Canada), Madagascar, Norway, Siberia (in the eastern part of Russia) and the southern tip of Africa. Each needed to accurately record the time it took for Venus to cross the face of the Sun. Yet because of poor visibility and unreliable equipment the results from these expeditions were not very good.

Eight years later, in 1769, scientists from Russia, Britain and America arranged to record the

transit from many more places. One recording was made on the Pacific island of Tahiti by the British explorer Captain James Cook (1728 – 1779). After visiting Tahiti, Captain Cook traveled west and became the first European to sail around New Zealand and along the east coast of Australia. The place where Cook made his recording in Tahiti is still known as 'Point Venus'.

From the observations made in 1761 and 1769 the distance between the Earth and the Sun was eventually calculated. The figure was 95 million miles (153 million kilometers). Today, we know that a more accurate figure is 93 million miles (149.6 million kilometers).

In 2012 a NASA robotic vehicle landed on Mars. Known as the Mars rover Curiosity, it has been exploring the surface of Mars for the last four years. In 2014, the rover observed Mercury transiting, or moving across the face of, the Sun. This was the first time that a transit had been seen from any part of the Solar System other than the Earth. The next two Transits of Mercury (as seen from the Earth) will be in 2019 and 2032.

So far, only two spacecraft have traveled to Mercury. A new unmanned mission is expected to launch in 2018. Called Bepi-Colombo, it will not reach the planet until 2024. ■

ENDEAVOUR FOUND?

Marine archaeologists in the U.S. claim that they are about to identify the wreck of a famous ship. Best known as the *Endeavour*, the wreck is close to Newport. This city is in Rhode Island, one of America's smallest states.



Replica of Captain Cook's ship HMB Endeavour (Australian National Maritime Museum)

HMS *Endeavour* was the ship used by Captain Cook for his voyage of discovery to New Zealand and Australia. Cook sailed from Britain in 1768. He returned three years later. HMS stands for His or Her Majesty's Ship. Cook's ship was also known as HMB *Endeavour*. The "B" stands for bark, or barque. This was a type of sailing ship with three or more masts.

James Cook was born in 1728. As a young man he worked on ships that carried, or transported, coal. He joined the navy and became an expert cartographer, or mapmaker. In 1768 Cook was appointed as the captain of *Endeavour*. Navy commanders ordered him to sail to the island of Tahiti, in the Pacific Ocean. There, he was to record the transit of Venus. This is when the planet Venus can be seen to move across the face of the Sun. Transits of Venus happen four times every 243 years.

To get to Tahiti, Cook sailed across the Atlantic Ocean. He went around Cape Horn, or the southern

tip of South America. On his return voyage Cook sailed all the way around New Zealand. He was the first European to do this. Cook mapped the coast of New Zealand's two largest islands. He then turned towards Australia. European explorers had reached other parts of Australia before. Yet in 1770, Cook and his crew were the first Europeans to see, and land on, Australia's east coast.

Captain Cook made many new maps. Scientists on his ship collected samples of local plants. Cook named the place where he landed in Australia Botany Bay. Botany is the scientific study of plants. On behalf of Britain, Captain Cook claimed ownership of Eastern Australia. In 1788 other ships from Britain arrived to set up a new colony. The place they chose to build a new [settlement](#) eventually became Sydney, Australia's biggest city.



Aerial view of Newport, Rhode Island (Michael Kagdis)

After Cook returned, his ship was sent to a dockyard for repairs. Later, Cook set out on two other long voyages. For these he used a different ship. Cook died in Hawaii in 1779. He was killed after a disagreement with the ruler of the people who lived there.

In 1775 a war broke out in America. Many people living in America did not want to be governed by Britain and its king. Known as the American War of Independence, or the American Revolutionary War,

the fighting lasted for eight years. By this time, *Endeavour* had been renamed. It was now called the *Lord Sandwich*. *Lord Sandwich* was the man in charge of the British navy. After the war began, the *Lord Sandwich* took soldiers from Britain to America. It then became a floating prison in Newport's harbor.

During the war France also fought against the British. French ships threatened to attack Newport. British commanders deliberately sank, or scuttled, 13 ships. They did this to block the entrance to the harbor. This would stop the French ships from attacking Newport. The attack never happened because of stormy weather.

From studying old documents, the marine archaeologists discovered that the scuttled ships included the *Lord Sandwich*. They have found a group of five wrecks on the seabed. One, the archaeologists say, is likely to be the *Lord Sandwich*. As it was used as a prison ship, they should be able to identify it. If they do locate the *Lord Sandwich* then they would have found *Endeavour*.

A museum in Australia is helping to pay for the marine archaeologists' work. It plans to bring the wreck to the surface and take it to Australia. Museum officials hope that this can be done by 2020. This year will be the 250th anniversary of Captain Cook's landing in eastern Australia in 1770. ■

FIRST OF MAY

Celebrations are held in many European countries on May 1. Traditionally, this date marks the beginning of summer. It's known as May Day. In the late 1800s, May 1, was chosen to be 'International

Workers Day'. In later years, the governments of many nations decided that this date would be a holiday for the workers. Therefore, in many places, May 1, is also called Labor Day or Workers' Day.

In Ancient Rome people danced and collected flowers on May 1. By the beginning of this month, in the northern hemisphere, the days are far longer than the nights. The weather is warmer. For many the first day of May marked the start of the crop-growing season.

In some European countries traditional May Day celebrations involve singing and dancing. In Britain, May Day is known for dancing and maypoles. A maypole is a tall wooden post that is put in the ground. Maypoles are put up in many villages or small towns. Brightly-colored ribbons are attached to the top of the post. Maypole dancers hold one of the ribbons. Nowadays, the dancers are usually young children. As they move around the pole, the dancers move inwards and outwards. By doing this, the ribbons create a woven pattern. During the celebrations, a girl is crowned the "May Queen". Dressed in white, she has flowers around her neck or in her hair.



Maypole dancers

The first trade, or labor, unions were set up in the early 1800s. This was when large numbers of people first began to work in factories. Many workers became union members. The unions' leaders

worked to protect the workers and their rights.

In 1884 union leaders in the U.S. organized a protest known as a general strike. The date chosen for the strike was May 1. All union members were encouraged not to go to work. Instead, tens of thousands of people took part in demonstrations in cities across the country. The union leaders wanted company bosses to agree to an eight-hour working day.



International Workers' Day march in Spain

In the city of Chicago some workers decided not to strike. These people were known as strikebreakers. Striking workers tried to stop them going to work. Violence broke out and the police fired at the crowd. At least two people were killed. A few days later, a large [rally](#) was held in a part of Chicago called Haymarket Square. The leaders of the gathering said that it would be peaceful. The crowds listened to several speakers. They spoke about workers' rights and an eight-hour day.

In the evening, the police moved into the square. They had been ordered to [disperse](#) the crowd. Somebody threw a hand-made bomb at the police. The police began shooting at the crowd. Some police officers and protesters were killed. Many others were injured. This incident became known as the Haymarket Affair.

Eight men were arrested for organizing the rally. They were sentenced to death. Many people believed that this was done to try to

stop future workers' gatherings and demonstrations. Prosecution lawyers admitted that none of the men on trial threw the bomb. Four of them were executed and one committed suicide in prison. The others were eventually freed.

In 1889, unions in the U.S. decided to make their fight, or struggle, for better workers' rights an international campaign. Because of the Haymarket Affair, they declared that May 1, was International Workers' Day. Unions in other countries began to hold their demonstrations on this date. Nowadays, trade union members in cities all around the world take part in rallies and marches on May 1. ■

PRESS FREEDOM

Democratic countries elect their own leaders. These elections are meant to be both "free" and "fair". Many people believe that a country is only fully democratic with proper elections if there is "freedom of the press".

Freedom of the press means that news companies can produce reports without government [restrictions](#). Nowadays, the "press" (often called the media) includes television, radio and internet news reporting, as well as newspapers and magazines.

Where there is press freedom, media organizations can criticize politicians, government officials and business leaders. News reporters, or journalists, write or say what they believe to be true. Readers or listeners of their reports then make up their own minds. They may think that the reporters are right or that they are wrong. Freedom of the press, many people believe, prevents corruption, or dishonesty, and leaders becoming too [autocratic](#).

In some countries there is limited or no freedom of the press. In these places, news reporters rarely criticize government officials. Where there are restrictions, the state (or government) often owns, or controls, the main newspapers, radio and television companies. Only selected news is reported. Stories that might embarrass the government are suppressed, or [censored](#).

In 1993 the United Nations (U.N.) declared that May 3, was World Press Freedom Day. (It is also known as World Press Day.) The U.N. says that this day is meant to remind everyone that freedom of the press and “freedom of expression” (or free speech) are human rights. The U.N. claims that freedom of the press improves people’s lives. For example, countries with a free press often have more successful economies.

UNESCO is part of the U.N. Its name is an [acronym](#) for (the) United Nations Educational, Scientific and Cultural Organization. Each year, on May 3, UNESCO awards a prize. Its official name is the UNESCO/Guillermo Cano World Press Freedom Prize. The award is named after a journalist from Colombia. Cano was murdered in 1986. Then, powerful drug gangs were operating in his country. Cano’s newspaper criticized how these cartels worked with some politicians. It’s thought that drug gang leaders arranged for him to be killed.

The prize is given to a journalist whom UNESCO thinks has promoted press freedom. This is usually in a country where it can be dangerous to do so. This year’s prize was awarded to Khadija Ismayilova. She is a journalist from Azerbaijan. Ms. Ismayilova is currently in prison. She was arrested

two years ago. Officials in Azerbaijan say that Ms. Ismayilova is guilty of several crimes. However, UNESCO believes that these crimes have been “made up”. It claims that the Azeri journalist is being punished for investigating dishonest, or corrupt, government officials.



Memorial bust of Guillermo Cano, in Colombia

Several organizations judge how much press freedom they think there is in different countries. One of the best known is Reporters Without Borders. This organization is based in France. Each year, it produces its own World Press Freedom Index. The latest index includes 180 countries. Finland is at the top. Reporters Without Borders therefore believes that this country has the best press freedom. The Netherlands and Norway are second and third. The three countries at the bottom are North Korea, Eritrea and Turkmenistan. Britain is number 38 in the index, the U.S. 41, Russia 148, and China 176.

An award ceremony for the UNESCO press freedom prize was held

on May 3. It took place in Helsinki, the capital of Finland. As Ms. Ismayilova could not attend, the prize was presented to her mother. ■

LEOPARD REPORT

Zoology is the study of animals. The Zoological Society of London (ZSL) was set up in 1826. The organization is a [charity](#). It works to protect animals and their habitats, or the places where they live. Nowadays, ZSL researchers work on animal and habitat surveys in many parts of the world.

The ZSL has recently published a report on leopards. It highlights the animal’s range. This is the size of the area in which an animal lives. Leopards are known to have one of the biggest ranges in the animal kingdom. This is because leopards are very adaptable. They can survive in rainforests, open grassland, woodlands, mountains, and even desert areas. However, the ZSL report says that the leopard’s range has shrunk by 75% over the last 250 years.

Leopards used to be found in northern and southern parts of Africa, Turkey and the Middle East, Pakistan, India, China, and South East Asia. Working out how many leopards there are in the world is difficult. The ZSL estimates that there are now around 100,000 leopards in Africa. Nearly all are in the southern part of the continent. In other parts of the world, no more than 10,000 leopards remain.

Leopards are one of a group of animals known as “big cats”. Scientists disagree on the [definition](#) of a big cat. Some say that only those that make a roaring sound are big cats. By this definition there are four. In order of size these are:

tigers, lions, jaguars, and leopards. By other definitions, big cats also include: snow leopards, pumas, clouded leopards, and cheetahs.

Adult leopards are solitary animals. They live on their own and only meet with others to mate. Females give birth to two or three cubs. They stay with their mother until they are about two years old. Each leopard has its own territory or area. Sometimes these territories overlap. If they do, the animals usually try to avoid each other.

Leopards are well known for their golden fur and black spots. Some are much darker, so their spots are harder to see. Leopards are between three and six feet long (0.9 to 1.8 meters). They can jump, or leap, long distances. The animals are very good swimmers and tree climbers. What's more, leopards have a running speed of around 36 miles (58 kilometers) per hour. The animals have long tails. These help them to keep their balance. Leopards are nocturnal, or more active at night. They hunt and kill many types of animals. Sometimes they pull or drag an animal they have killed up into a tree.



Leopard in Africa (Steve Garvie)

In some countries there are people who believe that parts of leopards can cure certain illnesses. The animals' whiskers and bones are used to make traditional medicines. Leopards are hunted for their skins as well as these body parts. This is one

reason why there are not many leopards left in China and South East Asia. However, the ZSL says that the biggest problem is loss of habitat. This is caused by human activity. Clearing land for farming or constructing roads and buildings are examples. In recent years, there has been a lot of this type of development in China and other parts of Asia.

The ZSL believes that leopard numbers can increase. This is because the animals can live in many different places. Also, like other types of cats, leopards are good breeders. The ZSL says that countries within the leopard's range should protect habitats and make sure that they are not hunted. ■

NEW PHILIPPINE PRESIDENT

A presidential election was held in the Philippines on May 9. On the same day the people elected members of the country's Congress, or parliament, as well as thousands of local government officials. Rodrigo Duterte won the presidential election. He is a [controversial](#) figure. Mr. Duterte beat the other four candidates easily.

The Philippines is an archipelago, or group, of around 7,000 islands. It has two main, or larger, islands: Luzon in the north and Mindanao in the south. There are many small islands in between. The Philippines was a colony of Spain for over 300 years. The country was named after a Spanish king, Philip the Second (1556 – 1598).

In 1898 a conflict broke out between the U.S. and Spain. Known as the Spanish-American War, it lasted for just over three months. As part of the peace treaty, Spain agreed that the U.S. would take control of

the Philippines. However, a group of revolutionaries in the country declared that the Philippines was an independent nation. Fighting began. This conflict became known as the Filipino-American War. It ended in 1902 when the revolutionaries were defeated. During the Second World War (1939 – 1945), Japanese soldiers captured and occupied the Philippines.



The new president of the Philippines, Rodrigo Duterte

After Japan's defeat, the government of the U.S. agreed that the Philippines should be an independent country. This happened in 1946. People in the Philippines elected their own leaders. Between 1965 and 1986 Ferdinand Marcos (1917 – 1989) ruled the country. For most of the time, he did so as a dictator. Marcos was forced to leave the country after large street demonstrations. Since then elected presidents have led the country.

In the Philippines presidential elections happen every six years. They take place on the second Monday in May. The Philippines' vice-president is also elected. This election takes place on the same day. Because both are elected, the president and vice-president can be members of different political parties.

The president is only allowed to serve one six-year term. Many

other countries have a “run-off” rule. If none of the presidential candidates gets more than 50% of the votes, a run-off or second election is held. This is between the two candidates who got the highest number of votes. This does not happen in the Philippines. The person who gets the most votes wins. Six years ago, Benigno “Noynoy” Aquino won with 42% of the votes.

The Philippines is home to 102 million people. Most follow the Roman Catholic faith. Filipino (also known as Tagalog) and English are the country’s official languages. Many Filipinos are poor. Nearly half the people live on less than \$2 a day. Yet in recent years, the country has been one of the world’s best-performing economies.



Malacañang Palace in Manila, the home of the president of the Philippines

Mr. Duterte has been the elected mayor of Davao City for 22 years. This city is the largest on Mindanao. Mr. Duterte is a popular mayor. He is very strict on criminals, especially drug gangs, and dishonest, or corrupt, government officials. In Davao, Mr. Duterte is believed to have supported [vigilante](#) gangs. These people have shot and killed more than 1,000 suspected criminals. Nowadays, there is little crime in the city. Mr. Duterte has also reduced traffic accidents, banned smoking in public and stopped late night drinking.

Mr. Duterte is 71 years old. He frequently uses bad language. Some things he said before the election shocked many people. Of those who took part in the election, around 40% voted for him. Many Filipinos dislike the way in which their country is run. They complain that members of wealthy families hold all the powerful positions in government and business. Many hope that Mr. Duterte will make many changes. They also want him to be strict on law and order.

Mr. Duterte will officially take over and move into the Malacañang Palace on June 30. This building is in Manila, the Philippine’s capital city. It is the home and offices of the country’s president. ■

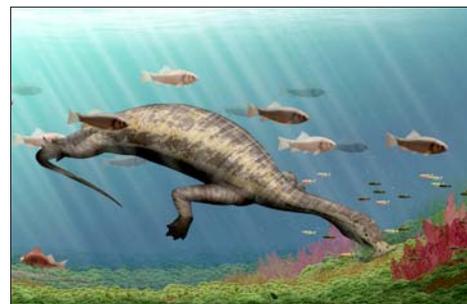
“STRANGELY TOOTHED” CREATURE

In the Earth’s long history there have been several mass extinctions. These are often called extinction events. The biggest extinction event happened before the age of the dinosaurs. Known as the Permian-Triassic mass extinction, it happened 252 million years ago. This event marked the end of the Permian and the beginning of the Triassic geological periods.

Then, the world was very different to what it is today. All the continents were joined together in one huge landmass. Scientists call this land area Pangaea. Panthalassa was the “super ocean” that surrounded it. The mass extinction at the end of the Permian is also called the Great Dying. Around 96% of all life in the sea and about 70% of life on the land died out. It is not known why.

Two years ago scientists uncovered an ancient fossil in Yunnan

province, in Southwest China. The fossil was of an unknown marine creature, or reptile. It lived about 246 million years ago. The discovery was exciting. This was because this reptile must have evolved in the seas soon after the Great Dying. The marine creature was about ten feet (three meters) long, or the same size as a modern-day crocodile.



An artist's impression of what *Atopodentatus unicus* looked like (Y. Chen IVPP)

The creature’s head puzzled scientists. The fossilized skull was badly damaged. It was therefore difficult to work out the shape of its snout, or nose. Scientists thought that the mouth must have been vertical. When shut, the reptile’s mouth and teeth would have looked like a closed zip.

The scientists suspected that the marine creature used its mouth like a flamingo. Flamingos are long-legged wading birds. They feed in shallow lakes and rivers. First, they put their heads under water. Then the birds scrape the bottom with the top part of their beaks. This means that they use their beaks upside down. Flamingos feed on small shrimps and algae. Their beaks filter out any mud, or silt, that is picked up with them.

Because of its strange mouth and teeth the ancient creature was given the name *Atopodentatus unicus*. These words are a combination of Ancient Greek and Latin. They mean “[unique](#) strangely toothed”.

Recently, researchers from China and several British universities have been working in Yunnan province. They found two more fossils of the same creature. The heads of these fossils are much better preserved. They confirm that the previous idea of a vertical mouth with zipper-like teeth was wrong.



Model head of *Atopodentatus unicus* with a fossilized head (University of Scotland)

The new fossils show that the reptile had a T- or hammer-shaped head and snout. Along the top and bottom jaws were a row of peg-like teeth. The researchers say that the creature's mouth looked like the end of a vacuum cleaner. They think that it used its teeth to scrape algae off the rocks on the seabed. The algae then floated around like a green cloud in the water. The reptile sucked in the "cloud" and closed its mouth. Then, the water was pushed out, or expelled, through closed teeth. This filtered out the algae.

The researchers say that this ancient reptile was a strange animal. Animals that feed on plants are called herbivores. Of all marine animals that have ever lived on the Earth only a few are herbivores. So far, *Atopodentatus unicus* is the most ancient. ■

RUNESTONE TRANSLATION

The Rök Runestone is in Sweden. It can be seen outside the church in a village called Rök, in the southern part of the country. Of all the runestones found in northern Europe, the one at Rök is the most famous. This is because of its size and the length of its carved inscriptions.

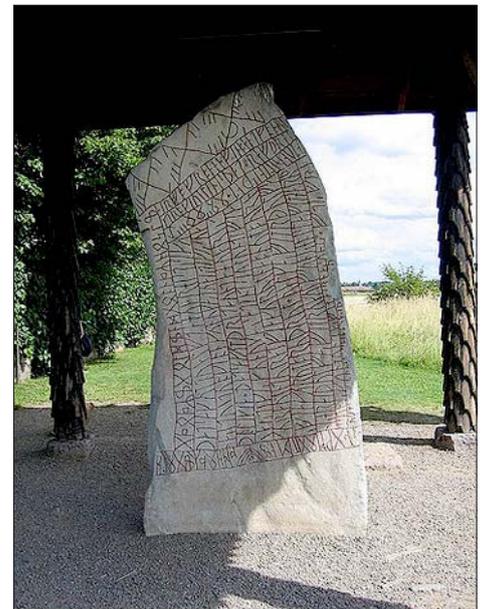
Sweden is one of three countries that together are called Scandinavia. The others are Norway and Denmark. Scandinavia was the home of the Vikings. These people were warriors, explorers and expert sailors, or seafarers. In northern Europe the period between 800 and 1066 is often called the Viking Age. During this time, Vikings sailed their long wooden boats to many places in Europe. They also reached Iceland, Greenland and the east coast of North America.

The Vikings are well known for their sagas. These are stories or legends. The sagas describe sea voyages and battles from long ago. It's thought that the inscriptions on the Rök Runestone were carved in the late 800s. For over 100 years, people have thought that the inscriptions described former kings, ancient gods, wars, and acts of bravery. Recently, a professor from a university in Sweden has produced a new translation. His [interpretation](#) of the inscriptions is very different.

The inscriptions on the stone are runes. Runes are an alphabetical script. People who lived in northern Europe first used them about 2,000 years ago. The oldest known runes were carved on a stone around 150 CE. The runic script was used until the late 1400s. By this time, most people in Europe used the Roman alphabet. The leaders of the Christian Church disliked runes. They claimed

that Devil worshipers used this alphabet. As Christianity spread, using runic script was discouraged. However, the meaning of runes was preserved in old texts, or manuscripts.

The word "rune" means "secret wisdom" or "mystery". Nowadays, some people believe that they represent magic spells. Runic script is found on many old items in Scandinavia. These include: stones, swords and jewelry, or pendants. Some list the whole runic alphabet. However, many ancient runic inscriptions are difficult to read. This is because they were written in a type of code. The runes carved on the Rök Runestone are an example.



Rök Runestone in Sweden

The Rök Runestone is about ten feet (three meters) high. There are carvings on each of its five sides. There are no inscriptions at the bottom. It was therefore made to stand upright, with the base buried in the ground. A person needs to tilt their head to the left to read the runes.

The church in the village is about 900 years old. The stone was used to build one of the church's walls. It was discovered about 160 years ago when workmen repaired the walls.

A few years later, the stone was set up outside the church.

The professor used a different way of deciphering, or working out, the code. He says that the inscription is written in riddles, or puzzles. The runes, the professor claims, describe the stone, how it was carved, the runic alphabet, and how it should be read. This is nothing like the legend-like translation. Some people believe that the professor is correct. This is because other runestones are known to display similar information. ■

CHARLEMAGNE PRIZE

On May 6, a special ceremony took place in the Vatican. This is the headquarters of the Roman Catholic Church. Even though it is in Rome, Italy's capital, the Vatican is a separate city-state. During the ceremony, Pope Francis was awarded the Charlemagne Prize.

Pope Francis is from Argentina. He was selected to be the pope, or leader of the Roman Catholic Church, three years ago. During this time he has visited many countries. Pope Francis has now become one of the world's most admired leaders.

The Charlemagne Prize is awarded every year. It is one of the most [prestigious](#) awards in Europe. The prize was set up by the city of Aachen in 1950. It is awarded to people who work for European unification, or the peoples of Europe working together.

The Romans founded Aachen nearly 2,000 years ago. They were attracted by the hot springs in this part of northern Europe. Today, Aachen is Germany's most western city. It is close to the place where the borders of the Netherlands, Belgium

and Germany meet. Aachen is best known as the place where Charlemagne lived. It is also the city where German kings used to be crowned.

Charlemagne was born in 742. He was the King of the Franks. Charlemagne means "Charles the First". The Franks were Germanic tribes during Roman times. Later, they moved into parts of France. The name France comes from these tribes. Roman rule in this part of Europe ended in 410. Clovis was the first King of the Franks. He managed to unite all the Frankish tribes in 509.

Charlemagne increased the size of the Frankish Empire. Then, it included most of Central Europe as well as France and northern parts of Spain and Italy. The Central European part of the empire did not break up until the early 1800s. Charlemagne was a strong and popular ruler. He set up schools and monasteries throughout the empire. Charlemagne also introduced new laws about money lending and accounting.



Pope Francis

In 800 Charlemagne visited the city of Rome. There, the pope crowned him Emperor of the Romans. Later, the lands he ruled became known as the Holy Roman Empire. Charlemagne died in Aachen in 814. He was buried in the city's cathedral. Charlemagne was the founder of both the French

and German royal families. For this reason he is often called the "Father of Europe".

The winner of the Charlemagne Prize receives a large medal. Its design is based on Aachen's ancient seal, or emblem. This displays the seated figure of Charlemagne.



Charlemagne Prize medal

Many winners of the Charlemagne Prize have been politicians. Angela Merkel, Germany's chancellor, or leader, was awarded the prize in 2008. Unusually, in 2002, the award was given to the euro currency and not a person. This was the year in which many countries first used euro coins and banknotes.

Several European Union (EU) leaders attended the award ceremony at the Vatican. They included: Donald Tusk, the president of the European Council (a former Polish prime minister), Jean Claude Juncker, president of the European Commission (a previous leader of Luxembourg) and Martin Schulz, the president of the European Parliament. Mr. Schulz was the [recipient](#) of the Charlemagne Prize last year. ■

WILDFIRE IN CANADA

Fort McMurray is in the province of Alberta, in Canada. Forests surround the town. It is close to the place where two rivers meet. Around 100,000 people live in and around

Fort McMurray. On May 3, local officials told everyone to leave their homes. A huge wildfire was about to engulf the town.



Fort McMurray evacuation

Residents put a few of their **possessions** into their cars and left. Long lines of traffic built up on the main road out of the town. Many people in Fort McMurray work at the nearby oil sands. Here, there are large amounts of oil close to the surface. The companies that extract this oil have large buildings, or camps. The oil workers use these. Some people drove north to stay at these camps. Others went south towards the city of Edmonton. As they drove away, walls of flames burned close to the roads.

The fire started three days before the evacuation. No one knows what caused it. Wildfires are usually started by human activity or lightning. These fires are not unusual in Alberta. Each year there are at least 1,000. Most are put out quickly by firefighters, rain or changes in the way in which the wind is blowing. Trees are cleared around towns and on either side of bigger roads. This is done to create firebreaks. These act like barriers that can stop or slow wildfires.

The weather in this part of Canada has been unusually dry. There has been little rain for two months. Temperatures have been far higher than normal. What's more, not much snow fell during the winter. Often, in Alberta, at this time of

year, heavy winter snows would still be melting. When the fire started the forests were very dry. Strong warm winds fanned the flames.

Firefighters, police and soldiers were sent from other parts of Canada to the area around Fort McMurray. There, they worked to protect the town's buildings. Planes and helicopters dropped water onto the flames. The fire continued to burn out of control for five days. Burning **embers** rose high into the air. The wind blew them to other places where new fires began. The wildfire eventually became so big and hot that it created its own weather. Lightning was seen in the dark skies above. Near the ground, air was drawn, or sucked, towards the flames. When this happens it's known as a firestorm.



Smoke from the Fort McMurray wildfire in Canada, photographed from the ISS

Huge plumes of smoke rose high into the air. It spread to other parts of Canada and northern areas of the U.S. In these places people could not smell the smoke. This was because it was too high in the air. The smoke turned the sunlight hazy. Because of the smoke particles in the air, sunsets and sunrises looked much redder than usual. The spreading cloud of smoke could be clearly seen from the International Space Station (ISS), high above the Earth.

Senior firefighters said that they could not control the flames. They declared that only heavy rain and a

change in the weather would stop the fire. Some predicted that the blaze would double or even triple in size. If this happened the flames would reach the forests in the province of Saskatchewan. There, it might burn for several months. Then, on May 8, or eight days after the fire started, the weather changed. Winds weakened, temperatures dropped and it started to rain.

On the same day, officials returned to Fort McMurray. They discovered that the fire had not affected large parts of the town. About 20% of the buildings had been destroyed. Yet the town's school and hospital were undamaged. Plans have now been made for residents to return to their homes. The cost of the fire in damage and lost oil production is expected to be around C\$4 billion (\$3.1 billion). ■

NEW NATIONAL MAMMAL

Many countries have national animals, birds or flowers. Often these are symbols for a country. They can appear on emblems, badges or even flags. There are no rules about choosing these symbols. It's possible that the animals or flowers are found only in the country or surrounding region.

The kiwi is a symbol of New Zealand. This small flightless bird is not found anywhere else in the world. Australia has a kangaroo and emu (another bird that cannot fly). One of France's national symbols is a cockerel, or rooster. In Britain it is a bulldog or lion. South Africa's national animal is a springbok and Germany has an eagle. Some countries have mythical figures. Indonesia and Bhutan are examples. Bhutan's is a druk,

or dragon. The bird-like garuda is a symbol of Indonesia.

The U.S.'s national bird is the bald eagle. This bird of prey is found only in North America. This eagle is not bald. Most of its feathers are brown. Yet the eagle's head feathers are white. The bird's name comes from an older word that meant "white-headed". The bald eagle has been a symbol of the U.S. for over two hundred years. Other American symbols are the oak (national tree) and the rose (national flower).



Bald eagle (NASA)

Recently, a campaign was started to make the bison the U.S.'s national mammal. Members of Congress agreed. Then, on May 9, Barack Obama, the American president, signed the ruling into law.

In the U.S., the bison is also known as the buffalo. However, many people insist that this name is incorrect. Buffaloes are animals that live in Africa and India. Early settlers in America called bison buffaloes. This was because the animals looked similar. There are several bison species in North America. The largest one is called the wood bison. It mostly lives in Canada. The other species are the American bison and the plains bison. They have short curved horns and large heads. Bison mainly eat grasses.

There is a huge area of flat land between the Mississippi River and the Rocky Mountains. This part of America is known as the Great

Plains. Since the 1950s, large parts of the Great Plains have been used for growing food crops. Prior to this they were an enormous area of grassland. Before Europeans arrived in North America, millions of bison lived in large herds on the Great Plains. Native Americans killed some of them for food and their skins.

By 1800 large numbers of European settlers began to move westwards. They came into contact with the Native American tribes. This led to a number of so-called Indian wars. Many Native Americans died from diseases, such as smallpox, that European settlers brought with them. Native Americans had no immunity to these infections.

Soldiers were ordered to shoot the bison. This was done to force the Native Americans to move elsewhere. Settlers brought their own cattle. These animals carried diseases that killed the bison. Before Europeans arrived, there were at least 30 million bison in North America. By the 1880s, only 600 remained. The animals were close to dying out. A few people worked to save them. Some were kept in zoos and others on ranches.



American bison (Agricultural Research Service)

Today, there are about 30,000 bison in the country. Most are kept in conservation herds. In the wild, bison need large open areas. The biggest wild herd is in the Yellowstone National Park. Around 4,000 live

in the park. Some have to be culled, or deliberately killed, to control the population.

Now, 130 years after its near extinction, the American bison is a national mammal and symbol of the U.S. ■

PLANT ASSESSMENT

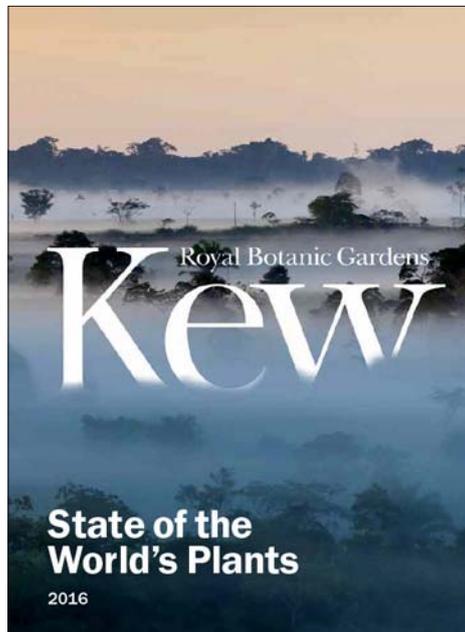
Kew is a well-known plant research and education organization. Its official name is Royal Botanic Gardens, Kew. The organization recently published an important report. It's called "The State of the World's Plants". Kew calls it an [assessment](#) of all the world's plants. This has never been done before. Over 80 botanists, or researchers who study plants, worked on the report. It took 12 months to complete.

Kew gets its name from Kew Gardens. Kew is a [suburb](#) of London, the capital of Britain. Kew Gardens was set up in 1840. Today, it has a collection of 30,000 living plants. This is one of the largest plant collections in the world. In addition, seven million specimens are kept at Kew Gardens. These are plants that have been preserved. The library contains 750,000 books about plants and nearly 200,000 drawings and prints. Kew Gardens is also a tourist attraction. Each year over one million people visit the gardens.

The researchers who worked on the report searched through existing records and databases. They discovered that some plants were recorded more than once. This meant that these plants had been given two separate names. These errors were corrected. Overall the report says that there are 390,900 known plants in the world. These include trees,

but not smaller plants such as algae and mosses. Of these known plants, 369,400 produce flowers.

However, the number of known plants changes all the time. Hundreds of new ones are found each year. Botanists working at Kew usually record between 200 and 300 new plant species every 12 months. In total, about 2,000 new plants were discovered in 2015. Examples of new plants that have recently been recorded include five species of onion, a large tree and a big spreading plant that eats insects. The tree only grows in Gabon, in West Africa. The insect-eating plant has only been found on one mountain in Brazil and nowhere else.



The Kew report includes information about plant use. It highlights how humans rely on plants. If there were no plants in the world, humans would not exist. Plants help to control the climate and produce food and medicines. Food and drinks can be made from 5,000 plants. Over 15,000 are used to make medicines and health care products. Plants, especially trees, provide fuel and building materials. Poisons can be

made from 2,500 plants. At least 1,000 have other “social” uses. These include tobacco and plants from which illegal drugs are made.

Nearly 5,000 plants are now classed as invasive species. These plants have been taken to places where they do not normally grow. Here, they can cause problems. One example is Japanese knotweed. This bamboo-like plant can grow up to 13 feet (four meters) in height. It spreads quickly. Japanese knotweed is difficult to kill and almost impossible to get rid of. It is now a problem in New Zealand, the U.S., Britain, and Canada. In Japan, a small winged insect feeds on the plant. This insect does not eat anything else. It therefore controls the knotweed. In other countries there is nothing that stops the plant spreading.

The report says that one in five plants is in danger of becoming extinct. Pests, diseases and a changing climate are all problems. However, the biggest threat is from agriculture and cutting down forests. The most damaging types of farming are new palm oil [plantations](#) and clearing land for cattle. Nowadays, many foods, cosmetics, shampoos, and cleaning products contain palm oil. In places like Indonesia, companies make a lot of money from palm oil. Large areas of forest are cleared to increase palm oil production.

Now that the first global assessment of plants has been written, Kew plans to update it every year. ■

HYPERLOOP TEST

On May 11, an American company, called Hyperloop One, organized a test. A Hyperloop is a new type of transportation system. The com-

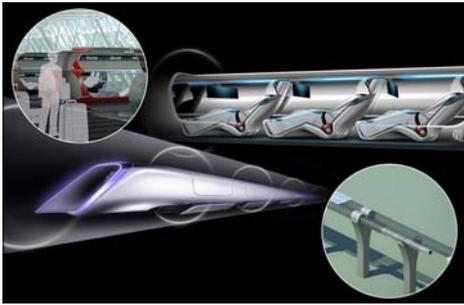
pany has built a special test track in the desert, in the state of Nevada, in the U.S. This is where the test took place. A number of news reporters and people who write about new technologies were invited to watch it.

The Hyperloop was Elon Musk’s idea. He is a wealthy American businessman. Mr. Musk was one of the founders of the PayPal Company. He made a lot of money when this company was sold to eBay in 2002. Since then, Mr. Musk has set up or become involved with several other companies. One, called SpaceX, designs and builds space rockets. It has a contract with NASA to take supplies to the International Space Station (ISS). Mr. Musk’s other companies make electric cars and generate energy from the Sun.

Three years ago Mr. Musk suggested that a high-speed new transport system could be built between Los Angeles and San Francisco. He called it a Hyperloop. These cities are about 380 miles (610 kilometers) apart. Both are in the state of California. Mr. Musk outlined his idea for enclosed pods, or capsules, traveling through long tubes at very fast speeds. People, and even cars, could travel inside the capsules. The tubes would be high above the ground on columns, or pillars. Earthquakes are not uncommon in California. The pillars would have to be earthquake proof. The Hyperloop could follow the motorway that currently connects the two cities.

Mr. Musk’s proposal included special motors positioned along the tubes at regular intervals. These would power the capsules. Some of the air could be removed from the tubes. This would make the capsules go even faster. There would also be a small amount of air between the

sides of the capsules and the inner walls of the tube. The motors could be powered by solar energy.



Artist impressions of the Hyperloop

Capsules would depart every 30 seconds. They would travel at a speed of around 760 miles (1,220 kilometers) per hour. Traveling time, from one city to the other, would be 30 minutes. The businessman explained that sitting in one of the capsules would be like flying in a passenger aircraft. He estimated that the price of a one-way ticket would be about \$20.

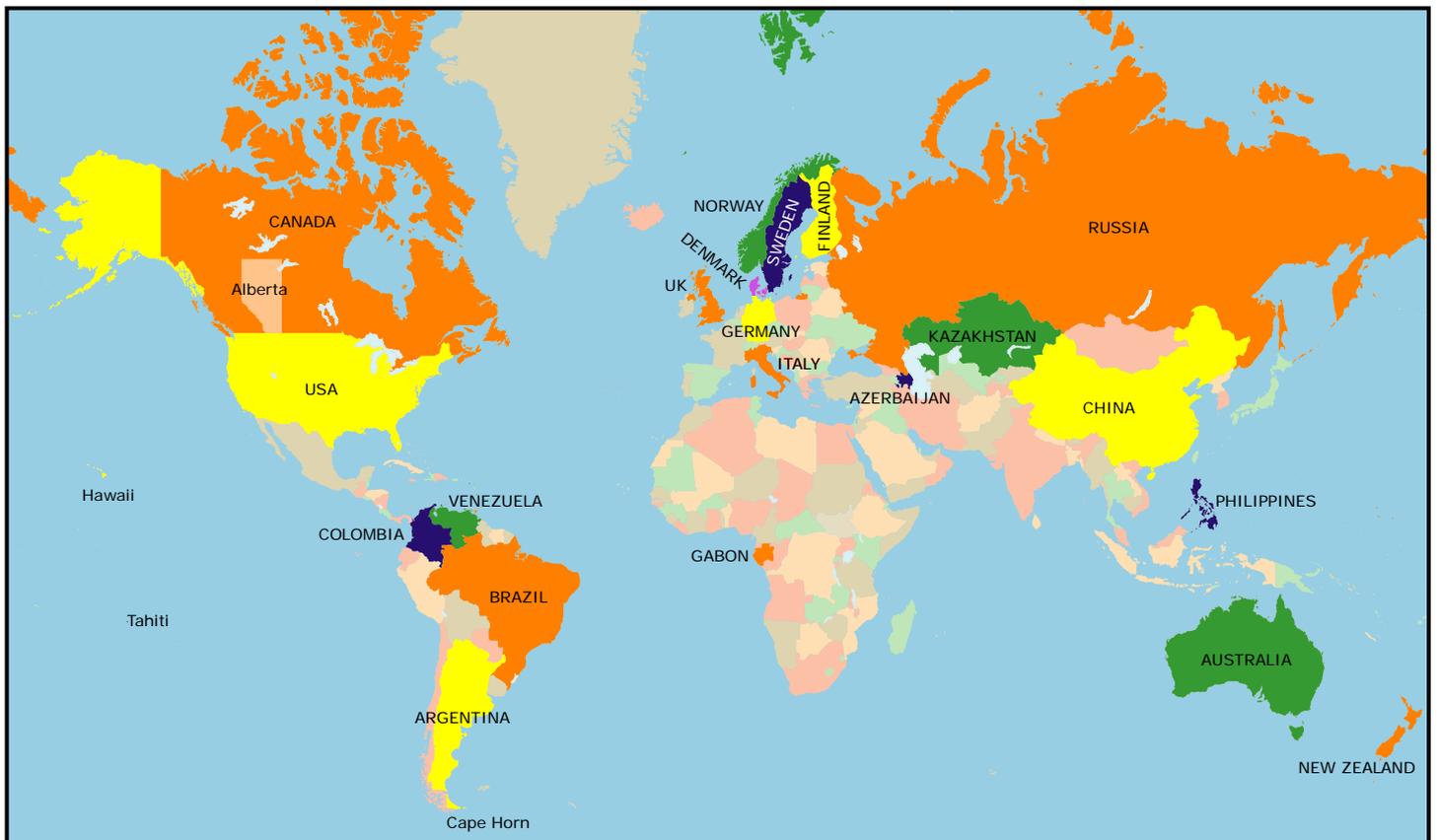
Mr. Musk declared that he was too busy to manage the project. He therefore challenged other companies to take up and improve on his ideas. The Hyperloop would be expensive to build. So a consortium, or group of larger companies, would be needed to provide money for the project.

Several people were interested in Mr. Musk's Hyperloop idea. Two companies were set up to work on the project. They are called Hyperloop One and Hyperloop Transportation Technologies (HTT). These companies are working separately. Both have managed to get other companies to invest in the project. For example, SNCF has invested \$80 million in Hyperloop One. SNCF is the company that operates all the trains in France. A railway engineering company from Germany is another investor.

The Nevada desert test was the first time that either of the Hyperloop companies has demonstrated its technology. During the test a small sled-like object was propelled along the test track. In one second it reached a speed of 116 miles (187 kilometers) per hour. Some people were impressed with the test. Yet others said it showed how much more work is needed before the Hyperloop becomes a reality. ■

ERADICATING CARP

Government officials in Australia have made a plan to eradicate a type of fish. They want to kill all the carp in what's called the Murray-Darling basin. These fish are not native to Australia. They come from rivers in Europe and Asia. The officials' plan is to release a virus into the water.



This map shows countries to which news stories refer in this issue. Visit www.newsademic.com for more detailed world maps.

It's known that this virus kills carp but not other kinds of fish.

There are several carp species. Most live in fresh water. The European carp can be up to 31.5 inches (80 centimeters) long. These fish will eat water plants. Yet they prefer to feed on insects and small creatures that live in mud on the riverbed.



Carp have been taken to many other countries. Unfortunately, in places like Australia, the fish have become an invasive species. Animals living in places where they are not normally found are known as alien species. If they have no, or few, predators their numbers keep increasing. If this happens, they become an invasive species.

Europeans first took carp to Australia in the 1850s. The fish were thought to be a useful type of food. These carp did not cause too many problems. However, in the 1960s another type of carp was released into a river accidentally. These were "fish-farming" carp. They grow and breed faster than normal carp. Floodwater in the 1970s washed these carp into other rivers and streams. By carrying carp eggs, birds have helped to spread the fish to other places.

The Murray-Darling basin is in Southeast Australia. The Murray and Darling Rivers drain this large area. The Murray is Austral-

ia's longest river. Both rivers have many **tributaries**. This part of the country contains Australia's best farming lands. It is also an important area for wildlife. The carp in many of the basin's waterways eat most of the available food. Native fish cannot compete. When searching for food, the carp erode, or wear away, the riverbeds. This makes the water very muddy. Most native fish species need clear water to survive.

Fishermen can catch as many carp as they like. They are not allowed to catch any other types of fish. Officials now believe that carp make up at least 80% of the biomass in the Murray and Darling. This is the total volume or weight of all living things in these two rivers.

Australia has problems with other invasive species. Foxes; feral, or wild, cats; and rabbits are examples. Foxes and cats kill large numbers of small native Australian animals every year. Rabbits eat the vegetation and crops. In the 1950s a virus that causes myxomatosis was deliberately released. This disease affects rabbits. It killed millions of them. Numbers fell from 600 million to about 100 million. Some people describe carp in Australia as "rabbits of the waterways".



Carp in a river in Australia

A type, or strain, of the herpes virus has been used to kill carp in other parts of the world. In Japan

the virus was put in several lakes. Within a few weeks, it killed 70% of the carp. The virus does not harm other species. If humans eat carp that have this virus, it does not cause any health problems.

Soon after the virus is put in the river, there will be millions of tons of dead fish. These will need to be collected. The dead fish could be buried, turned into a fertilizer or used as pet food. The officials want to spend the next two years discussing this with local people. After finalizing what will happen to all the dead carp, the virus will be released.

Armageddon is mentioned in the Bible. It is supposed to be the place where the final battle between good and evil is fought. Nowadays, some people use this word to describe the end of the world. In Australia, the plan to eradicate carp in the Murray-Darling basin has been nicknamed "Carpageddon". ■

MARIANA TRENCH INVESTIGATION

The National Oceanic and Atmospheric Administration (NOAA) is an American scientific organization. It studies the oceans, coastal areas and the atmosphere. The NOAA is carrying out a three-month investigation of the Mariana Trench. This is the deepest-known part of the world's oceans.

The Mariana Trench is in the western Pacific Ocean. It is close to the island of Guam. The deepest part is called Challenger Deep. Here, the seabed is 6.8 miles (11 kilometers) below the surface. This depth is about the same distance below sea level as the height at which passenger aircraft fly above the ground. Mount Everest is the

world's highest mountain. If this mountain were put at the bottom of Challenger Deep, its top, or summit, would be one mile (1.6 kilometer) under water.

The NOAA investigation began on April 20. It will continue until July 10. One of the NOAA's ships is being used. It is fitted with many types of scientific equipment.



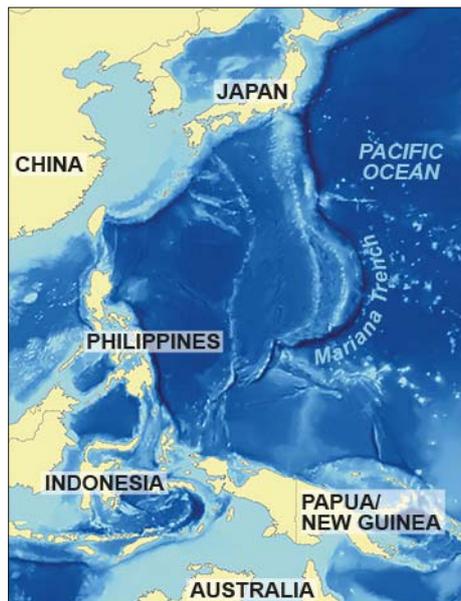
New jellyfish filmed near Mariana Trench (NOAA)

Surprisingly, the first people to reach the bottom of Mariana Trench did so in 1960. Then, two men used a specially designed craft. The men stayed at the bottom for about 20 minutes. Yet their submersible created a cloud of silt, or mud. The men were unable to see anything. In 2012 a movie director called James Cameron spent seven hours exploring the trench around Challenger Deep. At these depths no living things were seen. His submersible was designed to withstand the extreme pressures. At the bottom of the trench, the pressure is many times greater than it is at the surface.

The NOAA is using several ROVs (remotely-operated vehicles). These are fitted with cameras. They also have robotic arms, so samples can be collected and taken to the surface. The ROVs are exploring parts of the trench that have not been visited before. They are staying at depths where living things are able to exist. The ROVs have discovered underwater mud volcanoes and hydrothermal vents.

Hydrothermal vents occur where there are deep cracks in the seabed. Cold seawater sinks into these cracks. Deep below the seabed is a layer of hot semi-liquid rock called magma. This heats the seawater in the deep cracks. The hot water expands and is forced back up towards the seabed through hydrothermal vents. As it is heated, the seawater absorbs chemicals and minerals from surrounding rocks. The super-hot water can have a temperature of 660°F (350°C). It bursts out from the top of the vent in a black chemical-rich cloud.

Some of the dissolved minerals in the water harden and attach themselves to the rock. Over a long period of time this forms chimney-like structures. These vents have been nicknamed “black smokers”. This is because the dark clouds of hot water that rush out of them look like plumes of smoke.



When black smokers were first discovered, scientists were surprised by the life forms around them. Here, whole [ecosystems](#) have evolved in places where survival ought to be difficult. Bacteria have evolved that

feed off the chemicals coming from the vents. These chemicals, the scientists say, would be poisonous for most living things. Small sea creatures feed on these bacteria. Larger deep-sea organisms then eat these creatures. Some scientists think that life on Earth probably first began around black smokers.

The NOAA's ROVs have filmed many marine creatures that have never been seen before. These include: purple sea cucumbers, sponges, hairy snails, blind white shrimps, odd shaped lobsters and worms, and a jellyfish. At these depths there is no light and the water is very cold. During the investigation one of the ROV's live video feeds can be seen via the internet. ■

LONDON'S NEW MAYOR

There were regional and local elections in Britain on May 9. One of the most important was for mayor of London. Sadiq Khan won this election. Mr. Khan is a Muslim. He is the first Muslim to be elected as mayor of a European capital city.

London is one of the most famous cities in the world. The Romans founded it nearly 2,000 years ago. In Roman Britain, the city was called Londinium. The Romans chose a site by the Thames River where a bridge could be built. They built a wall around their city. Parts of this wall can still be seen.

In later years, London became two cities joined together. One is the City of London and the other the City of Westminster. The city of London is the area that was enclosed by the Roman walls. It became the business and financial center for the whole country. This part of London is also called “the City” and the

Square Mile. The area within the old city walls is almost exactly one square mile (2.6 square kilometers).

The City of Westminster is to the west of the Square Mile. It grew up around a church building called Westminster Abbey. The first church made of stone on the site was completed about 925 years ago. The country's parliament building (known as the Palace of Westminster), most of the government offices and Buckingham Palace are in the City of Westminster or close by. Buckingham Palace is the home of Britain's royal family.

London was the first city in the world to have an underground railway. Now it has one of the world's oldest and busiest underground networks. In many cities the underground railway is known as the subway or the metro. In London it is called "the tube". Most of the underground lines are over 100 years old.



London's new mayor, Sadiq Khan

London is divided into 32 boroughs. Borough is an ancient word that means a settlement or town. Two of London's boroughs are the Square Mile and the City of Westminster. Together London's 32 boroughs are known as Greater London. Today, Greater London is home to about 8.6 million people.

The City of London has had a mayor for over 900 years. This person is elected by the members of a few organizations that have existed in the Square Mile for hundreds of years. He or she serves for 12 months and is known as the Lord Mayor of London.



City Hall in London

Elections for a mayor of London were first held 16 years ago. The people who live in Greater London elect this person. The mayor works in a building called City Hall. This is a modern purpose-built structure. It is on the opposite side of the river from the old City of London. Elections for the mayor of London take place every four years. The mayor has many responsibilities. They include: transport, the police and housing.

Mr. Khan grew up in London. His mother and father moved to the city from Pakistan before he was born. Mr. Khan's father worked as a bus driver for 25 years. Mr. Khan went to university to study law. After working as a lawyer, he became a local councillor in one of London's boroughs. In 2005, Mr. Khan was elected as a Labour member of parliament.

In Britain the two largest political groups are the Conservative Party and the Labour Party. Currently, the Conservatives govern the country. Immediately after winning the election, Mr. Khan declared that he

had resigned from being a member of parliament. Mr. Khan took over from Boris Johnson. Mr. Johnson is a Conservative Party member. He was mayor for eight years.

The day after the election, Mr. Khan took part in a ceremony. During it, he was officially appointed as the new mayor. Mr. Khan arranged for the ceremony to be held in one of London's cathedrals. He made a short speech. The new mayor declared that he was proud of the city and that he would work for all Londoners. ■

SLEEP PATTERNS

There are different kinds of sleep. How they change from one to another is called a sleep pattern. Humans, birds and other mammals are known to have similar patterns of sleep. Surprisingly, scientists in Germany now suspect that lizards also share this sleep pattern.

Vertebrates are animals with backbones. There are five types: mammals, reptiles, amphibians, birds, and fish. Like crocodiles and snakes, lizards are reptiles. They are cold-blooded. This means that they cannot control their own body temperature. It can go up and down. Lizards are often seen lying, or basking, in the Sun. They do this to warm up, or increase their body temperature. Most reptiles lay eggs and have dry, scaly, waterproof skin.

Humans are mammals. Nearly all mammals are warm-blooded. Their bodies stay at a constant temperature. Most mammals don't lay eggs. They give birth to live young. The young feed on their mother's milk. Mammals are the only kind of animal that has hair. Millions of years

ago, all mammals walked on four legs. Now, some, such as humans, use two. Whales are mammals. Over many millions of years, their legs have gradually changed, or evolved, into flippers.

Sleep is important for many animals. It helps build and repair their bodies' systems. To work properly, bones, muscles, nerves and the immune system (which fights disease) all need sleep. There are two types, or patterns, of human sleep. One is called REM sleep and the other non-REM sleep. REM stands for Rapid Eye Movement.



Pogona or bearded dragon (Greg Hume)

During REM sleep, a person's eyes (under their closed eyelids) move randomly. Paralysis is another side effect of REM sleep. This is when the body is unable to move. REM sleep is when a person is most likely to have vivid dreams.

Non-REM sleep is different. Sleepwalking or sleep talking usually happen during non-REM sleep. Dreaming is less vivid. About 80% of human sleep is non-REM. All mammals go through phases of REM and non-REM sleep. Birds do this as well. However, in larger animals the phases tend to last longer. It takes a human about 90 minutes to go through a cycle of REM and non-REM sleep. A cat experiences something similar. Yet in a cat the cycle lasts for 22 minutes. A rat's cycle of

REM and non-REM sleep is only 12 minutes long.

The German scientists studied the sleep pattern of a lizard known as a pogona. These creatures are also called bearded dragons. Pogonas originally come from Australia. To check these lizards' sleep patterns, the scientists measured their brain activity. This was done while they slept. The scientists put a probe, or special device, inside the lizards' brains. This was the first time that this technology has been used to study this type of brain activity.

The scientists noticed that the lizards went through phases when their eyes moved in their sleep. This was similar to human REM sleep behavior. The scientists wondered if the lizards were dreaming! However, when compared to humans, the probe showed that a different part of the brain was active. The REM to non-REM cycle was much shorter than the human 90 minutes. It lasted about 80 seconds. Unlike human sleep, it was evenly divided between REM and non-REM.

The scientists were surprised to find that lizards had REM and non-REM sleep. This suggests that these sleep patterns developed much earlier than previously thought. Did dinosaurs have REM and non-REM cycles?

Mammals, birds and reptiles share a common ancestor. This creature lived around 320 million years ago. At that time, the main land animals were known as amniotes. They had four legs, backbones and laid eggs. This might be when REM and non-REM sleep first began.

Scientists now plan to measure sleep cycles in other animals. If reptiles have REM and non-REM sleep patterns, amphibians and fish may do so as well. ■

RUSSIA'S NEW COSMODROME

The first rocket launch at Russia's new spaceport took place on April 28. In Russia, spaceports are known as cosmodromes and astronauts are cosmonauts. Russia's space agency is called Roscosmos.



The first rocket launch at the new Vostochny Cosmodrome in eastern Russia

The spaceport has been named the Vostochny Cosmodrome. (Vostochny is the Russian word for "eastern".) Vladimir Putin, Russia's president, decided to build a new cosmodrome in 2007. Construction work began three years later. The site is in Siberia, or the far east of the country. Few people live in this part of Russia. The spaceport is about 3,730 miles (6,000 kilometers) from Moscow, the country's capital city. It is only 62 miles (100 kilometers) from Russia's border with China.

In 1957, Russia was the first country to use a powerful rocket to put a satellite into orbit. Called Sputnik, the satellite sent simple radio signals back to the Earth. In the same year, Russia sent the first animal into space. It was a dog called Laika. Four years later, the Russian cosmonaut, Yuri Gagarin (1934 – 1968), completed the first human spaceflight. It lasted for only 108 minutes. Gagarin's spacecraft orbited, or circled, the Earth once. However, the U.S. reached the Moon before Russia. In 1968, Neil Armstrong (1930 – 2012), an American astronaut, was the first person to walk on the Moon.

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Nowadays, the American space agency, NASA, and Roscosmos work closely together. Russian and American astronauts frequently travel to and from the International Space Station (ISS). In recent years, space capsules taking astronauts to the ISS have all been launched on top of Russian Soyuz rockets. These and Russia's earlier rocket launches have all taken place at the Baikonur cosmodrome. This spaceport is in Kazakhstan.

Like many other countries in Central Asia and Eastern Europe, Kazakhstan used to be part of the Russian-led Soviet Union. Then, Russia and the other Soviet Union nations were communist countries. The Soviet Union began to break up in 1991. Its member countries became independent nations. They included Kazakhstan. After it became a separate country, Kazakhstan made an agreement with Russia. Russia would pay an annual sum of \$117 million to use the Baikonur cosmodrome.

Russian Soyuz rockets are very **reliable**. Since the 1960s over 1,000 have been launched. For the next few years, only unmanned Soyuz rockets will be launched from the Vostochny Cosmodrome. Most will carry satellites into space. Rockets taking people to the ISS will continue to lift off from Kazakhstan.

Russia is planning to build a new type of rocket and a new spaceship.

The new rockets are called Angara. They will be used for manned spaceflights. All Angara rockets will lift off from the new spaceport. The launch pad for these rockets at the Vostochny Cosmodrome is yet to be completed. The first Angara rocket launch is not expected to be until 2023. Roscosmos hopes to send Russia's first manned spaceflight to the Moon in 2029.

The first rocket was supposed to lift off from the Vostochny Cosmodrome six months ago. Yet work at the spaceport was not completed on time. Mr. Putin traveled to the new cosmodrome to watch the first rocket launch. Unfortunately, there was a technical fault. The launch was halted 90 seconds before lift-off. Mr. Putin stayed to see the rocket's successful launch on the following day. ■

WORM LANDSCAPE

The Orinoco river is in South America. It begins in Colombia and flows through Venezuela before reaching the sea. Where the river crosses the border, there is a huge wetland area. When the rains are heavy it floods.



Aerial photograph of surales (José Iriarte)

In the 1940s people flew over this part of South America for the first time. Looking below, they saw hundreds of thousands of green mounds. During the floods they look like little islands. The mounds are piles of

earth and the green is vegetation that grows upon them. Local people call the mounds *surales*. The larger ones are six feet (1.8 meters) high and 16 feet (five meters) across.

No one knew what the mounds were, or how they formed. Many believed that they were made long ago. They thought that farmers created the mounds to grow crops in the flooded area. Recently, several researchers have been studying the *surales*. They believe that they have solved the mystery.



One of the surales (José Iriarte)

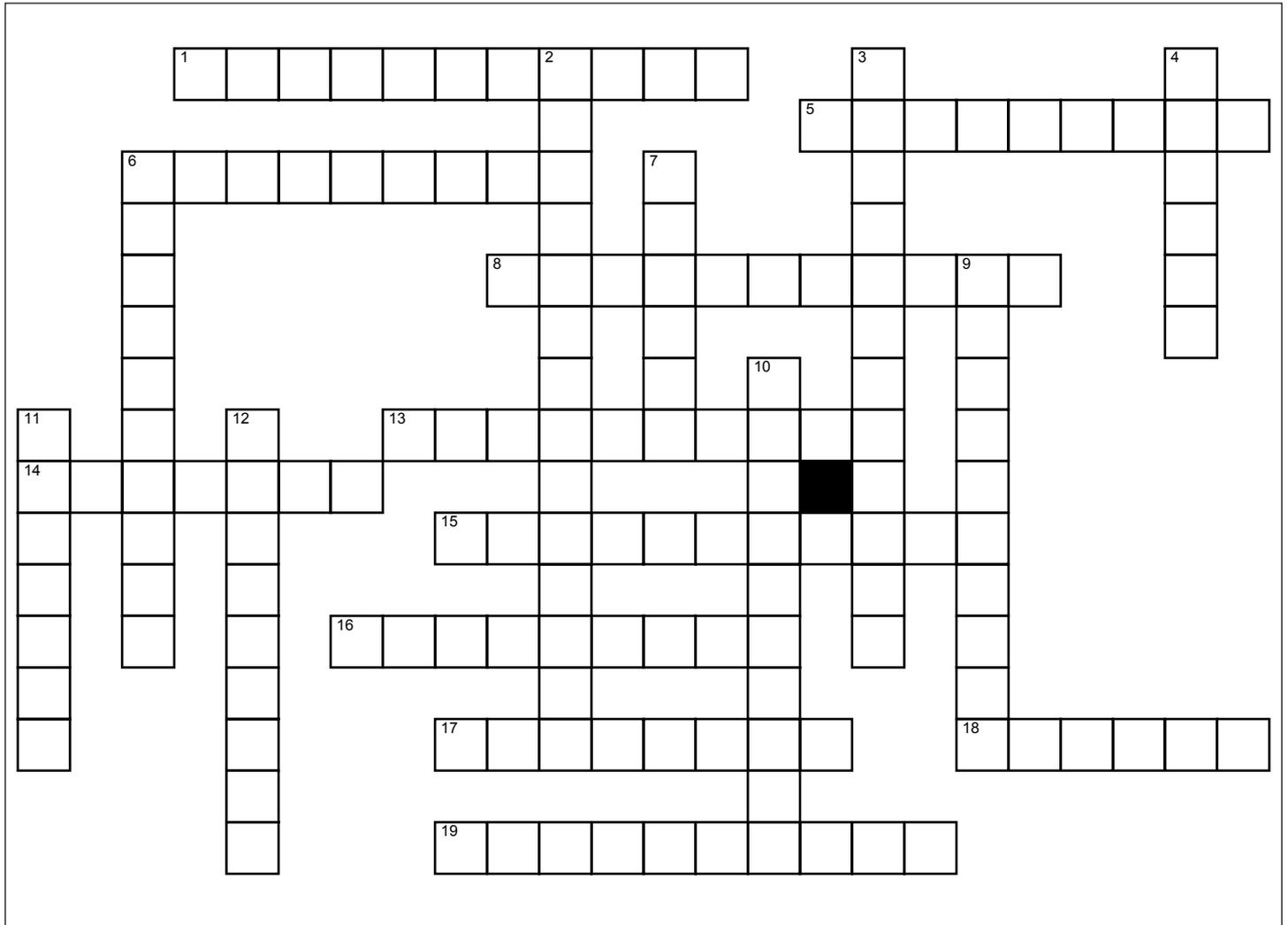
The researchers dug into some of the mounds. By doing this, they confirmed that farmers had not grown crops on this land for over 1,000 years. However, the researchers noticed that the mounds were mainly made up of worm casts. Earthworms ingest, or swallow, soil. It passes through their bodies. The worms digest small bits of rotting plants in the soil. The remaining soil is expelled as waste. The waste forms tube-like soil shapes. These are known as worm casts.

The researchers also discovered that extra long earthworms live in the area. These had not been recorded before, so they are a new worm species. The researchers now believe that these big worms ingest the soft mud caused by flooding. Then, they return to the same place where the casts are expelled. Over hundreds of years, or even longer, the casts pile up and create the *surales*. ■

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GLOSSARY PUZZLE

INSTRUCTIONS: ① Complete the crossword. The answers are highlighted in orange in the news stories. There are 25 words highlighted and you need 20 of them to complete the crossword. ② Once you have solved the crossword go to the word search on the next page ➡



Across

- 1 *Noun* Things you own or are carrying
- 5 *Noun* A person who is awarded, or gets, something
- 6 *Noun* An arrangement of number of objects all positioned in a straight line
- 8 *Noun Plural* Rivers or streams flowing into larger rivers or lakes
- 13 *Noun* The act of working out or judging if something is correct
- 14 *Noun* An organization that raises its own money and spends it in a way that helps others or good causes
- 15 *Noun Plural* Large areas where trees or crops are grown
- 16 *Verb* To get rid of completely
- 17 *Verb* Controlled what may be reported in the news and newspapers and what books and magazines can be sold
- 18 *Noun* District with buildings outside a city center
- 19 *Noun* Statement that explains what a phrase or word means

Down

- 2 *Noun* An explanation of something that is difficult to understand
- 3 *Noun Plural* The act of keeping things within set limits or rules
- 4 *Adjective* Remarkable or unusual
- 6 *Adjective* Describes someone who runs a country or company by taking all the decisions without consulting others
- 7 *Noun Plural* Hot glowing or smoldering fragments of wood or coal left from a fire
- 9 *Noun* Communities of living things and the environments in which they live
- 10 *Noun* An area in which groups of families or people live together
- 11 *Noun* A word formed from the initial letters of other words, often used as a shortened way of referring to something
- 12 *Noun* A person or group of citizens who decide to enforce the law in their own village or town

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GLOSSARY PUZZLE *CONTINUED*

INSTRUCTIONS: ③ Find 19 of the 20 crossword answers in the word search. Words can go vertically, horizontally, diagonally and back to front. ④ After finding the 19 words write down the 20th (or missing) word under the puzzle.

I Z S U H N T N E M N G I L A E R P
 D N B U A R E C I P I E N T P Y Q L
 W T T I J F X T I G D N A W N V S A
 N K W E M Y N O R C A S R E B M E N
 O X H C R G I N C V G E O L I C X T
 I T H H K P Y U P G C I C V A L F A
 T E S U B U R B L O K R H K R N H T
 I R N B A M T E S O P A A A V V U I
 N A E H S Q S Y T O D T R Q M T C O
 I D V T Q E S O S A D U I R A N I N
 F I G V N T T S E U T B T Y Y E T S
 E C O I E A E T U S N I Y A A M A A
 D A F M C S L O L I W R O L H S R E
 B T S C S B O I B E E T W N F S C U
 I E F I M G I K G E M A O C P E O Q
 M A O U R C J D A I K E D T Q S T I
 Z N S G G B T R W Q V R N F Q S U N
 S N O I T C I R T S E R G T G A A U

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If you wish to earn additional Demics please email the missing word answer to: subscriptions@newsademic.com Puzzle entries need to be submitted by 10pm on May 25, 2016 (GMT/UTC).*

MISSING WORD ANSWER =

ISSUE 274 ANSWERS

S N O I T A C I F I T R O F Y V T D
 R U G Z L Z C H S X T T P O I E H E
 O B O C Q H Q T U N P L Y B P V A T
 T K N I M L H K E U S W R D N A G C
 U Z J N G M I M L C S A W S Z C N E
 B F R W B I E K A S T X X A N U I R
 I A Z S L N T N M I E N R R F A T R
 R C I G I D D S O X C N E V E T A U
 T T S F D A H N E O G C D R Y E T S
 N I N C L H S A M R E J A O O D S E
 O O D L A T J B Z S R D S P R Y A R
 C N F S E L I L S F I K N Y L S V P
 Q S B R A N P I F C O A B R P Y E C
 F M I B A V O E A U I I T R B T D D
 J L W T M N S T L F E Q F I D H L W
 E D I B Z R E H I J Q D I X R F N O
 A O S Q R D E T U B I R T S I D G X
 N O I T A S N E P M O C Z T H L J H

HOSPITALITY