SCIENCE EDITION

CLASSROOM READY

Science News

CLASSROOM READY MONTHLY SCIENCE NEWS •JUNE 2008 • GRADES 5, 6 & 7

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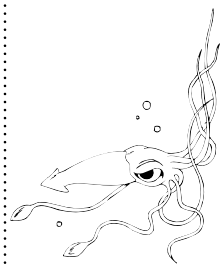

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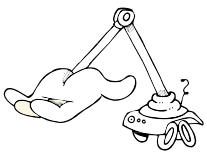

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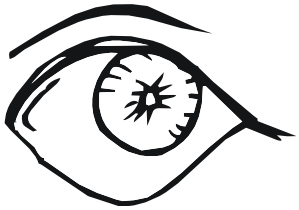
Visionary Diagnosis



A SCIENTIST WORKING AT ETH ZURICH, A TECHNICAL INSTITUTE IN SWITZERLAND, HAS INVENTED AN INNOVATIVE NEW DEVICE THAT TRACKS EYE MOVEMENTS AS A WAY OF DIAGNOSING DISEASE.

Called the Wearable Eye Tracker, the device can be used to diagnose problems such as schizophrenia, **rotary vertigo** and reading and writing deficits. These illnesses have symptoms that can include unusual and distinctive eye movements.

Invented by doctoral student Andreas Bulling, the Wearable Eye Tracker identifies and records these eye movements. The device consists of a set of goggles with electrodes that detect eye movements through changes in electric potentials in the eyes—in a similar way to how **electrocardiograms**, or ECGs, detect heart beats. The use of electric potentials to track eye movements is based on the science of **electro-oculography** (EOG). But what makes the Wearable Eye Tracker innovative is that it is completely portable.

In the past, EOGs were recorded using large machines where a person would sit motionless in a doctor's office or clinic. Beyond being uncomfortable, this wasn't always effective because the eye movements the doctors were looking for might not **manifest** themselves right at that moment.

> The Wearable Eye Tracker can be worn by a person who is moving around in normal life.

In contrast, the Wearable Eye Tracker can be worn by a person who is moving around in normal life. In addition to the goggles, the device includes a mini-computer about the size of a credit card. As the goggle electrodes record the eye movements, they transmit the data along cables to the computer, which records and analyzes the signals in real time.

To allow the device to work while a person is moving, Bulling had to deal with the fact that electrical potentials in the eye change not only as a result of eye movements, but also as a result of changes in light intensity, as well as changes in movement speed. The Wearable Eye Tracker includes both light and acceleration sensors to compensate for these factors. ★

Rotary Vertigo: A condition where a patient feels an illusory sensation of movement, such as the room spinning around her.

Electrocardiograms: The curve traced by a cardiograph, used in the diagnosis of heart disorders.

Electro-Oculography: The study and interpretation of electroencephalograms made by moving the eyes a constant distance between two fixed points.

Manifest: To show or demonstrate plainly; reveal.

Questions

1. What does the innovative new device track?

2. What problems can the Wearable Eye Tracker be used to diagnose?

3. Define rotary vertigo.

4. What makes the Wearable Eye Tracker innovative?

5. How were EOG's recorded in the past?

Scrambled Tracker

Unscramble these words from the story and use the circled letters in the unscrambled word to complete the mystery word below.

1. fanimets ___ ___ ___ ___ ___ ◯ ___ ___

2. borpleat ___ ___ ___ ___ ___ ◯ ___ ___

3. lgegogs ___ ___ ___ ___ ◯ ___ ___

4. aadt ___ ___ ___ ◯

5. toigrev___ ___ ◯ ___ ___ ___ ___

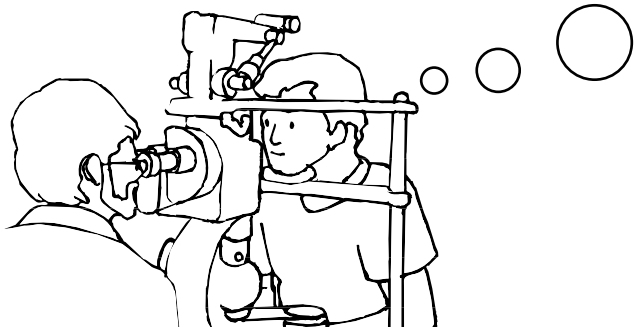
6. snossre ___ ___ ___ ___ ___ ___ ___

7. eadgniso ___ ___ ◯ ___ ___ ___ ___ ___

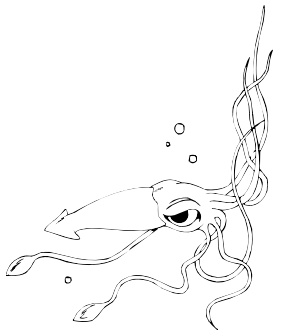
8. dircet drac ___ ___ ◯ ___ ___ ___ ___ ___ ___ ___

W ___ ___ ___ ___ ___ ___ ___
8 4 5 7 2 3 1

Remember the old bulky eye trackers?



A Really Big Squid



IN THE DAYS OF ANCIENT MARINERS, GIANT SQUID WERE CONSIDERED TRUE MONSTERS OF THE DEEP, WITH LEGENDS OF TALL SHIPS BEING DRAGGED DOWN INTO THE OCEAN DEPTHS BY THEIR MASSIVE TENTACLES.

Though no longer viewed as monsters, giant squid, and their even larger cousins, colossal squid, are still a source of mystery and fascination—as shown by the worldwide attention paid to the landing of a 10-metre (34-foot) long, 495 kg (1091 lb) **colossal** squid by New Zealand fishermen in the Ross Sea, near the coast of Antarctica.

Residents of the deepest parts of the ocean, colossal squid are rarely seen. Only six specimens have ever been found and little is known about how and where they live. The specimen caught is the largest intact colossal squid body ever captured.

Since 2007, the squid has been kept frozen in a walk-in freezer. Recently, scientists at the Museum of New Zealand Te Papa Centre defrosted the creature and then dissected it to learn more about this mystery of the deep, with the entire **autopsy** carried live to the world via webcast.

Colossal Calamari

If the colossal squid were made into calamari, the rings would be the size of tractor tires.

Among their discoveries were the colossal squid's huge eyes—measuring 27 centimetres (10.6 inches) in diameter—about the size of a soccer ball. The massive eyes may be necessary for the squid to see in the extreme dark of the depths at which it hunts (believed to be 1,000 metres, or 3,300 feet below the surface of the ocean).

The Te Papa team has also discovered light-emitting organs called photophores just underneath the eyes. These organs may be used to confuse prey about its size, or as a "**cloaking** device" when near the surface.

The team has also determined that the squid was a female, and that it was probably not fully grown—suggesting that adult colossal squid are even bigger. ★

Mariners: A person who serves as a sailor or seaman.
Colossal: Very large or very great; enormous or immense.
Autopsy: Examination of a body after death; often internal organs are examined.
Cloaking: Device used to cover up or hide something.

Questions

1. What do legends say about giant squid?

2. What did scientists at the Museum of New Zealand Te Papa Centre recently do?

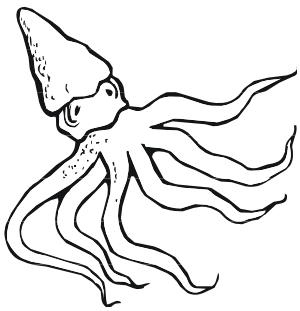
3. Define colossal.

4. How big are the colossal squid's eyes?

5. What might the photophores be used for?

Colossal Squid Facts

Match up the numbers with the descriptions to get some facts about the colossal squid.



10 metres	Number of colossal squid that have ever been found
2007	Number of days it took to thaw the squid
4	Length of squid
6	Depth at which the squid hunts
1,000 metres	Weight of the squid
495 kg	Year the squid was found

Write the equivalents in Imperial measurements:

495 kg _____

10 metres _____

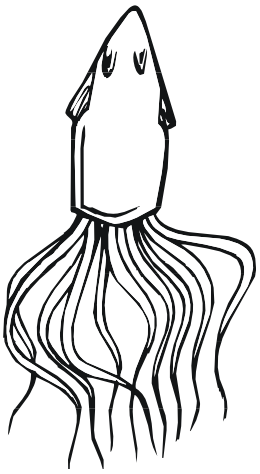
1,000 metres _____

What does a tractor have to do with a colossal squid?

_____

_____

_____



The Face Never Lies

WOULDN'T IT BE GREAT TO KNOW WHEN SOMEONE WAS LYING? PERHAPS YOU COULD READ THEIR THOUGHTS, OR THEIR NOSES WOULD GROW LIKE PINOCCHIO.

Everyone lies. A recent study at Dalhousie University, Nova Scotia, discovered that most university students fibbed an average of two or three times during short everyday conversations. Generally, women lied to make the person they were talking to feel good, while men lied to make themselves look better.

Dalhousie researchers, Stephen Porter and Leanne ten Brinke, showed images that ranged from happy (puppies playing) to fearful (a close-up of an angry, rabid dog) to disgusting (a severed hand) and instructed the volunteers to respond to the photographs with either real or fake emotional expressions. For example, some people were told to smile when looking at the photo of a severed hand. The reactions were watched and judged by other volunteers, who could not see the images. They were also videotaped and analyzed frame by frame.

> Researchers found that most people focus on the lower part of the face while people's true emotions are "leaked" to the observer through the upper face around the eyes and are often missed.

The secret to detecting falsehoods lies in the face. The face and its **musculature** are much more complex than any other external place on the body.

The scientists concluded that no one could hide their emotions perfectly and that some emotions were harder to fake. Video-tape analysis showed "microexpressions," flashes of true emotion that appeared for less than a second on the faces of the participants who attempted to deceive the watchers.

Another study has shown that most people don't focus on the area of the face that displays true emotions. Researchers found that most people focus on the lower part of the face while people's true emotions are "leaked" to the observer through the upper face around the eyes and are often missed. This is especially true for cultures which consider looking people directly in the eye to be an aggressive or threatening behavior. ★

Musculature: The system or arrangement of muscles in a body or a body part.

Questions

1. What did a recent study at Dalhousie University, Nova Scotia, discover?

2. Where does the secret to detecting falsehoods lie?

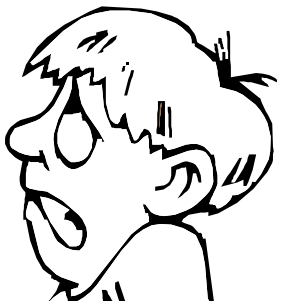
3. Define musculature.

4. What did the scientists conclude?

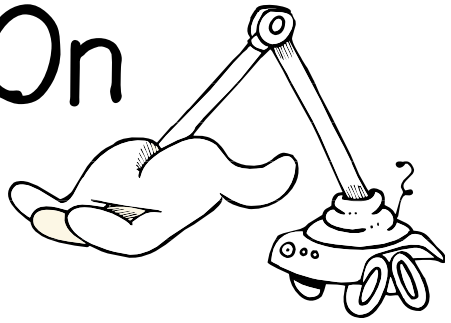
5. According to the researchers, where do most people focus?

Science of Lying

Try to read the emotions on each face. Tell a brief one or two sentence story about what you think happened to each person to make them look that way OR write some ideas you've learned about faces and emotions that the faces make you think about.



Getting A Grip On Things



WHAT CAN HOLD A CREDIT CARD, USE A KEYBOARD, AND LIFT A 20 KG BAG? THE ANSWER? THE WORLD'S FIRST COMMERCIALLY AVAILABLE PROSTHETIC HAND.

Eighteen-year-old Sören Wolf was born with only one hand. His first **prosthetic** hands only allowed him to "pinch" an object using his thumb, index, and middle fingers. He recently tested the two most advanced prosthetic hands, the "i-LIMB" and the "Fluidhand," and was enthusiastic about both models.

The i-LIMB has motors in each finger so every digit can work individually. Muscle signals located in the stump are picked up by **electrodes** on the skin and transferred to the controls in the prosthetic hand. Batteries provide the power.

The Fluidhand has drives located in the movable finger joints. To flex the joints, elastic chambers are pumped up by miniature **hydraulics**. The index finger, middle finger and thumb can be moved independently. The prosthetic hand gives the stump feedback, enabling the **amputee** to sense the strength of the grip. It requires less gripping power and feels softer, more elastic, and more natural than conventional hard prosthetic devices.

The human hand has 27 bones, is very flexible, and can make such a large number of complex movements that it is very difficult to duplicate.

Hundreds of people lose their hands every year. The human hand has 27 bones, is very flexible, and can make such a large number of complex movements that it is very difficult to duplicate. Until recently, prosthetic hands looked like a hand but didn't move, or could only "pinch" with a simple single-motor grip, and were so heavy that they were uncomfortable and caused injury to the area where it joined with the arm.

Sören has been the only patient in the Orthopedic University Hospital in Heidelberg who has tested both models. Only one patient in the world has received a Fluidhand for every-day use. A second patient will soon be fitted with this innovative prosthesis in Heidelberg. ★

Prosthetic: An artificial device used to replace a missing or defective body part, such as a limb or a heart valve.
Electrode: A conductor of an electric current.
Hydraulics: A mechanical device worked by the force of moving liquid.
Amputee: A person who has lost all or part of one or more limbs.

Questions

1. What did Sören Wolf recently test?

2. How is the i-LIMB controlled?

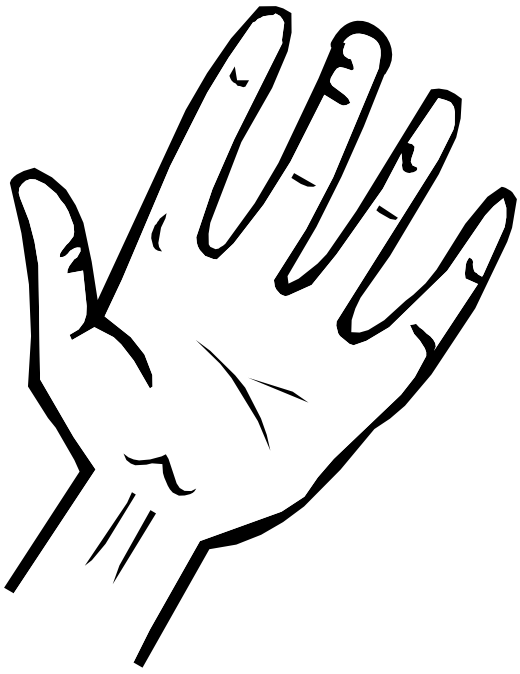
3. Define prosthetic.

4. With the Fluidhand, how does the amputee sense the strength of the grip?

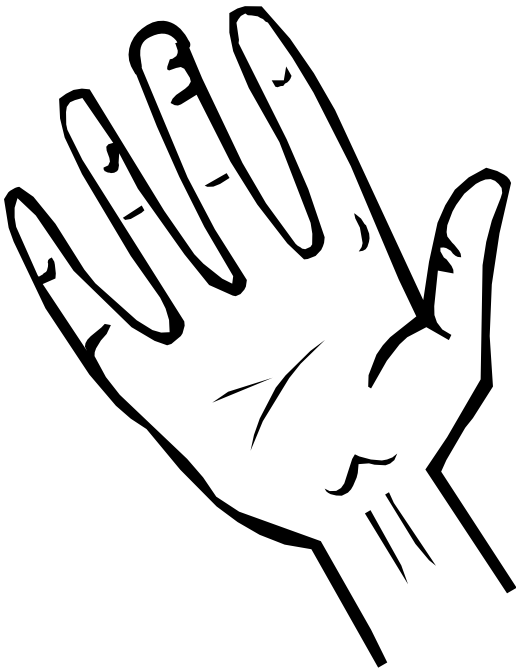
5. Why is the human hand difficult to duplicate?

The Amazing Hand

Make labels or write brief notes around each hand to show the difference between the i-LIMB and the Fluidhand. Below those, trace your own hand and make some notes and labels describing its capabilities.

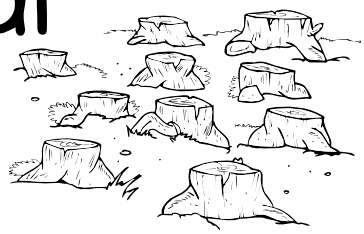


i-LIMB



Fluidhand

Bug Adds to Global Warming Woes



The villains in humanity's battle to stop global warming are well known—exhaust from cars and airplanes, emissions from coal, oil and gas-fired power plants, gas furnaces and factory smokestacks—all of which release carbon dioxide and other greenhouse gases into the atmosphere. Well, add to the list a **diminutive** yet deadly foe: the mountain pine beetle.

Canadian researchers have determined that the pine beetle outbreak is a serious contributor to the problem of global warming. Though smaller than a grain of rice, swarms of these beetles have been killing the mightiest of pine trees. An estimated 33 million acres of pine forest in B.C. and Alberta have already been affected by the outbreak.

The problem is double-edged because forests are normally a "carbon sink"—that is, they absorb carbon dioxide out of the atmosphere. With the death of so many trees due to pine beetles, not only are these trees no longer alive to remove carbon from the atmosphere, their gradual decay is actually turning the forests into a new "carbon source". As trees rot, their stored carbon is released back into the atmosphere.

Though smaller than a grain of rice, swarms of these beetles have been killing the mightiest of pine trees.

Scientists from Natural Resources Canada (NRCan) estimate that between 2000 and 2020, the **decimation** of western Canada's forests by pine beetles will cause the release of 990 megatonnes of greenhouse gases into the atmosphere. "That's equivalent to five times the annual emissions from the transportation sector in Canada," said NRCan's senior research scientist Werner Kurz.

Ironically, one of the believed causes of the pine beetle outbreak is global warming itself. Extended cold periods of -30°C temperatures are needed to kill pine beetles. A succession of mild winters over the past decade have allowed the pine beetle population to grow out of control. ★

Diminutive: Extremely small in size; tiny.

Decimate: To destroy a great number or proportion of.

Questions

1. Name some of the villains in humanity's battle to stop global warming.

2. What have Canadian researchers determined is a serious contributor to the problem of global warming?

3. Define decimate.

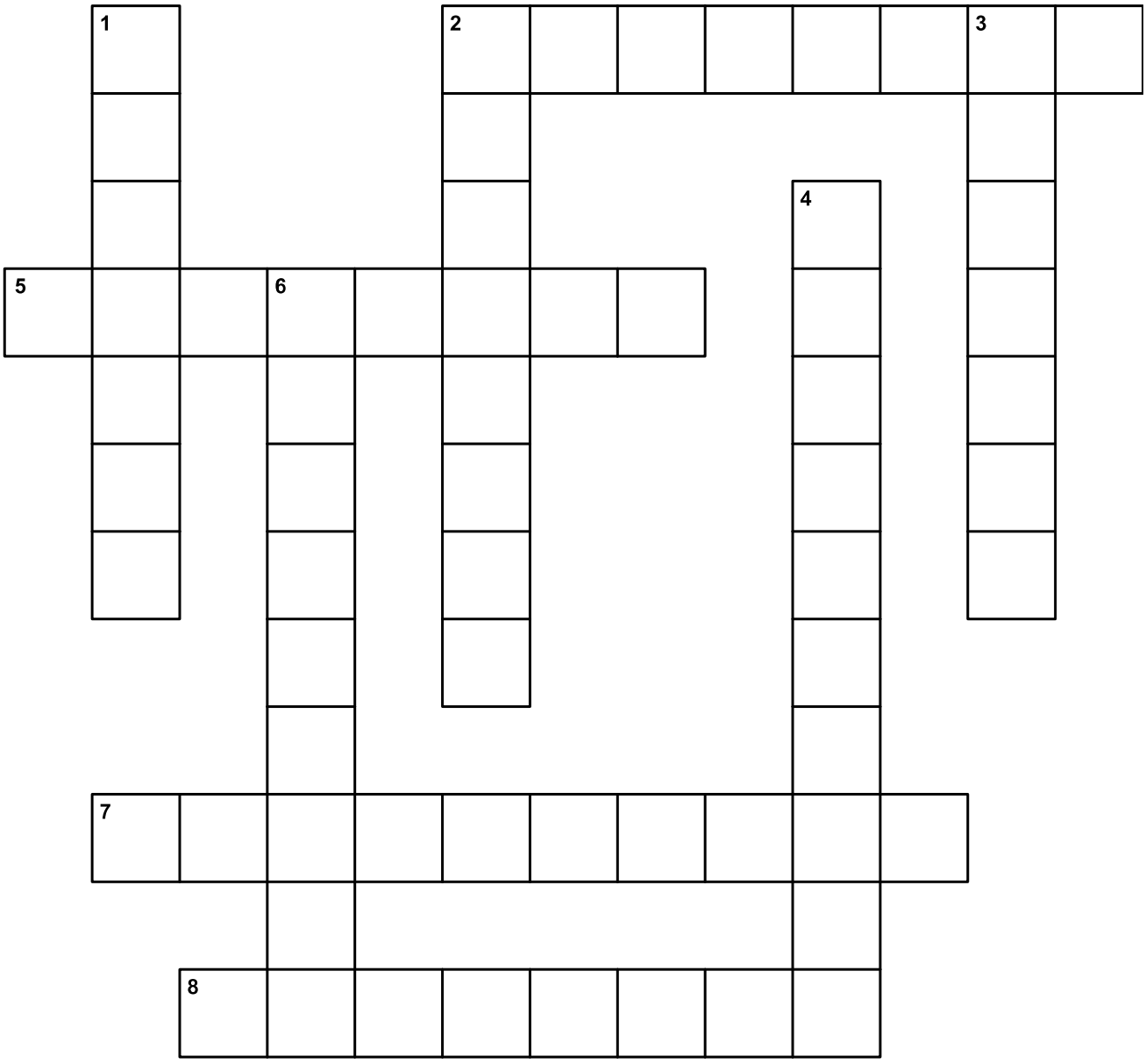
4. Why are the forests turning into a "carbon source"?

5. How has global warming allowed the pine beetle population to grow out of control?

Carbon Sinks and Sources

Complete the following diagrams with titles, labels, arrows, and/or notes to show which is a carbon sink and which is a source of releasing carbon back into the air, and how that works. Refer to the story for ideas.

Science Fun



Across

2. Very large or very great; enormous or immense.
5. Pertaining to a funeral or burial.
7. An artificial device used to replace a missing or defective body part, such as a limb or a heart valve.
8. To destroy a great number or proportion of.

Down

1. Capable of being dissolved or liquefied.
2. Device used to cover up or hide something.
3. Examination of a body after death; often internal organs are examined.
4. Extremely small in size; tiny.
6. A conductor of an electric current.

Quiz

Match the word on the left to the correct definition on the right. (5 marks)

___ Diminutive	A. To show or demonstrate plainly; reveal.
___ Amputee	B. The system or arrangement of muscles in a body or a body part.
___ Manifest	C. A person who has lost all or part of one or more limbs.
___ Musculature	D. Very large or very great; enormous or immense.
___ Colossal	E. Extremely small in size; tiny.

Answer the following questions in the space provided. (5 marks)

1. Which two provinces have been affected by the pine beetle outbreak?

_____

_____

2. Who invented the Wearable Eye Tracker?

_____

_____

3. How many bones are in the human hand?

_____

_____

4. A recent study discovered that most university students fibbed an average of how many times during short everyday conversations?

_____

_____

5. How many colossal squid specimens have been found?

_____

_____

China's Terracotta Army Marches to the Beat of an Egg

IT IS CONSIDERED TO BE ONE OF CHINA'S GREAT HISTORICAL AND CULTURAL TREASURES.

The **Terracotta** Army was created around 210 BC to accompany China's first Emperor, Shi Huang Di, into the afterlife. More than 7,000 ceramic warriors, chariots and horses were individually sculpted and then buried with the Emperor when he died.

The Terracotta Army was discovered in 1974, when local farmers drilling a water well near Xian, stumbled across some of the **funerary** statues. The rest of the figures were soon excavated and the site has since become a popular tourist attraction and a UNESCO World Heritage Site.

Though more than 2,000 years old, the figures are in remarkably good condition and scientists may have figured out at least one reason why. German and Italian chemists have analyzed paint fragments from the surface of several of the figures and have concluded that all of the figures were covered by beaten egg to help preserve them.

The Terracotta Army was discovered in 1974, when local farmers drilling a water well near Xian, stumbled across some of the funerary statues.

"Egg paint is normally very stable and not **soluble** in water...This makes it less sensitive to humidity and moisture," noted Catharina Blaensdorf, a researcher at the Technical University of Munich. The proteins in the egg were also used to help **bind** colourful paints to a lacquer finish. Though many of the bright colours have now faded, the scientists have found a range of pigments, from bone white to malachite, Chinese purple and azurite.

In addition to the sheer number of sculptures, the Terracotta Army is notable because each figure is life-size and life-like in appearance. The figures were individually sculpted with different heights, uniforms, hair styles and facial features. After they were created, the figures were arranged in precise military formation according to rank and duty. ★

Terra Cotta: A clay-based orangey-red hue ceramic, used in sculpture and pottery.
Funerary: Pertaining to a funeral or burial.
Soluble: Capable of being dissolved or liquefied.
Bind: To cause to cohere or stick together in a mass.

Questions

1. When and why was the Terracotta Army created?

2. According to scientists, why are the figures in such remarkably good condition?

3. Define soluble.

4. What were the proteins in the egg also used for?

5. Why is the Terracotta Army so notable?

Answer Key

Visionary Diagnosis (Page 1)

QUESTIONS

1. What does the innovative new device track?
A scientist working at ETH Zurich, a technical institute in Switzerland, has invented an innovative new device that tracks eye movements as a way of diagnosing disease.

2. What problems can the Wearable Eye Tracker be used to diagnose?
The Wearable Eye Tracker can be used to diagnose problems such as schizophrenia, rotary vertigo and reading and writing deficits. These illnesses have symptoms that can include unusual and distinctive eye movements.

3. Define rotary vertigo.
A condition where a patient feels an illusory sensation of movement, such as the room spinning around her.

4. What makes the Wearable Eye Tracker innovative?
What makes the Wearable Eye Tracker innovative is that it is completely portable.

5. How were EOG's recorded in the past?
In the past, EOGs were recorded using large machines where a person would sit motionless in a doctor's office or clinic. Beyond being uncomfortable, this wasn't always effective because the eye movements the doctors were looking for might not manifest themselves right at that moment.

SCRAMBLED TRACKER

manifest
portable
goggles
data
vertigo
sensors
diagnose
credit card

Mystery word: WEARABLE

A Really Big Squid (Page 4)

QUESTIONS

What do legends say about giant squid?
In the days of ancient mariners, giant squid were considered true monsters of the deep, with legends of tall ships being dragged down into the ocean depths by their massive tentacles.

2. What did scientists at the Museum of New Zealand Te Papa Centre recently do?
They defrosted the creature and then dissected it to learn more about this mystery of the deep, with the entire autopsy carried live to the world via webcast.

3. Define colossal.
Very large or very great; enormous or immense.

4. How big are the colossal squid's eyes?
The colossal squid's huge eyes measure 27 centimetres (10.6 inches) in diameter—about the size of a soccer ball.

5. What might the photophores be used for?
These organs may be used to confuse prey about its size, or as a "cloaking device" when near the surface.

LESSON

10 metres - Length of squid
2007 - Year the squid was found
4 - Number of days it took to thaw the squid
6 - Number of colossal squid that have ever been found
1,000 metres - Depth at which the squid hunts
495 kg - Weight of the squid

Metric Equivalents:
495 kg – 1,091 pounds
10 metres – 34 feet
1,000 metres – 3,300 feet

The Face Never Lies (Page 7)

QUESTIONS

1. What did a recent study at Dalhousie University, Nova Scotia, discover?
The study discovered that most university students fibbed an average of two or three times during short everyday conversations.

2. Where does the secret to detecting falsehoods lie?
The secret to detecting falsehoods lies in the face. The face and its musculature are much more complex than any other external place on the body.

3. Define musculature.
The system or arrangement of muscles in a body or a body part.

4. What did the scientists conclude?
The scientists concluded that no one could hide their emotions perfectly and that some emotions were harder to fake.

5. According to the researchers, where do most people focus?
Researchers found that most people focus on the lower part of the face while people's true emotions are "leaked" to the observer through the upper face around the eyes and are often missed.

Getting A Grip On Things (Page 10)

QUESTIONS

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He recently tested the two most advanced prosthetic hands, the "i-LIMB" and the "Fluidhand,"

Answer Key

and was enthusiastic about both models.

2. How is the i-LIMB controlled?
Muscle signals are picked up by electrodes on the skin and transferred to the controls in the prosthetic hand.

3. Define prosthetic.
An artificial device used to replace a missing or defective body part, such as a limb or a heart valve.

4. With the Fluidhand, how does the amputee sense the strength of the grip?
The prosthetic hand gives the stump feedback, enabling the amputee to sense the strength of the grip.

5. Why is the human hand difficult to duplicate?
The human hand has 27 bones, is very flexible, and can make such a large number of complex movements that it is very difficult to duplicate.

Bug Adds to Global Warming Woes (Page 13)

QUESTIONS

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2. What have Canadian researchers determined is a serious contributor to the problem of global warming?
Canadian researchers have determined that the pine beetle outbreak is a serious contributor to the problem of global warming.

3. Define decimate.
To destroy a great number or proportion of.

4. Why are the forests turning into a "carbon source"?
With the death of so many trees due to pine beetles, not only are these trees no longer alive to remove carbon from the atmosphere, their gradual decay is actually turning the forests into a new "carbon source". As trees rot, their stored carbon is released back into the atmosphere.

5. How has global warming allowed the pine beetle population to grow out of control?
Ironically, one of the believed causes of the pine beetle outbreak is global warming itself. Extended cold periods of -30°C temperatures are needed to kill pine beetles. A succession of mild winters over the past decade have allowed the pine beetle population to grow out of control.

CARBON SINKS AND SOURCES

The healthy forest, top, is the carbon sink, taking carbon dioxide out of the air.

The rotting forest is a carbon source, releasing the carbon dioxide it has absorbed back into the atmosphere.

Science Quiz (Page 17)

MATCH THE WORD ON THE LEFT TO THE CORRECT DEFINITION ON THE RIGHT. (5 MARKS)

DIMINUTIVE	**E.** Extremely small in size; tiny.
AMPUTEE	**C.** A person who has lost all or part of one or more limbs.
MANIFEST	**A.** To show or demonstrate plainly; reveal.
MUSCULATURE	**B.** The system or arrangement of muscles in a body or a body part.
COLOSSAL	**D.** Very large or very great; enormous or immense.

ANSWER THE FOLLOWING QUESTIONS IN THE SPACE PROVIDED.(5 MARKS)

1. Which two provinces have been affected by the pine beetle outbreak?
B.C. and Alberta

2. Who invented the Wearable Eye Tracker?
Doctoral student Andreas Bulling.

3. How many bones are in the human hand?
27

4. A recent study discovered that most university students fibbed an average of how many times during short everyday conversations?
Two or three times.

5. How many colossal squid specimens have been found?
Six

China's Terracotta Army Marches to the Beat of an Egg (Page 18)

QUESTIONS

1. When and why was the Terracotta Army created?
The Terracotta Army was created around 210 BC to accompany China's first Emperor, Shi Huang Di, into the afterlife.

2. According to scientists, why are the figures in such remarkably good condition?
German and Italian chemists have analyzed paint fragments from the surface of several of the figures and have concluded that all of the figures were covered by beaten egg to help preserve them.

3. Define soluble.
Capable of being dissolved or liquefied.

4. What were the proteins in the egg also used for?
The proteins in the egg were also used to help bind colourful paints to a lacquer finish.

5. Why is the Terracotta Army so notable?
In addition to the sheer number of sculptures, the Terracotta Army is notable because each figure is life-size and life-like in appearance. The figures were individually sculpted with different heights, uniforms, hair styles and facial features.