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Emperor Akihito and Empress Michiko of Japan at a ceremony in Tokyo to remember those who died in the war

SURRENDER ANNIVERSARY

Japan's Emperor Akihito and his wife Empress Michiko took part in a memorial service on August 15. It was held in a large hall in Tokyo, Japan's capital city. The ceremony marked the 70th anniversary of Japan's surrender in 1945 and the end of the Second World War in the Pacific. The emperor and empress bowed before an altar in remembrance of all those who died in the war.

Seventy years ago, on August 15, a historic recording was broadcast on the radio. Japanese people listened to Emperor Hirohito (Akihito's father) declare that Japan would surrender. Then, many Japanese people believed that their emperor was divine, or god-like. They had not heard him speak before. The emperor used a form of Japanese that few understood. His "surrender speech" was made several days after atomic bombs were dropped on the cities of

Hiroshima and Nagasaki. American air force planes did this.

Emperor Akihito spoke at the 70th anniversary ceremony. He said that he "hoped what had happened would never be repeated". For the first time, the emperor declared that he felt a "deep **remorse**" for what Japan's leaders had done during the war.

Today, Japan's emperor is what's known as a constitutional monarch. He is the country's head of state. Yet the emperor has few powers. The prime minister leads the country. He (Japan is yet to elect a female prime minister) is normally the leader of the political party with most seats in the parliament. Japan's current prime minister is Shinzō Abe.

In 1910 Japan seized control of what is now both North and South Korea. In the early 1930s it occupied the northern part of China. Japan's army then began

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to take over other large areas of the country. During this period many Japanese troops and their commanders behaved very badly. Tens of thousands of Chinese people were needlessly killed.

In 1941 Japan's military leaders launched a surprise attack on the American naval base at Pearl Harbor, in Hawaii. This attack marked the start of the war in the Pacific. During the next four years, Japanese forces occupied several other Asian countries such as Malaysia, Burma (now also known as Myanmar) and the Philippines. Often the Japanese treated local people and prisoners of war in a very cruel and inhumane way.

The destruction of Hiroshima and Nagasaki killed tens of thousands of people. Before the atomic bombs were dropped, American planes firebombed Tokyo and many other Japanese cities. The bombs dropped on these cities were designed to start fires. These bombing attacks were not aimed at military targets. Most of those who died were the elderly and women and children.

By August 1945 Japan was losing the war. Yet Japanese army commanders refused to give up. To end the conflict the U.S. would need to invade Japan. Any invasion would have led to the deaths of many thousands of American troops, Japanese soldiers, and civilians in Japan. The atomic bombs ended the war quickly. So an invasion was not necessary. Many people therefore believe that the bombing of Hiroshima and Nagasaki actually saved lives.

Some argue that the U.S. was wrong to use the atomic bombs. They say that its leaders should have given Japan a warning. If the country didn't surrender, a terrible new weapon would be used to destroy Japanese cities. Others say that this

would not have worked. The atomic bomb was developed in secret. No one would have believed the destruction the weapon could cause unless it was used. These people therefore believe that warnings would not have made Japan surrender.

Since the end of the war, some people in Asian countries have complained about Japan's leaders. Many in China and South Korea often say that Japan has never fully apologized for what it did in the past. Apologies have been made, yet they do not think that they have been sincere. These people are also angry that senior Japanese politicians continue to visit the Yasukuni Shrine.



Shinzo Abe, Japan's prime minister, speaking at the Hiroshima Peace Memorial Park on August 6,

The Yasukuni Shrine is in Tokyo. Its purpose is to commemorate those who died while serving their country. This includes the soldiers, sailors and airmen who were killed during the Second World War. In 1978 priests at Yasukuni secretly enshrined 14 war criminals. They include Hideki Tojo. He was an army general and Japan's prime minister for most of the war. After the war, Tojo was found guilty of war crimes. He was sentenced to death by hanging.

The enshrining of the war criminals upset many Japanese people. Since then, the emperor and members of his family have not visited Yasukuni. Mr. Abe went to the shrine in 2013. He was the first prime

minister to do this for seven years. After Mr. Abe's visit, China stopped all talks with Japan for several months.

People in China and South Korea often compare Germany and Japan. Germany's leaders, they say, have apologized for what happened in the war. Schoolchildren in Germany learn about the terrible crimes that German leaders were responsible for. One example is the Holocaust, or the deliberate killing of millions of Jewish people.

Schoolchildren in Japan are not told about [atrocities](#) committed by Japanese soldiers in China and other countries. A small group of people in Japan claim that their country did not commit any war crimes. These people are known as [nationalists](#) or ultra-nationalists.

Mr. Abe took part in ceremonies that marked the 70th anniversaries of the atomic bombings. These were held in Hiroshima on August 6, and in Nagasaki three days later. In recent years, it has become a custom for prime ministers to make a special statement on every tenth anniversary of the war's end. This is done on or around August 15. Mr. Abe made his statement the day before. He repeated apologies made by previous prime ministers. He also declared that future generations should not have to keep apologizing for Japan's wartime past. Mr. Abe's statement angered China and South Korea.

In the U.S. and Britain, August 15, is known as V-J Day (or Victory in Japan Day). Memorial events were held at Pearl Harbor and in London, the capital of Britain. Japan's surrender in 1945 ended its 35-year occupation of Korea. Then, North and South Korea were a single country. Both countries celebrate on August 15. There, this date is a holiday. It's called [Liberation Day](#). ■

COTOPAXI VOLCANO

Cotopaxi is a large volcano in Ecuador. It is about 25 miles (40 kilometers) from Quito, the country's capital city. On August 14, the volcano began to erupt. The following day Rafael Correa, Ecuador's president, declared a state of emergency. This makes it easier for officials to apply for government funds. This money can then be used to help people if there is a major eruption.

The state of emergency means that the army can be ordered to assist the police. News or information about the volcano can also be blocked or [censored](#). In Ecuador the law says that a state of emergency cannot last longer than 60 days. Thus far, 400 people who live closest to Cotopaxi have been told to leave their homes.



Quito and the Cotopaxi volcano

Cotopaxi is nearly 20,000 feet (6,000 meters) high. It is the second tallest mountain in Ecuador and the second tallest volcano in the world. The highest is in Argentina. Cotopaxi is one of many volcanoes that make up the "Ring of Fire". This is a long chain of active and dormant volcanoes. It runs all the way around the edge of the Pacific Ocean. A dormant volcano is one that has not erupted for many years, but might do so in the future. An extinct volcano is one that has not erupted for thousands of years.

Cotopaxi's last major eruption was in 1877. There was a minor one in the early 1940s. Some people claim that Cotopaxi is one of the world's most dangerous volcanoes. This is because it is not far from Quito. This city is home to 2.7 million people. Another reason is that Cotopaxi has an icecap. Thick layers of snow and ice cover the volcano's summit. Any big eruption will immediately melt the icecap. This can create, or trigger, deadly lahars.

A lahar is a type of mudflow. Huge amounts of water rushing down a volcano's sides pick up ash, rocks and other debris such as trees. Lahars can be very destructive. They destroy everything in their paths: buildings, bridges, farmland, and roads. Cotopaxi has steep canyons, or valleys, running down its sides. These were made, or eroded, by lahars from past eruptions.

The 1877 eruption melted all the snow and ice on Cotopaxi. Then, one lahar reached the Pacific Ocean. This is a distance of 62 miles (100 kilometers). Another one traveled a similar distance in the opposite direction. It reached the Amazon basin. The town of Latacunga was destroyed by one of these lahars. If another major eruption melted Cotopaxi's icecap, a lahar could flow down the valley that leads to Quito.

The latest eruption covered Quito in a fine layer of ash. During a speech, Mr. Correa said "God willing, everything will go well and the volcano will not erupt". ▣

GREEK ISLANDS MIGRANTS

Officials in Greece have been struggling to deal with a huge [influx](#) of migrants. Recently, every day, around 1,000 people have been

arriving in small boats on the islands of Kos, Lesbos, Chios, Samos, and Leros. Since the beginning of the year, 130,000 migrants have landed on these islands. All are very close to the Turkish coast.



Many of these migrants (men, women and children) come from Syria. Others are from Iran, Pakistan and Afghanistan. Those from Syria say they are trying to get away from the war in their country. There, several rebel groups are fighting against the Syrian army. The conflict began four years ago. It's thought that over 200,000 people have died in the fighting. Hundreds of thousands of Syrians have been forced to leave their homes. Many are now living in refugee camps in Turkey, Lebanon and Jordan.

Thousands of other migrants have been setting off from the coast of Libya. The boats are old, overcrowded and unseaworthy. Navy ships from European Union (EU) countries pick up most of these people. They are taken to the island of Sicily, which is part of Italy. Some crowded boats have sunk. Many migrants have drowned. Those sailing from the Libyan coast mostly come from African countries, such as Sudan, Somalia and Eritrea. Yet others are from Syria.

All the migrants want to get to an EU country. Both Italy and Greece are members of the EU. The migrants believe that they will be able to find

work and improve their lives. The boats leaving Libya are organized by criminal gangs. These gangs are called people smugglers or people traffickers. Those who want a place on their boats must pay the people smugglers large sums of money.

Migrants trying to get to the Greek islands have to pay \$1,130 (€1,000) to be smuggled out of Turkey. The boat trips do not take long. Kos is only 2.5 miles (four kilometers) from Turkey. Officials and police officers in the Turkish coastal towns do not try to stop the migrants leaving. Most are happy to see them go.

In recent years, Greece has had severe financial problems. The country is finding it difficult to deal with the migrants. On the islands they all have to be registered. Yet the Greek officials who do the registrations have only two computers. Once they have their registration papers, the migrants can travel by boat to Athens, the capital city. From there, they try to take trains or buses to other EU countries. Officials on Kos asked for extra police to be sent. Fights have broken out. On the islands there are not many buildings where migrants can stay. Thousands sleep on the beaches and streets.



Migrant boat near the island of Kos

On August 16, the Greek government sent an empty passenger ship to Kos. Officials who could issue registration papers were on the ship. It left Kos three days later with hundreds of migrants on board.

Some EU officials say that the migrant problem is the worst crisis in Europe since 1945, or the end of the Second World War. EU country leaders have had arguments about where the migrants should go. All agree that Italy and Greece need help. Yet many do not want thousands of migrants moving to their own countries. ■

COMET'S PERIHELION

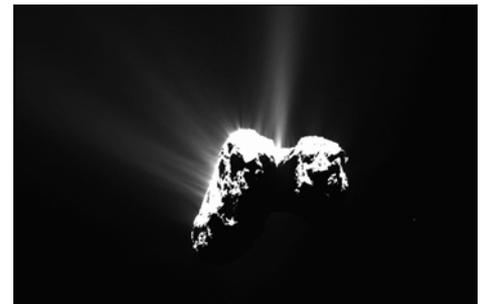
On August 13, Comet 67P reached its perihelion. This is the closest it gets to the Sun. Rosetta, an unmanned spacecraft, has been circling the comet for the last 12 months. It was able to take pictures of dust particle outbursts and jets of gas. These “fly off” comets when they get near the Sun. Close-up pictures of a comet’s perihelion have never been taken before.

The comet’s official name is 67P/Churyumov-Gerasimenko. Two Russian astronomers discovered it in 1969. The comet is about 2.8 miles (4.5 kilometers) across. Like the planets in our Solar System, comets orbit, or go around, the Sun. They are made of ice and dust. Comets are often described as big “dirty snowballs”.

67P is what’s known as a periodic, or short-period, comet. (The “P” stands for periodic.) It takes about six and a half years to complete one orbit of the Sun. The comet travels at about 84,000 miles (135,000 kilometers) per hour. Short-period comets are thought to come from a part of the Solar System called the Kuiper belt. This is beyond Neptune and the dwarf planet Pluto.

Comets such as 67P are very old. They date back to the beginning of the Solar System, or roughly 4.6

billion years ago. This was when planets such as the Earth were just beginning to form. Researchers say that comets are like time capsules. Studying them is like looking far back in time. When in deep space, comets are completely frozen. As they get closer to the Sun, they start to warm up. Then comets release dust, gases and water vapor, which trail behind them.



Picture taken by Rosetta of Comet 67P as it reaches its perihelion (ESA)

Rosetta was launched by the ESA (European Space Agency) in 2004. Many people say that it is one of the most complicated space missions ever attempted. When it launched, Rosetta was carrying a smaller spacecraft, or lander, called Philae. It traveled 3.73 billion miles (6 billion kilometers) through space. Twelve months ago, Rosetta caught up with 67P.

Rosetta sent close-up pictures of the comet back to the Earth. The comet’s unusual shape surprised ESA scientists. Some joked that it looked like a “giant rubber duck”. The pictures also showed that 67P’s surface is covered in steep cliffs and deep hollows, or depressions. Rosetta continued to circle the comet as it sped towards the Sun.

The next part of the mission was to land Philae on the comet. This was completed last November. The landing did not go to plan. The comet’s gravity is very weak. Some devices designed to attach Philae to

its surface did not work. The lander bounced twice before coming to rest near a cliff. However, over the next five days, the lander completed most of its experiments and recordings. This information was sent back to ESA scientists in Germany before Philae's batteries ran out.

Rosetta has large solar panels. It generates the electricity it needs from the Sun. Philae has two much smaller solar panels. It was hoped that these could make about one hour of power from sunlight every two days. Philae probably landed in the shade. So it has not recharged its batteries. It sent back two short messages a few months ago. Yet, since then, nothing more has been received from the lander.

Rosetta will continue to circle 67P, as it loops back away from the Sun. In 12 months' time Rosetta will spiral down towards the comet and land on its surface. This touchdown will be the end of a very successful space mission. ■

EARTH OVERSHOOT DAY

The Global Footprint Network (GFN) is what's known as a think tank. These organizations study and give advice on certain subjects, or topics. Often the subjects are to do with politics or economics. The GFN is based in the U.S., Belgium and Switzerland. It tries to measure the resources humans use and the resources humans have.

Your bank statement shows you how much money is being paid into your account. It also shows you how much is being paid out. The GFN does something similar for cities, states and nations. Then, by adding these all together, it works out what it calls Earth Overshoot Day.

Each country has a "supply side", or its resources (money in the bank). This is the country's productive land and sea area. It includes areas where food crops are grown, land where farm animals graze, fishing grounds, forests, and built up areas, or places covered in buildings and roads.

Each country also has its "demand side" (money going out of the bank). This is what the country's population consumes or uses. It includes food crops and other types of food such as meat, dairy products and fish. Other items on the demand side are wood and things made from timber, space for new buildings and woodland areas. These woodland areas are needed to absorb any extra carbon dioxide (CO₂) the country produces. This CO₂ comes from burning fossil fuels.

The GFN works out the supply side and demand side in hectares. One hectare is 10,000 square meters or 2.47 acres. If a country's demand is bigger than its supply it is in **deficit**. When a country has a deficit, it either buys resources from other nations or uses too much of its own supply. An example of this would be overfishing.



The GFN adds all the country figures together. It then comes up with it Earth Overshoot Day. This is the day in the year when humans have used up, or consumed, all the resources available for that 12-month period (or the day after which there is no more money in the bank). On

any day after this date, humans are using resources that will be needed in future years. When this happens deforestation, drought, soil erosion, loss of species, and a lack of fresh water are likely to increase.

The GFN worked out its first Earth Overshoot Day in 1987. Then, the date was in late December. Since 1987 it has been getting earlier and earlier. In 2000, World Overshoot Day was in October. This year's Earth Overshoot Day was on August 13, six days earlier than 2014. Officials at the GFN say that much of the deficit is caused by increases in carbon emissions, or carbon dioxide.



The first image of the Earth released by NASA's Deep Space Climate Observatory

Later this year an important United Nations (U.N.) climate summit will be held in Paris, the capital of France. At this meeting all countries will have to declare their plans for reducing carbon emissions, or their carbon footprint. If nothing is done, the GFN says that, by 2030, we will be using the resources of "two Earths" in one year. ■

ALPHABET AND GOOGLE

Google is the world's largest internet company. On August 10, the company's bosses made a surprise announcement. They said that the business had been **restructured**. A new holding, or parent, company has been formed. It's called Alphabet.

Different parts of the company are to be separate businesses. Each has its own boss. Google's internet search is now one of these separate businesses.

Larry Page and Sergey Brin set up Google in 1998. Then, they were both students at Stanford University, in California. The company began as a search engine. Its name comes from a misspelling of the word "googol". This is a very big number. A googol is a figure one followed by 100 zeros. At first, the company did not make any money. This changed when it developed its "pay per click" advertising (Google AdWords).



Aerial view of the Googleplex, in California

In 2004 the company held or organized an initial public offering (IPO). An IPO is also called a stock market launch or flotation. This is when a company sells its shares (also known as stocks) to the public for the first time. Many of the company's shares were sold for \$85 each. Now, the shares are worth about \$660.

Today, Google (Alphabet) is one of the world's most valuable companies. It employs 53,600 people all around the world. The company's headquarters, or campus, is near the city of San Francisco, in California, in the U.S. The campus is known as the Googleplex.

After the company's IPO, Google became involved with many other businesses. For example, it bought YouTube and Motorola, a cell phone company. Google also

created the Android cell phone operating system. However, some of the things it has spent large amounts of money on have not been successful. Google Glass is an example. Google Glass is what's known as wearable technology. It's a computer device that looks like a pair of glasses.

Even though it has started or bought many other businesses, the company still makes nearly all of its money from "search". Nowadays, people all around the world use Google for three billion internet searches every day. In a recent three-month period, the company's total sales were \$17.7 billion. Of this total, \$16 billion came from advertising. YouTube has more than one billion users. Around 300 hours of video are uploaded to YouTube every minute. Yet the YouTube part of the company's business does not make much money.

Mr. Page is the CEO (chief executive officer) of Alphabet and Mr. Brin is its president. The new boss of the Google part of Alphabet is Sundar Pichai. He is in charge of: search, maps, apps, Android, and YouTube. Mr. Pichai is 43 years old. He was born in India and started working for Google in 2004.

Most of the other businesses within Alphabet are like [venture](#) capital companies. They invest in or start new ideas. These may or may not make money in the future. These new ideas are sometimes described as "moonshots". They include: a biology company that is researching longevity, or how people can live for longer, driverless cars, delivery drones, Wi-Fi hot air balloons, and smart home control kits. Within Alphabet, these venture-style parts of the company are expected to become more successful. ■

WHITE WHALES

A rare white whale was filmed swimming off the eastern coast of Australia on August 10. At first, the whale was thought to be Migaloo. This white whale is well known. It has been seen many times in the past. Yet the white whale in the movie is about 29 feet (nine meters) long. Migaloo is twice this size.

Migaloo is a humpback whale. It was first seen in 1991. Soon after it was spotted, the whale was named Migaloo. This means "white fella" in one of Australia's Aboriginal languages. Adult humpbacks can grow to a length of 62.5 feet (19 meters). The whales feed on small fish, plankton and tiny shrimp-like marine creatures called krill. When fully grown, humpbacks weigh 40 tons. In the past, many humpback whales were hunted and killed. Today, they are a protected species.



Migaloo

Humpback whales that live in the Southern, or Antarctic, Ocean migrate every year. Around June (this is winter in the southern hemisphere) they swim north to warmer waters closer to the Equator. Here, the females have their calves, or babies. Around the beginning of September (or the start of summer in the southern hemisphere) they swim back to the Southern Ocean to feed.

Nowadays, researchers say that 23,000 humpbacks pass by Australia's east coast each year.

When Migaloo was first seen it was believed to be the only albino, or white, humpback whale in the world. At that time, Migaloo was estimated to be between three and five years old. This was 24 years ago. Humpback whales live for at least 50 years. Later, it was discovered that Migaloo was a male. When migrating north and south, close to Australia's coast, male humpbacks can travel as far as 87 miles (140 kilometers) in a single day.

There are stories throughout history of white whales. Some may be true, but others are legends. The most famous is a novel called *Moby-Dick*. The American author Herman Melville (1819 – 1891) wrote this book. It was published in 1851. As a young man Melville worked on a whaler. These were ships that hunted whales. His book tells the story of a sea captain **obsessed** with finding and killing a giant white whale nicknamed Moby-Dick. In the book the huge white whale eventually sinks the captain's ship.

Whale-watching is a popular tourist attraction in Australia. Visitors travel to the east coast to see the humpback whales on their journeys north and south. Whale-watchers have to follow set rules. They must not disturb or harm the whales. Boats must stay a certain distance away from them. If they break the rules, boat owners can be fined large amounts of money.

Migaloo has not been seen every year. Since 1991 a few other humpbacks with large white markings have been recorded. Yet none were completely white like Migaloo. Four years ago an all white baby hump-

back calf was seen for the first time. It was close to its mother. Some believe that Migaloo is the baby's father. They nicknamed the calf Son of Migaloo, or MJ (Migaloo Junior).

Because of its size, researchers say that the white whale filmed on August 10, was either MJ or a "new" white whale. ■

ASIAN HORNET SOLUTION?

The boss of a botanical garden in France has made an interesting discovery. Botanical gardens grow plants for scientific study. He found several dead Asian hornets inside a pitcher plant. Called *Sarracenia*, this plant grows in parts of the U.S. and Canada. The discovery could help to control the numbers of Asian hornets in Europe.



Asian hornet (*Vespa velutina nigrithorax*)

The scientific name for the hornets found in the pitcher plant is *Vespa velutina nigrithorax*. They come from an area of China. In Europe, these hornets are an invasive species. In recent times, animals have been taken to parts of the world where they are not normally found. This may have been done accidentally or on purpose. These animals then become an alien species. If they have no, or very few, predators their numbers keep increasing. When this happens they are an invasive species. Asian hornets were first found in France in 2004. Since then they

have been seen in Portugal, Spain, Italy, Germany, and Belgium. It's thought that the first ones arrived in Europe in a shipping container. It came from Shanghai, one of China's biggest cities.



Sarracenia pitcher plants (Noah Elhardt)

Asian hornets are about 0.79 inches (20 millimeters) long. They are smaller than European hornets. Yet the Asian ones are more aggressive. Like bees, hornets sting if angry. Some people are **allergic** to these stings. They can become very ill if stung by a bee or a hornet. It's very rare for someone to die from a bee sting. However, in Europe, six people have died after Asian hornets stung them.

Asian hornets attack and eat honeybees. (European hornets do not do this.) Bees are very important insects. They make their honey from nectar. This is collected from flowering plants. As they fly from plant to plant, bees' bodies get covered in a fine powder called pollen. By taking the pollen to different plants, bees help them to produce their seeds. Without bees some fruit trees would not grow any fruit.

In Asia bees have evolved, or learned over a long period, how to avoid hornets or attack them. Hundreds of bees will form a ball around one hornet. The temperature within the ball gets hotter and the level of carbon dioxide goes up. This kills the hornet. Bees in Europe do not do this. They are not

able to defend themselves when attacked by Asian hornets.

Asian hornets live in large nests. These are usually difficult to find and destroy. The nests can be in underground holes or high up in trees. In Europe Asian hornets will wait outside beehives. The hornets then kill the bees as they enter or leave. The hornets will also enter the hives and steal the honey. The insects have destroyed many beehives in France. Now, France has to buy honey made in other countries.

There are many types of pitcher plant. All are carnivores, or meat eaters. In English, a pitcher is a jug-like container. Used for storing and pouring liquids, it has a handle and a spout. Pitcher plants are shaped like a bowl and open lid. They attract insects with either bright colors or sweet, sugary nectar. Their bowl's inner sides are smooth and waxy. Insects falling into them cannot climb out.

The liquid inside a pitcher plant's bowl contains digestive acids. These break down, or dissolve, an insect's body. After this, the liquid contains nutrients, such as nitrogen. The plant absorbs these nutrients from the liquid.

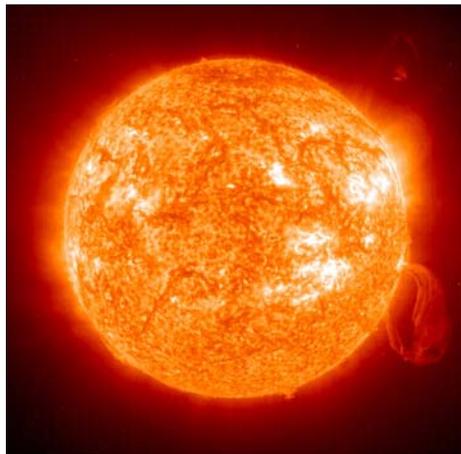
The pitcher plant in which the dead hornets were found came from the U.S. There are no Asian hornets in America. Why these plants attract the hornets is a mystery. The boss of the botanical garden will now work with an entomologist, or scientist who studies insects. They hope to find out what attracts the hornets.

Each *Sarracenia* plant has around 15 long thin pitchers. They could kill around 50 hornets. Yet as many as 4,000 Asian hornets live in one nest. Therefore the plants cannot solve the problem by themselves. Howev-

er, if the chemical that attracts the hornets can be man-made, it might be possible to use it to trap and kill them. ▣

NUCLEAR FUSION DESIGN

Governments are interested in making electricity from nuclear fusion. Yet the necessary technology is nearly always said to be “thirty years away”. Researchers at MIT (Massachusetts Institute of Technology), in the U.S., have come up with a new nuclear fusion reactor design. It makes use of powerful magnetic fields. Their new design means that making electricity from nuclear fusion could happen within the next ten years.



The Sun

Electricity generated from nuclear fusion would be inexpensive. Also, unlike burning fossil fuels (oil, natural gas and coal), no carbon dioxide is produced. Nuclear power stations make electricity. Yet they also create dangerous radioactive waste. Nuclear fusion does not do this. Nuclear fusion could therefore make an unlimited supply of “clean energy”.

Everything around us is made of tiny particles called atoms. Each atom is made of even smaller

particles. The largest of these are called electrons, protons and neutrons. Atoms of different substances contain different numbers of electrons, protons and neutrons.

In today's nuclear power plants, atoms are split using a process called nuclear fission. Uranium atoms are **bombarded** with neutrons. This makes the uranium atoms split into two. As they split, more neutrons and large amounts of energy are released.

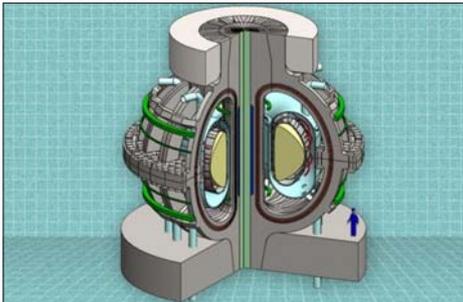
However, nuclear power stations' radioactive waste is dangerous. It is difficult to get rid of or store. Nuclear power plants can also leak radioactivity if damaged in an accident or attack. For example, four years ago a nuclear power station in Japan was struck by an earthquake and tsunami, or giant wave. Since then, workers at the plant have found it difficult to stop some radiation leaks.

Nuclear fusion is the opposite of nuclear fission. It is the process by which stars like the Sun release energy. In fusion, atoms join together rather than split. Inside the Sun, hydrogen atoms join to make a gas called helium. This releases a huge amount of energy.

The National Ignition Facility (NIF), in California, in the U.S., has been experimenting with nuclear fusion. There is a huge, very strong concrete chamber inside the NIF's specially constructed building. Here, NIF scientists have been trying to recreate what happens inside the Sun.

At the NIF, scientists are using two forms of hydrogen for fusion. One, called deuterium, is found in seawater. The other is tritium. It can be made from lithium, which is found in soil. Deuterium and tritium can combine to make helium.

The Sun's nuclear fusion happens at extremely high pressure and at temperatures of more than ten million°C (18 million°F). NIF scientists can increase the pressure in their experiments, but it cannot equal that of the Sun. Instead, they are able to increase the temperature to 100 million°C (180 million°F). The scientists use 192 laser beams to do this.



MIT nuclear fusion reactor design

In the chamber, all the lasers can be directed at a capsule. It is the size of a pea. The capsule contains a mixture of deuterium and tritium. For a tiny fraction of a second, the lasers can emit 500 trillion watts of energy. When the hydrogen atoms in the capsule join together a large amount of energy is released.

Containing the energy or super-hot plasma is difficult. It is as hot as the Sun's core. The plasma does not escape from the Sun because of the star's powerful gravity. In a nuclear fusion reactor extra energy is needed to contain the plasma. This is what the magnets in the MIT researchers' design can do.

A fusion reactor needs to make more energy than what's needed to work the lasers and contain the plasma. This is known as a self-sustaining reaction. If it happens, the extra energy can be used to make electricity.

The world's largest planned fusion power plant is being built in southern France. Many countries

are helping to pay for this project. Called ITER (International Thermonuclear Experimental Reactor), the power plant is expected to cost \$40 billion. It will take many years to construct. Experts say that a fusion reactor built to the MIT researchers' design would be finished much quicker. It would also be half the size and cost much less. □

PALIO HORSE RACE

On August 16, 30,000 people crowded into the Piazza del Campo. This large square is in the center of Siena, a city in northern Italy. The people came to watch the *Palio di Siena*. This famous horse race is held twice every year: once at the beginning of July and then again in mid August.

The first *Palio* in Siena took place about 450 years ago. Italian cities are divided into different areas, or wards. In Italian they are called *contrade* (the singular is *contrada*). Siena has 17 wards. Each is named after an animal or symbol. For example, some of the names are: Seashell, Dragon, Eagle, Giraffe, Caterpillar, and Tortoise.

The *Palio* is a competition between the wards. The horses are ridden bareback, so riders do not use saddles. They race three times around the square. The course is dangerous. It is not unusual for horses to fall over. Some parts are sloping and curved. Before the race, the course is covered in a thick layer of dirt and sand. This is to stop the horses from slipping. Barriers around the edge are padded. The race takes about 90 seconds.

At first, all the wards took part in the *Palio*. One horse and its rider

represented each ward. However, many years ago it was decided that the race was too dangerous with 17 horses. The number was reduced to ten. Therefore all the wards cannot compete in every race. There is a system for choosing which ones take part. The seven wards that did not run in the previous race are automatically selected. A draw then takes place to pick three from the remaining ten.

The *Palio* is a popular [spectacle](#). Many people travel to Siena from other countries to watch it. There is a large [pageant](#) before the race begins. It includes many people and horse riders. All dress in clothes that were worn when the race was first held hundreds of years ago.



Palio di Siena

There are not many rules in the *Palio*. For instance, riders are allowed to carry horsewhips. These can be used to strike other nearby horses. Riders can also try to block other horses to make sure that a certain ward does not win. If a horse without a rider finishes first, it still wins the race. The loser is judged to be the horse that is second and not the last one to cross the finishing line.

After the race the winning ward is presented with a *palio*, or *drappellone*. This is a large banner made of silk. It is hand painted by a local artist. A new *palio* is made for each race. Thus far, the ward that has won the most races

is Oca (Goose). The second most successful is Chiocciola (Snail). This year Torre (Tower) came first in July and Selva (Forest) won the August race.



Start of a Palio di Siena race (Roberto Vicario)

In recent times there have been protests about the horse race. Some people say that the *Palio* should be banned. They believe that it is cruel to make horses take part in the race. Seven horses have died in the last 15 years. This year, for the first time, town officials allowed 2,000 protesters into the square. Their leader promised that the protesters would not try to stop the race. ■

SINGAPORE AT 50

Thousands of people attended outdoor events in Singapore on August 9. These were organized to celebrate the country's 50th birthday. Singapore became a small independent nation on August 9, 1965. This was the day on which it was **expelled** from Malaysia.

The anniversary celebrations had street parades and marches. Fifty military aircraft flew overhead. There were performances by Singapore's different ethnic groups. A stage was set up in the city center. There, 26,000 people listened to a music concert. Millions of others watched it on television. The 50th birthday party also included a huge firework display.

Singapore is not far from the Equator. Fifty years ago it was a "backwater". People use this word to describe a place where nothing happens and there is no development. The city-state is now home to 5.5 million people. In only two generations Singapore has become one of the world's wealthiest nations.

Most of this change happened under the leadership of Lee Kuan Yew. He died five months ago, aged 91. Lee was Singapore's first prime minister. He decided to stand down in 1990. People often say that he was the "father of Singapore". His eldest son, Lee Hsien Loong, has been the country's prime minister since 2004.

Singapore used to be an area within the Malay Federation. For many years, this was a part of the British Empire. Japanese forces occupied Malaya and Singapore during the Second World War (1939 – 1945). At the end of the war the British returned. Lee then went to study law at Cambridge University, in Britain. He returned to Singapore in 1950 and got a job with a law firm.

Lee wanted British control to end and for Singapore to have its own leaders. In 1954 he set up a new political party. He called it the People's Action Party (PAP). The following year, Lee was elected to Singapore's parliament. At an election four years later, his party won 43 of the 51 seats. The British government then agreed to give Singapore **partial** independence. The country's parliament could make most decisions. However, foreign affairs and defense were still controlled by Britain. As leader of the party with the most seats in parliament, Lee became Singapore's first prime minister.

Singapore became a fully independent nation in 1963. Lee then agreed for Singapore to become a part of Malaysia. Yet, two years later the Malaysian government voted to expel Singapore. Racial differences had caused problems. Most people in Singapore are of Chinese descent. The majority of people in Malaysia are Malays. Most follow the Islamic religion. Malay leaders were worried that Malaysia's Chinese population would support the PAP. If this happened, the PAP might become too powerful.

Lee was upset. Singapore was alone. It was a very small island country with no resources. Even its water supply came from Malaysia. Lee decided to change many things. He persuaded large foreign companies, especially from the U.S., to set up factories in Singapore. Roads were widened, old buildings knocked down and new housing estates built. English became Singapore's first language. Chinese, Indian and Malay people lived in Singapore. Lee made sure that they all lived together in the same areas.

Each ethnic group's religious holidays were celebrated.



Singapore's skyline

By the 1970s, Singapore was one of the world's busiest seaports. Singapore Airlines was set up in 1972. Today, it is thought to be one of the best airline companies in the world. In the 1980's Singapore became an important financial center. Many

international banks and other companies now have their Asian headquarters in Singapore.

Before he retired, some people complained that Lee was too strict. When he was prime minister, little opposition was allowed. News reporters were not able to say bad things about the government. Yet hundreds of thousands of people lined the streets for Lee's funeral. Many Singaporeans cried as his coffin passed by.

A red circle, or dot, was the official logo for the 50th birthday celebrations. Within the circle are the characters "SG50". The logo's design is in **defiance** of a former leader of Indonesia. In the 1990s, he described Singapore as just "a little red dot" (on the map). ■

SHIP'S BELL RECOVERED

On August 7, an underwater ROV (remote-operating vehicle) **retrieved** a large bell from the ocean floor. It had been on the seabed for 74 years. The bell belonged to a British battleship. It sank during a sea battle in the Second World War (1939 – 1945).

The bell came from the wreck of HMS *Hood*. (HMS stands for either His or Her Majesty's Ship, depending on whether a king or queen is the ruling monarch.) *Hood* was one of the largest battleships ever made in Britain. It was launched in 1920. The warship was named after Samuel *Hood* (1724 – 1816). He was an admiral, or senior commander in the navy.

In 1941 *Hood* and HMS *Prince of Wales*, another British battleship, were ordered to sail to the North Atlantic Ocean. There, they were to try to find and sink *Bismarck* and *Prinz*

Eugen, two German warships. Not far from Iceland, the British and German ships spotted each other. They began firing their large guns. This **engagement** is called the Battle of the Denmark Strait. During the battle, part of *Hood* exploded. The ship sank soon afterwards. Of the 1,418 men on board only three survived. This was the highest number of deaths ever to have happened on any British warship.

After *Hood* sank, *Prince of Wales* sailed farther away. However, *Bismarck* was also damaged during the battle. The captain of *Bismarck* decided to sail to France. There, the battleship could be repaired. However, another group of British navy ships and aircraft managed to find *Bismarck* a few days later. After several attacks, the German battleship was sunk before it reached France.



HMS Hood in 1924 (A. Green and A. Cuerden)

Blue Water Recoveries is an American company. It specializes in finding sunken ships. The company discovered the wreck of *Hood* in 2001. The explosion on the ship had scattered wreckage over a wide area on the sea floor. While investigating the wreckage with an ROV, the company found and filmed the ship's bell. The ocean where *Hood* sank is 9,186 feet (2,800 meters) deep.

A ship's bell is important. In many countries it often represents a ship that has been scrapped or sunk. Normally, these bells are made of brass

and are engraved with the ship's name. Traditionally, a ship's bell was rung as a time signal, in an emergency, if the ship was sailing through thick fog, when someone important came on board, and if a sailor died.

In 2012, British officials declared that they wanted to retrieve *Hood's* bell. This would prevent it from being **salvaged** by anyone else. Paul G. Allen, a wealthy American **philanthropist**, agreed to help. In 1975, together with Bill Gates, Mr. Allen cofounded the Microsoft Company.



Picture of the ROV picking up the ship's bell from the wreck of HMS Hood (Paul G. Allen)

Mr. Allen and Blue Water Recoveries first tried to retrieve the bell in 2012. Their attempt failed. The weather was bad and the ROV had technical problems. This time they succeeded. The bell will now be cleaned and restored. It will then be given to a museum in Britain. There, it will be displayed as a memorial to the sailors who died when *Hood* sank.

A movie taken by the ROV may help to explain what caused the explosion on the ship and why *Hood* sank so quickly. ■

NEW ANGLERFISH

Scientists from two universities in the U.S. have discovered a new species of anglerfish. Three of the fish were discovered deep below the sea's surface in the Gulf of Mexico. All were females.

The new fish is both small and ugly. The largest one was 3.7 inches (9.5 centimeters) long. It has a big head and mouth, needle-like teeth and a “fishing rod, or pole”. The fishing pole, which is on top of its head, is a lure. It attracts marine creatures that the fish preys on, or eats.



Lasiognathus dinema anglerfish (T. Pietsch)

There are over 200 species of anglerfish. Most are brown or gray. The biggest ones are around 3.3 feet (one meter) in length. Yet most anglerfish species are less than one foot (30 centimeters) long. The fish are found in most of the world’s oceans. Some live on the seabed. They have fins that help them “walk” along the ocean floor. Many anglerfish live at depths of over 9,840 feet (3,000 meters). Here, the ocean is black and very cold. There is no light. Pressure (from the weight of seawater above) is **intense**.

Anglerfish get their name from how they catch their prey. All have a long thin fleshy growth that comes out of the tops of their heads. The “fishing pole” part of this is called the illicium. The bit at the end is known as the esca. The esca of many anglerfish can move, or wriggle. It therefore looks like a small fish. So, the esca is similar to the bait on the end of a fishing line. This is why the fish are called anglerfish. An angler is a person who catches fish with a rod and line.

The esca can glow in the darkness. A certain type of bacteria

creates this “light”. Marine creatures that swim towards the light are eaten. Anglerfish have large mouths. Their bodies can expand, or get bigger. This means that they can eat fish or shrimp-like creatures that are twice their own size.

Anglerfish are an example of what’s called sexual dimorphism. This is when males and females of the same species differ in size or shape. Where the sexes differ in size and color, males are usually larger and more brightly colored. However, with some species it’s the opposite. Females are far bigger than males. Anglerfish and some species of spider are examples of this type of sexual dimorphism.

Compared to female anglerfish, males are tiny. They do not have an illicium or esca. Some researchers suspect that the female’s esca is also used to attract males. The males are like parasites. Using their teeth, they attach themselves to the females’ bodies. Over time, the male becomes part of, or fuses with, the female’s body. It connects to, and feeds from, the female’s bloodstream. Each female may have as many as five males attached to her body.

Several years ago there was a serious accident in the Gulf of Mexico. An oilrig explosion and broken drill pipe caused a big oil leak. The oil polluted a large area of sea. The American scientists have been testing the waters where the oil leak happened. They want to find out what effect it had on marine life. The scientists lowered nets to different depths. These were pulled up and their contents recorded.

The three anglerfish in the nets were all females. No males were found. The scientists realized that the fish had not been recorded before. Their suggested name for the

new fish is *Lasiognathus dinema*. All anglerfish species have the name *Lasiognathus*. In Ancient Greek it means “hairy” and “jaw”. *Dinema* is Greek for “two” and “thread”. This, the scientists say, describes the hooks on the fish’s lure, or esca. ■

SHADE BALLS

There has been a serious drought in the state of California for several years. State officials have been looking for ways to save, or **conserve**, water. On August 10, the mayor of Los Angeles helped workers to dump tens of thousands of “shade balls” into the city’s biggest reservoir. The floating balls are expected to save millions of gallons of water.



Shade balls being emptied into a reservoir

In 2013 there was the least rain in California since it officially became an American state in 1850. The current drought is thought to be the worst for over 100 years. Normally, in California, mountain snow melts in the summer. This melt water then fills up lakes and reservoirs. Yet last winter very little snow fell. Six months ago, state officials declared that water might have to be **rationed**. They want everyone to use 25% less water.

Now, homeowners are not allowed to water their gardens. People are being encouraged to let grass lawns die. Some are creating “desert

gardens” with plants that only need small amounts of water. Officials urge people to have short showers, turn taps off when cleaning their teeth and not to wash cars. Restaurants have been asked to only serve water if customers ask for it. Anyone seen wasting water may have to pay a large fine.



Reservoir covered with shade balls

Reservoirs, or man-made lakes, lose large amounts of water from evaporation. This increases in the summer months when the weather is warmer. Reservoirs in California

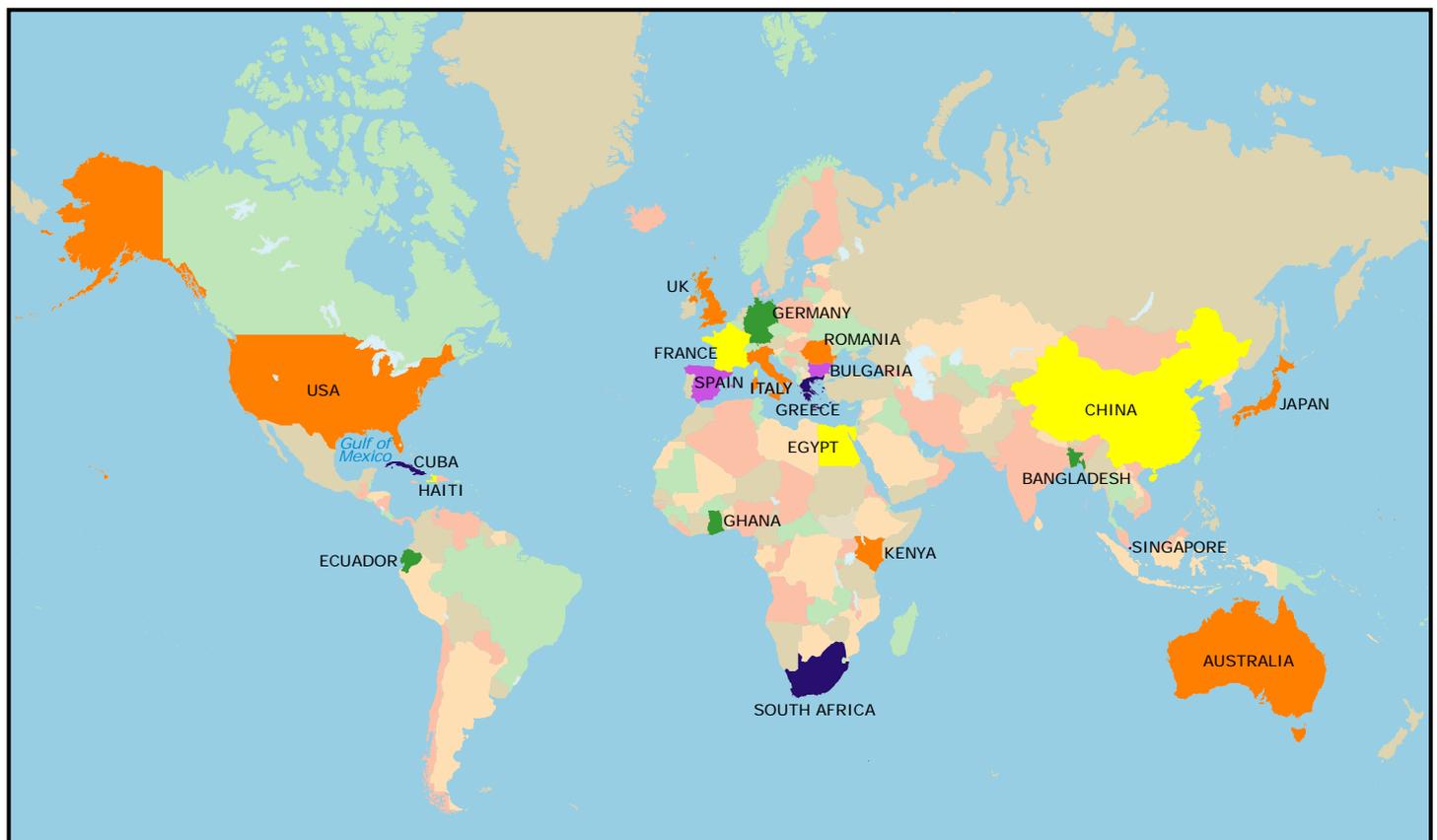
are less than half full. Last year, a person who works for the water department suggested that reservoirs be covered with floating balls. This, he claimed, would prevent most of the evaporation. He got the idea from airports.

Some airfields have man-made ponds and small lakes close to their runways. These can attract water birds. Flocks of birds flying near airports are dangerous. Accidents can happen if they get sucked into a plane’s jet engines. Many airports now use “bird balls” to keep water birds away. The black plastic balls are about the same size as an apple. They form a floating “carpet” on the surface of the water. The balls hide the ponds and lakes, so birds are no longer attracted to them. The balls also prevent the growth of waterweeds and algae, which many water birds feed on.

In California the balls are being used for a different reason. (There, they have been named “shade balls”.) By covering the surface of a reservoir, they reduce evaporation. The balls also stop algae growing and protect the water from dust, pollution, birds and other wildlife. Around 96 million shade balls are now covering one of Los Angeles’ biggest reservoirs. The balls cost \$0.60 each. Officials say that the shade balls are very cost-effective. They claim they will save 300 million gallons (1,135 million liters) of water every year. ■

NEFERTITI’S TOMB?

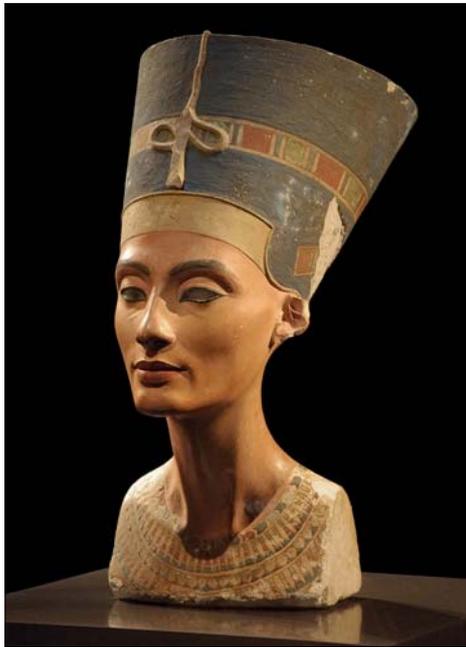
Egyptologists study the language, history, and civilization of Ancient Egypt. A British Egyptologist, who works at an American universi-



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ty, thinks he may have made an important discovery. He believes that Tutankhamun's tomb has two undiscovered rooms. The entrances are bricked-up, or sealed. The Egyptologist suspects that one of these rooms is Queen Nefertiti's burial chamber.

Queen Nefertiti was married to the Egyptian pharaoh Akhenaten. He ruled Ancient Egypt between 1353 BCE and 1336 BCE. During his reign, Akhenaten stopped Egyptians from worshiping many gods. He decided that they must worship only one. This is known as monotheism. Akhenaten's chosen god was Aten, or the Sun.



Nefertiti Bust

As part of his monotheistic religion, Akhenaten built a new capital city. Today, its ruins are called Amarna. Yet, soon after his death, everyone left Akhenaten's new city. It is not known why. Within a few years, Egyptians began to worship the same gods as they had before Akhenaten's time. Statues and carvings of Akhenaten were deliberately destroyed or damaged. This suggests that later Egyptian pharaohs

and leaders wanted to delete him from their history.

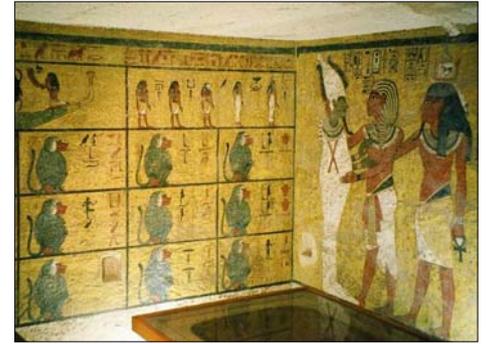
Nefertiti became well known about 100 years ago. Then, German archaeologists, working at Amarna, discovered the Nefertiti Bust. A bust is a sculpture of a person's head and shoulders. The 3,350-year-old painted sculpture is one of the most famous artifacts ever found in Egypt. The bust, which is missing one eye, is 19 inches (47 centimeters) tall. It was made from plaster and limestone.

Akhenaten was Tutankhamun's father. Nefertiti may have been his mother. Yet many Egyptologists think this unlikely. They believe that Tutankhamun's mother was one of his father's sisters. Tutankhamun married one of Akhenaten and Nefertiti's many daughters. Therefore his wife was either his sister or half-sister. Then, it was not unusual for Egyptian pharaohs to marry or have children with their close relatives.

Akhenaten died when Tutankhamun was only about eight years old. It is not known if Nefertiti died before or after her husband. Akhenaten's tomb was found at Amarna over 100 years ago. Yet Nefertiti's grave has never been discovered. Some people think that she ruled Egypt after Akhenaten. Tutankhamun (who is also known as King Tut) then took over after her. He died in BCE 1324, at the age of 19.

Nearly all pharaohs' tombs were broken into hundreds, or even thousands, of years ago. The people who steal items put inside tombs are called grave robbers. Tutankhamun's burial chamber was discovered in 1922. Even though he was not one of Egypt's most powerful or long-lived pharaohs, Tutankhamun is probably the most famous. This is because, in later years, grave

robbers never found his tomb. When opened, the chamber still contained nearly 2,000 valuable artifacts. Inside Tutankhamun's sarcophagus, or stone coffin, was a mask made of gold. His funeral mask has now become a symbol of Ancient Egypt.



Wall paintings in Tutankhamun's tomb

Many thousands of people have visited Tutankhamun's tomb. Moisture and carbon dioxide from their breath have damaged the tomb's paintings. A few years ago, to try to solve this problem, Egyptian officials decided to build a replica tomb, or copy, close by. It is exactly the same size and shape as the original tomb. The wall paintings have been copied. To make the replica, a Spanish company used special equipment to scan the walls in the original tomb.

Tutankhamun's tomb has four chambers. All were cut out of the rock. However, only the walls in one room were decorated with paintings. This was the chamber that contained the pharaoh's stone coffin. Many Egyptologists have been puzzled by the layout of Tutankhamun's tomb. It is smaller and a different shape to other pharaohs' tombs. Also, only one room has wall paintings.

The Egyptologist has studied the scans made by the Spanish company. He believes that they reveal faint outlines of two sealed entrances. These, he says, were bricked-up and painted over.

The Egyptologist believes that Tutankhamun was hurriedly buried in a room (or antechamber) of someone else's tomb. The tomb (with the two sealed up rooms) has the correct shape for a queen. The Egyptologist thinks that the most likely "someone else" is Nefertiti. If correct, finding Queen Nefertiti's tomb and its contents would be one of the most astonishing archaeological discoveries ever made. ■

EMBASSY REOPENS IN CUBA

A special ceremony was held outside a six-story building in Havana, the capital city of Cuba, on August 14. The ceremony marked the re-opening of the U.S.'s embassy. The American embassy in Havana and Cuba's embassy in Washington DC, the U.S.'s capital city, were shut 54 years ago. Both closed after the countries stopped speaking to each other, or "broke off diplomatic relations".

An embassy is a country's diplomatic office in another nation. Embassies are usually in capital cities. They include the offices of the country's ambassador. He or she acts as their country's representative in the host nation.

Cuba's embassy in Washington DC reopened on July 20. The re-opening of the embassies followed announcements made by the two countries' leaders nine months ago. Then, Barack Obama, the American president, declared that his country would start to speak and work with Cuba again. At the same time, Raúl Castro, Cuba's president, made a similar statement. The two declarations surprised many people.

In 1956 Fidel Castro, Raúl Castro's elder brother, started a

revolution in Cuba. Then, General Batista ran the country. The American government supported the Cuban leader. Fidel Castro set up a group of fighters, or rebels. As Batista was unpopular, many Cubans joined the rebel group. After two years of fighting, Castro's rebel army took control of Havana. Batista left the country.



Cuban embassy in Washington DC, in the U.S.

Fidel Castro then declared that Cuba was now a one party communist state. The government took ownership of all houses, businesses and factories. Other political parties were banned. Many American businesses in Cuba were taken over. In 1960, the U.S. imposed a trade **em-bargo** on Cuba. This is still in place. Because of the embargo, American companies are not allowed to sell anything to Cuba, or buy goods made in Cuba.

Even though Batista was disliked, not all Cubans were happy that their country had become a communist state. Thousands decided to leave. Many went to live in Florida, which is one of the U.S.'s 50 states. Florida is less than 100 miles (160 kilometers) across the sea from Cuba.

One year after the embargo began, the American government secretly helped to organize an attack on Cuba. It became known as the "Bay of Pigs" invasion. Fidel Castro's forces easily defeated the invading force. After this Fidel Castro decided to work with

the then-communist Russian-led Soviet Union.

In 1962 Russian leaders arranged to send some nuclear missiles to Cuba by ship. The Americans discovered what was happening. At that time, John F Kennedy was the U.S.'s president. He warned the Soviet Union's leader, Nikita Khrushchev, that America would attack Russian ships if they sailed to Cuba. Many people expected a nuclear war to start. However, the missiles did not get to Cuba, as the Russian ships turned back. This incident became known as the "Cuban Missile Crisis".

Russia continued to help Cuba. Yet when the Soviet Union began to break up in 1991, Cuba lost its biggest supporter. In 2008, after running Cuba for 49 years, Fidel Castro decided to retire. He was 81 years old and in poor health. It was agreed that his younger brother, Raúl, would take his place.



American embassy in Havana, in Cuba

Cuba is still a one party state. Most people have little money. However, the country is known for its good hospitals, schools and universities. Cuba has poor electricity supplies and telephone networks. Few people have access to the internet. Many buildings and roads need repair. Because of the American trade embargo, foreign companies are unwilling to set up operations in Cuba.

John Kerry attended the re-opening ceremony. He is the U.S.'s

secretary of state. This person is one of the country's most important politicians. He or she speaks and negotiates with the leaders and governments of other countries.

During the ceremony an American flag was raised. Three American soldiers, or marines, did this. The three marines who lowered the flag 54 years ago were also invited to take part. All are now over 75 years old. Hundreds of Cubans watched the ceremony. Many cheered when the "Stars and Stripes" was raised. Mr. Kerry spoke. He said that it was a "truly memorable day". ■

DRINKABLE BOOK

In recent years, fewer paper books have been printed. Electronic books, or eBooks, are becoming more popular. An American scientist has created a new type of paper book. It's not one that can be read. After being torn out, the book's pages are used as water filters. The scientist calls it *The Drinkable Book*. It has been designed for places where access to clean water is a problem.

Humans need water to survive. Yet drinking dirty water can be dangerous. Tiny bugs and bacteria in water can cause serious diseases. They include: typhoid, *E. coli* (which causes severe food poisoning), cholera, and hepatitis. These diseases can kill or make people very ill. It's thought that at least 660 million people in the world do not have access to clean drinking water.

The book's pages, or filters, are made with the use of nanotechnology. This is the science of working with things at the level of their atoms and molecules. These are the tiny "building blocks" from which everything is made. Inside

the pages are very tiny particles of silver. These "nanoparticles" release silver ions. Ions are atoms or molecules with an electric charge. Silver ions will make bacteria inactive, or harmless.

The filters have been designed to work with a special box, or container. Water needs to be poured, or allowed to pass, through the filters. Once this is done any dangerous bugs and bacteria would have been removed. The water is then ready for drinking or cooking. Adding chemicals is another way of cleaning, or purifying, water. Yet this often makes it taste different. Using the book's filters does not alter the water's taste.

When *The Drinkable Book* was first designed it was tested in a laboratory. Over the last two years, tests have been done in South Africa, Ghana, Kenya, Haiti, and Bangladesh. All were successful. However, people in different countries use different containers to store and carry water. For instance, in African countries many people use plastic buckets. Yet in Bangladesh they use a container called a kolshi. Made from aluminum, these containers have thin necks. Filters therefore need to be made that can be easily used with containers of all shapes and sizes.



Drinkable book

The scientist who designed *The Drinkable Book* has set up an organization called pAge Drinking Paper. She has teamed up with the WATERisLIFE (WiL) charity. WiL

will help to introduce the book to many poorer parts of the world. It says that 4,100 children under five years of age die from waterborne diseases every day. An advantage of *The Drinkable Book* is that local people can use the filters by themselves. No help is needed. One filter can clean 26 gallons (98 liters) of water. A single book of 25 filters could purify enough water for one person for four years.



Book filters being used in Bangladesh

Thus far, each book has been created by hand. In total, they contain about 2,000 sheets of paper filters. The future plan is to make them by an automated process. This will increase the number of books and lower their cost. Copper ions have also been shown to stop bacteria. Copper is much less expensive than silver. Therefore using copper ions in the filters could also make *Drinkable Books* cheaper. ■

PREHISTORIC FISH

Wildlife officials in Bulgaria have released 50,000 small fish into the Danube River. The fish are baby sterlets. These fish used to be

common in the river. Yet overfishing and poaching in recent years means that they are now endangered. Sterlets are a type of sturgeon.

Sturgeon are often described as prehistoric fish, or living fossils. Fossils of sturgeon have been found that are 70 million years old.

Charles Darwin (1809 – 1882) invented the living fossil phrase. Darwin was a naturalist from Britain. He was the first person to write a book about evolution. Darwin used the name “living fossil” to describe animals or plants that have not changed much over millions of years. He believed that this was because the place, or surroundings, in which they lived had not altered. As little had changed, Darwin said that there was no need for living fossils to evolve or adapt to survive.

Six types of sturgeon used to live in the Danube. Only four are left. These are: the Russian and Stellate sturgeons, the Beluga, and sterlets. Of the four, sterlets are the smallest. Fully-grown sterlets are about 3.3 feet (one meter) long. They are a gray color with a thin white stripe down either side of their bodies and along their backs. Sterlets feed on shrimp-like creatures, worms and insect larvae. They are found in rivers that flow into the Black Sea, the Caspian Sea and the Sea of Azov.



Sterlet

The other sturgeon in the Danube will swim down the river and into the Black Sea. They therefore move from fresh water to seawater. These

sturgeon swim up the river to spawn, or lay their eggs. Sterlets do not swim into the Black Sea. They spend all their lives in the river. The eggs of all these sturgeon are valuable. They are sold as caviar. Many people believe that caviar is a delicacy. Small amounts are served with other foods. Even a small amount of caviar is worth a lot of money. This is why so many sturgeon in the Danube have been poached, or caught illegally.

The Danube is Europe’s second-longest river (the longest is the Volga River, in Russia). The river flows through, or along the borders of, Austria, Hungary, Slovakia, Serbia, Croatia, Romania, Bulgaria, Moldova, and Ukraine. The Danube forms most of the border between Bulgaria and Romania. It finally empties into the Black Sea in Romania. The capital cities of Austria (Vienna), Slovakia (Bratislava), Hungary (Budapest), and Serbia (Belgrade) are all on the Danube River.

The baby sterlets were raised in large tanks. Most of the money for this project has come from the European Union (EU). All the fish have been tagged with a tiny metal wire. This wire, which has a number on it, is fixed to one of the fish’s front fins. The tags will help the wildlife officials find out where the sterlets swim to and how they grow. ■

EXPLOSIONS IN TIANJIN

There were a number of huge explosions in the city of Tianjin, in China, during the night of August 12. The largest one created a giant fireball. It lit up the night sky and was even visible from space. The blasts caused fires that burned for several days. Some people said that the largest explosion was like a “nuclear bomb”.

Tianjin is a port city. It is home to about 15 million people. Where the explosions happened is about 93 miles (150 kilometers) from the center of Beijing, China’s capital city. The deadly blasts happened in a warehouse. A company that buys, sells and transports dangerous chemicals owns the building.



Picture of one explosion taken from far away

The explosions killed at least 110 people. Over 700 were injured and 70 are still missing. Most of those who have not been found are firefighters. The warehouse was designed to store dangerous chemicals. One of these is calcium carbide. This chemical reacts with water. When in contact with water it creates acetylene. This is a highly explosive gas.

It seems that firefighters were called to put out a small fire in the warehouse. They either did not know that calcium carbide was being stored there, or thought that it was in a different part of the building. The water they sprayed on the fire could have reacted with the calcium carbide. The fire then ignited the gas. This might explain the huge explosions. The firefighters still missing are those who arrived at the warehouse first.

All buildings near the warehouse were wrecked by the blasts. The windows and doors in several large apartment blocks were “blown out”. These blocks are home to 3,500 people. All have been sent to live in other parts of the city. After the blasts, over 1,000 firefighters worked to

put out all the fires. Military tents were set up outside hospitals. This was because so many people had to have medical treatment.



Picture of explosion site taken by a drone

Military experts were sent to the site. They are trained to handle dangerous chemicals. They found large amounts of sodium cyanide. This powder is used for the chemical and mining industries. It is very dangerous. Anyone who breathes in the powder will die soon afterwards. Because of the sodium cyanide, officials evacuated everyone who lived within 1.9 miles (three kilometers) of the warehouse.

The president of China, Xi Jinping, said that an investigation would be carried out. This will find out exactly what happened and if anyone is to blame. Many people in Tianjin are angry with the government. They say that companies should not be allowed to store dangerous chemicals close to where people live. ■

EARLIEST FLOWERING PLANT?

Fossils of a type of plant were found in Spain over 100 years ago. Since then, in the same area, many more have been uncovered. Researchers from the U.S. and Britain have been using modern technology to study the plant fossils.

The fossils are between 125 and 130 million years old. The plants were aquatic. They grew in

freshwater lakes that used to cover parts of what is now Spain. These ancient water plants are called *Montsechia vidalii*. The researchers have discovered that the plants had small fruits that contained single seeds. Therefore the plants must have had flowers. This means that *Montsechia vidalii* is now the world's oldest known flowering plant.

Flowering plants are called angiosperms. Today, these plants are everywhere. They are very important for humans and the rest of the animal kingdom. Humans have turned some flowering plants, such as rice and corn, into food crops. Nearly every non-meat food people eat starts with an angiosperm. The eggs, milk and meat people consume come from farm animals. These animals are fed on grains, or flowering plants. Even the cotton in clothes people wear comes from an angiosperm.



Montsechia vidalii fossil (David Dilcher)

Fossils can be found in many of the Earth's rocks. Older layers of rock are beneath more recent ones. From fossils in each rock layer it is possible to trace how life-forms slowly changed, or evolved. The progression of fossils, from small microbes to far more complex forms of life, is known as the fossil record.

The fossil record shows that plants were growing on the land 470 million years ago. Then, there were

no flowering plants. The plants that grew were similar to today's ferns and conifer trees. These trees have needle-like leaves and cones that contain their seeds. The fossil record shows that flowering plants seem to have "suddenly" appeared in the early Cretaceous. This period was between 140 million and 66 million years ago. Dinosaurs lived during the Cretaceous. Therefore many of them must have fed on flowering plants.

Flowering plants are sometimes described as the "backbone" of life on the Earth. Yet how they evolved has puzzled scientists. Some used to talk about finding "the first flowering plant". Today's scientists say that this is unlikely to happen. They believe that many plant species started to produce simple flowers at the same time. Yet how and why they did this is still a mystery.

The researchers studied more than 1,000 *Montsechia vidalii* fossils. They treated the stone fossils with drops of acid. When powerful microscopes were used, the acid helped to reveal the exact shape of leaves, small fruits and seeds. The researchers say that modern-day plants called coontails or hornworts are similar to the fossilized plants. These also grow under water and have tiny flowers, which are difficult to see. ■

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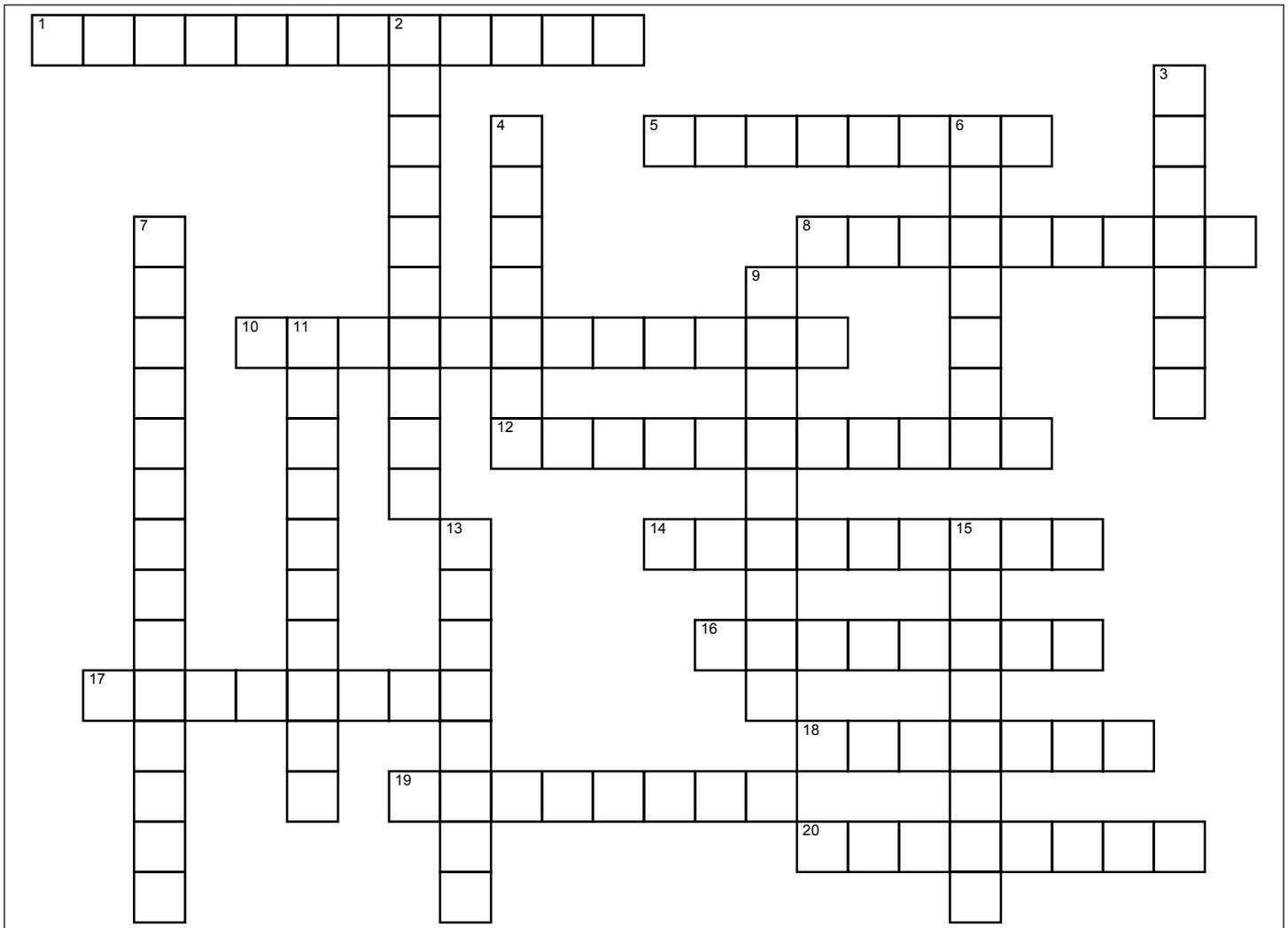
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ISSUE 256

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 Plural** People who fanatically support their country and are not prepared to believe that it has ever done any wrong
- 5 Verb** Raised from the sea or rescued from a disaster
- 8 Verb** Directed many things at something or someone
- 10 Noun** Rearranged how a company is organized
- 12 Noun** The process of changing from a liquid to a vapor
- 14 Noun** Impressive display or sight
- 16 Noun** Resistance or disregard for authority
- 17 Verb** To keep and protect something from danger or damage
- 18 Noun** A feeling of deep regret or guilt
- 19 Adjective** Very sensitive to something that might make you ill
- 20 Verb** To think about something or someone all the time

Down

- 2 Noun** Freedom and equal rights for people who have experienced discrimination or been unfairly treated
- 3 Noun** An entertainment or procession, usually with people wearing costumes to depict an historical scene or event
- 4 Noun** A business, or business idea that has a risk of failure
- 6 Noun** An order to temporarily stop something, especially trading with another country
- 7 Noun** A person who is concerned for his or her fellow human beings, especially as shown by kind and generous acts that benefit many people
- 9 Noun** Got or brought something back
- 11 Noun** A battle between armies or ships
- 13 Verb** Forced to leave or move out
- 15 Verb** Controlled what may be reported in the news and newspapers and what books and magazines can be sold

ISSUE 256

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.

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

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MISSING WORD ANSWER =

ISSUE 255 ANSWERS

D E L I C A C Y