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HEALTH

Bone Loss in Space

A recent study found that spending six months in space can cause astronaut bones to become weaker. The study tracked astronauts on the International Space Station (ISS).

The ISS is located in low Earth orbit where there is very little gravity. It is why you see astronauts in the ISS floating. There are consequences to the **microgravity** environment.

Leigh Gabel is an exercise scientist. She was part of the team studying astronaut bones. She points out that our bones are constantly changing. Old bone breaks down so new bone can take its place. From childhood to young adulthood, our bones are constantly growing. As we age, our bones can start to **deteriorate**.

One way to prevent bone loss is exercise. Exercise triggers the body to build

up our bones so they are stronger. Earth's gravity forces us to exercise. Standing and walking around puts pressure on our bones, but in space that pressure is gone.

For the study, scientists took images of the bones of 17 astronauts who spent between four and seven months in space. The images allowed scientists to measure the **bone density** of the tibia (a bone in the leg) and the radius (a bone in the arm). The researchers took images of the bones four times: once just before the astronaut went into space, once when they returned to Earth, and six months and one year after their return.

They found that astronauts experienced losses in bone density in their tibias. The bone loss was worse the more time the astronaut spent in space. They also found that astronauts experienced



almost no bone loss in their arms. That made sense since astronauts often work out their arms to get around, for example by pushing off handles and doorways.

Weightlifting exercises in space could be important in preventing bone loss in the legs. This could be important as humans consider longer missions in space. ★



DID YOU KNOW

It takes about two years to travel to Mars.

To view videos, go to:
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WORD POWER

MICROGRAVITY: Very weak gravity found in an orbiting spacecraft

DETERIORATE: To become worse as time passes

BONE DENSITY: The amount of minerals in a certain volume of bone (higher bone density means stronger bones)

HEALTH

Bone Loss in Space

1. What did Leigh Gabel point out about our bones?

2. How does exercise prevent bone loss?

3. What images did the scientists take? What did the images allow them to do?

4. What did the astronauts find?

5. What could be important to prevent bone loss?

CRITICAL THINKING

1. Do you exercise? How does exercise affect your body?

Weak Bones

Your bones are in a constant state of renewal. New bone is made and old bone is broken down. When you are young, your body makes new bone faster than it breaks down old bone and your bone mass increases. After your early 20s, this process slows, and most people reach their peak bone mass by age 30. As people age, bone mass is lost faster than it is created.

Osteoporosis occurs when the creation of new bone doesn't keep up with the loss of old bone. Osteoporosis causes bones to become weak and brittle, so brittle that a fall or even mild stresses such as bending over or coughing can cause a fracture. Osteoporosis-related fractures most commonly occur in the hip, wrist, or spine.

Do some research into how we can try to keep our bones strong as we age. Write your findings in the space below.

INNOVATION

Calgary Student Creates Life-saving Drone

Max Du is 14 years old and lives in Calgary, Alberta. This spring, he won the Canada-wide Science Fair for Grades 9 to 10. He won the award for building a “rescue drone.” The drone is designed to help save someone suffering from a heart attack at home.

Du got the idea during Christmas break last year. He received a toy drone from his parents, but he couldn’t fly it outside because it was cold and snowy. Instead, Du started experimenting. He wanted to see if he could **modify** the drone into an indoor robot that could help someone suffering from a heart attack.

Some people suffer from heart conditions and are at high risk for a heart attack. If a patient has an attack at home and collapses without their medications nearby, they could die before an

ambulance has time to arrive. Du’s idea is that a drone could be used to deliver life-saving medications to that patient.

He started making modifications to the drone to give it some new abilities. For example, he added an extendable arm to the drone that can be used to administer a needle or hand a patient their pills. The arm can also open closed doors. Du added a camera to allow the drone operator to see and monitor a patient from a remote location.

Each new addition to the drone added problems Du had to solve. He had to find the right, lightweight materials and add them to the drone in such a way that it could still fly and stay balanced. He spent hundreds of hours testing the drone, often learning from crashes and having to repair it. Through a lot of trial and error, he finally



got the drone to work.

Du’s science teacher encouraged him to show the drone **prototype** at an Alberta-wide science fair. When his project won top prize, he submitted it to the Canada-wide Science Fair. Du has applied for a **patent** and plans to keep improving his medical life-saving technology. ★



DID YOU KNOW

According to the Heart and Stroke Foundation, about 35 000 people have cardiac arrests in Canada each year. Of those who have a cardiac arrest outside of a hospital, fewer than 10 percent survive.

To view videos, go to:
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WORD POWER

MODIFY: To change some parts of something while not changing other parts

PROTOTYPE: A first model of something, used to test an idea

PATENT: A legal document that identifies someone as the inventor of something, making it illegal for someone else to copy and sell it without permission

INNOVATION**Calgary Student Creates Life-saving Drone**

1. What did Max Du do this spring?

2. When did Du get the idea?

3. How could Du's idea help someone having a heart attack?

4. What are some of the modifications Du made?

5. Once Du got the drone to work, what did he do with it?

CRITICAL THINKING

1. Can you think of some other uses for the drone? List a few ideas.

Drone Modifications

Drones can be used for many different things, from saving lives to making deliveries. Work on your own or in pairs. Think of a new use for a drone. What kinds of modifications will it need? How will the modifications affect things like speed, distance the drone can fly, and balance? Use the space below to describe your drone or to draw images of the modifications.

TECHNOLOGY

Dealing with Water Shortage

Singapore could be facing a water shortage in the next few decades. It is looking for ways to prevent this from happening.

Singapore is an island **city-state** in southeast Asia that is home to about 5.5 million people. Singaporeans use about 430 million gallons of water every day. That is about 10 million bathtubs full of water. The country has few natural sources of water. It must import about 40 percent of the water it uses from neighbouring countries. So far, that hasn't been a problem.

That could change. Singapore's water needs are expected to double in the next 40 years as its population increases. As well, climate change could affect how much water is available to the region. It is expected that parts of southeastern Asia will start to receive less rainfall

and some rivers are expected to dry up. Neighbouring nations may become less willing to export water to Singapore.

Singapore officials are looking for ways to get ahead of the problem. For example, they are encouraging citizens to conserve water by taking shorter showers and not leaving the tap running when washing dishes. The Singapore government is also building **desalination** plants that will turn sea water into fresh, drinkable water. The problem is that desalination plants use a lot of energy.

Singapore is also investing in new technologies that will help it clean and reuse existing water supplies. For example, EcoWorth Technology has created a material called carbon fibre aerogel. The aerogel is like a sponge. When placed in water, it can absorb and trap 190 times its weight



in waste and **contaminants**. The material could be used in wastewater plants to clean water on a mass scale.

Wateroam has invented a portable water filtration device about the size of a bicycle pump. It separates contaminants from the water. This device could help families living in rural areas. According to the company, one device can provide clean water to villages of 100 people for up to two years. ★



DID YOU KNOW

Singapore is just 733 square kilometres in size. That is about one-eighth the size of Prince Edward Island.

To view videos, go to:
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WORD POWER

CITY-STATE: A city and its surrounding area that is also an independent, self-governing country

DESALINATION: A process that removes salt from seawater

CONTAMINANT: A polluting or poisonous substance that makes something impure

TECHNOLOGY**Dealing with Water Shortage**

1. How much water does Singapore use?

2. Where does Singapore get its water?

3. Why could neighbouring nations become less willing to export water to Singapore?

4. What are Singapore officials encouraging citizens to do?

5. What does the carbon fibre aerogel do?

CRITICAL THINKING

1. How does Canada compare to Singapore when it comes to natural sources of water?

ENVIRONMENT

Cheetahs Making a Comeback in India



Cheetahs once roamed across large stretches of Africa, the Middle East, and India. The cheetah was declared extinct in India in 1952. Now the cheetah is about to make a long-awaited return to India.

Why did the cheetah become extinct in India? Men hunted the big cats throughout the 1800s and into the first half of the 20th century. During that time, India was a colony of Great Britain. British officials offered money to hunters who killed cheetahs. It was part of an effort to make the country safe from deadly predators.

Yadvendradev Jhala says cheetahs were an important part of Indian culture going back thousands of years. He points out that the word “cheetah” comes from the Hindi word “chita,” meaning “spotted one.”

The first attempt to bring

cheetahs back to India was in the 1970s, when the government of India proposed to trade some lions to Iran for cheetahs. The deal fell through.

Now, Jhala and other Indian conservationists have arranged to have 20 cheetahs transported to India from South Africa and Namibia. The cheetahs were mostly captured from **reserves** in the two African countries.

The cheetahs were given antibiotics and vaccinated for diseases. Now they are awaiting the trip to their new home. They will be transported to Kuno National Park, which is a wildlife sanctuary. The cheetahs will be **quarantined** for a month before being released into the wild.

Jhala has been working on the cheetah’s return for 20 years. He can’t wait to see these majestic creatures once again loping across India.

The antelope in India might not agree. Antelope are one of the cheetah’s favourite prey. Jhala says this will be a good thing. It will restore a part of the natural habitat, helping to keep antelope populations in balance. ★



DID YOU KNOW

The cheetah is considered the fastest land animal in the world. It can reach up to 120 kilometres per hour at top speed.

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WORD POWER

HINDI: The official language of northern India

RESERVE: An area of natural wilderness where human development like cities and farms aren’t allowed to protect the plants and animals living there

QUARANTINE: When people or animals are placed in isolation for a period of time to make sure they don’t have any infections or diseases they could pass on to others

ENVIRONMENT**Cheetahs Making a Comeback in India**

1. Why did the cheetah become extinct in India?

2. Where does the word “cheetah” come from?

3. What have Jhala and other conservationists arranged?

4. What will happen to the cheetahs?

5. How will the cheetahs help to restore the national habitat?

CRITICAL THINKING

1. What are your thoughts on re-introducing cheetahs to India? Do you think it will work? Explain your answer.

World's Fastest Animals

Below is a list of the fastest land animals in the world. There are different ways to rank the speed of fast animals. This list looks at the top recorded speed of a species and ranks them from one to ten.

1. Cheetah 120.7 km / 75 m per hour

The cheetah can accelerate from a standing start to over 95 km per hour in 3 seconds. Its top speed is around 120 km per hour, by far the fastest land animal in the world. This fast speed is limited to very short bursts, with cheetahs able to sprint at top speed only for around 60 seconds.

2. Pronghorn 88.5 km / 55 m per hour

Ranging from Canada to California, the pronghorn has the stamina to run over long distances, with the ability to run at a maximum speed of 56 km per hour for 6 km.

3. Springbok 88 km / 55 m per hour

The springbok is a smallish gazelle that lives in herds across southern Africa. Aside from their speed, which they can maintain only for short distances, their special skills are 3-metre-high bounce-like jumps, and sharp turns while running. This allows them to shake off chasing predators.

4. Wildebeest 80.5 km / 50 m per hour

There are two species of wildebeest found in East and Southern Africa – the blue wildebeest and black wildebeest – both of which are surprisingly fast for their size. Their build lends them to endurance running rather than sprinting, which helps them in their continual overland migration.

5. Lion 80.5 km / 50 m per hour

The lion has a top speed of 80 km per hour. Like the cheetah, the lion can only manage their top speed for short bursts, meaning they need to stalk close to their prey and work as a team to ensure a successful hunt.

6. Blackbuck 80 km / 50 m per hour

The blackbuck (or the Indian antelope) is found across southern Asia in India, Nepal, and Pakistan. They are able to maintain their top speed of 80 km per hour for over 1.5 km, helped by their huge strides of 6.5 metres.

7. Hare 80 km / 50 m per hour

Hares have long, powerful hind legs that help them reach speeds of up to 80 km per hour to evade predators in their grassland habitats.

8. Greyhound 74 km / 46 m per hour

Greyhounds belong to a family of hunting dogs called sighthounds and have been bred over hundreds of years to become the fastest dogs in the world, with a recorded top speed of 74 km per hour.

9. Kangaroo 71 km / 44 m per hour

Kangaroos are large marsupials found only in Australia and some New Guinea islands. Their long, strong back legs and muscular tails are made for speed, and they have been recorded hopping at 71 km per hour in short bursts, considerably faster than their cruising speed of around 25 km per hour.

10. African wild dog 71 km / 44 m per hour

The endangered African wild dogs have a successful hunt percentage of over 60 percent. This is a result of their speed and stamina, amongst other things. They can sprint at 66 km per hour in short bursts, and run for longer distances at 60 km per hour.

1. Which animals can only maintain their speed for short distances?

2. Which animals can maintain their speed over long distances?

3. How fast can a cheetah run?

4. How fast can a lion run?

5. Which animals can run at a speed of over 85 km per hour?

6. What is the cruising speed of a kangaroo?

7. What are the special skills of a springbok?

8. What is the sprinting speed of an African wild dog?



BIG IDEAS

What Are Fossil Fuels?



In certain places, if you dig underground, you will discover fossil fuels. The three main fossil fuels are coal, oil, and natural gas. If you burn these fuels, they release energy.

The earliest fossil fuel discovered was coal. It is believed that humans have burned coal to create heat since the days of cavemen. During the **Industrial Revolution** coal became important. Coal was burned to power machines like steam engines and generators, which in turn powered ships, trains, and factories. Coal is still burned today to generate electricity.

In the 1800s, it was also discovered that you could burn oil and natural gas to generate energy. It was also discovered that oil could be **refined** to create gasoline and jet fuel. This triggered the transportation age of automobiles and airplanes.

We have come to depend

on fossil fuels to power our transportation networks and factories, and to generate electricity and heat for our homes. We also use oil and natural gas to create plastics found in millions of products we use every day.

All three fossil fuels were formed from small plants and animals that lived in shallow seas and lakes millions of years ago. When they died, they decayed into organic matter that sank to the bottom of lakes and seas. Over millions of years, that organic matter was covered by many layers of **sediment**. Heat and pressure gradually changed the organic matter into coal, oil, and natural gas. The reason they are called “fossil fuels” is that they are made from the fossils of organisms that once were alive.

Because it took so long to make these fuels, they are called nonrenewable. Once we use up what is in the ground,

we won't be able to make any more. That is one reason why some say we need to switch to renewable energy sources like solar, wind, and hydroelectricity.

Burning fossil fuels also creates greenhouse gases like carbon dioxide and methane. The burning of fossil fuels has been one of the main causes of global warming and climate change.★



DID YOU KNOW

While efforts are being made to use less fossil fuels, they currently still supply almost 80 percent of all energy used in the world.

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WORD POWER

INDUSTRIAL REVOLUTION: The period between 1760 and 1850 when new machinery, new sources of power, and new ways of manufacturing products were

developed in Western Europe and North America

REFINE: Converting oil into other substances, such as gasoline, diesel,

propane, and jet fuel

SEDIMENT: Material such as stones and sand that is carried into water by water or wind

BIG IDEAS**What Are Fossil Fuels?**

1. What are the three main fossil fuels?

2. Why did coal become important during the Industrial Revolution?

3. What was discovered during the 1800s?

4. How have we come to depend on fossil fuels?

5. How were fossil fuels formed?

CRITICAL THINKING

1. Do you think that we should switch to renewable energy sources? Explain your answer.

Science News Quiz

BONE LOSS IN SPACE

1. One way to prevent bone loss is to _____.
2. The study found that the bone loss was worse the less time the astronaut spent in space.
True False

CALGARY STUDENT CREATES LIFE-SAVING DRONE

1. Why couldn't Max Du fly his drone outside?
A. It was broken. B. It was cold and snowy. C. It was too hot.
2. Du modified his drone into an indoor robot that could help someone suffering from a _____
_____.

DEALING WITH WATER SHORTAGE

1. Singaporeans use about 430 million gallons of water in what time period?
A. A year B. A month C. A day
2. Singapore is investing in new _____ that will help it clean and reuse existing water supplies.

CHEETAHS MAKING A COMEBACK IN INDIA

1. British officials offered money to hunters who killed cheetahs as part of an effort to make the country safe from deadly predators.
True False
2. The word "cheetah" comes from the Hindi word "chita," meaning "_____."

WHAT ARE FOSSIL FUELS?

1. What are the three main fossil fuels?
A. Coal, oil, natural gas B. Coal, solar power, wind power C. Oil, gasoline, diesel
2. The reason they are called "fossil fuels" is that they are made from the _____ of organisms that once were alive.

Science News Answer Key

Bone Loss in Space

1. What did Leigh Gabel point out about our bones?

She points out that our bones are constantly changing. Old bone breaks down so new bone can take its place. From childhood to young adulthood, our bones are constantly growing. As we age, our bones can start to deteriorate.

2. How does exercise prevent bone loss?

One way to prevent bone loss is exercise. Exercise triggers the body to build up our bones so they are stronger.

3. What images did the scientists take? What did the images allow them to do?

For the study, scientists took images of the bones of 17 astronauts who spent between four and seven months in space. The images allowed scientists to measure the bone density of the tibia (a bone in the leg) and the radius (a bone in the arm).

4. What did the astronauts find?

They found that astronauts experienced losses in bone density in their tibias. The bone loss was worse the more time the astronaut spent into space. They also found that astronauts experienced almost no bone loss in their arms.

5. What could be important to prevent bone loss?

Weightlifting exercises in space could be important in preventing bone loss in the legs.

Calgary Student Creates Life-saving Drone

1. What did Max Du do this spring?

This spring, he won the Canada-wide Science Fair for Grades 9 to 10. He won the award for building a “rescue drone.”

2. When did Du get the idea?

Du got the idea during Christmas break last year. He received a toy drone from his parents, but he couldn't fly it outside because it was cold and snowy. Instead, Du started experimenting.

3. How could Du's idea help someone having a heart attack?

If a patient has an attack at home and collapses without their medications nearby, they could die before an ambulance has time to arrive. Du's idea is that a drone could be used to deliver life-saving medications to that patient.

4. What are some of the modifications Du made?

He added an extendable arm to the drone that can be used to administer a needle or hand a patient their pills. The arm can also open closed doors. Du added a camera to allow the drone operator to see and monitor a patient from a remote location.

5. Once Du got the drone to work, what did he do with it?

Du's science teacher encouraged him to show the drone prototype at an Alberta-wide science fair. When his project won top prize, he submitted it to the Canada-wide Science Fair. Du has applied for a patent and plans

to keep improving his medical life-saving technology.

Dealing with Water Shortage

1. How much water does Singapore use?

Singaporeans use about 430 million gallons of water every day. That is about 10 million bathtubs full of water.

2. Where does Singapore get its water?

The country has few natural sources of water. It must import about 40 percent of the water it uses from neighbouring countries. So far, that hasn't been a problem.

3. Why could neighbouring nations become less willing to export water to Singapore?

Climate change could affect how much water is available to the region. It is expected that parts of southeastern Asia will start to receive less rainfall and some rivers are expected to dry up. Neighbouring nations may become less willing to export water to Singapore.

4. What are Singapore officials encouraging citizens to do?

They are encouraging citizens to conserve water by taking shorter showers and not leaving the tap running when washing dishes.

5. What does the carbon fibre aerogel do?

The aerogel is like a sponge. When placed in water, it can absorb and trap 190 times its weight in waste and contaminants. The material could be used in wastewater plants to clean water on a mass scale.

Cheetahs Making a Comeback in India

1. Why did the cheetah become extinct in India?

Men hunted the big cats throughout the 1800s and into the first half of the 20th century. During that time, India was a colony of Great Britain. British officials offered money to hunters who killed cheetahs. It was part of an effort to make the country safe from deadly predators.

2. Where does the word “cheetah” come from?

The word “cheetah” comes from the Hindi word “chita,” meaning “spotted one.”

3. What have Jhala and other conservationists arranged?

Jhala and other Indian conservationists have arranged to have 20 cheetahs transported to India from South Africa and Namibia. The cheetahs were mostly captured from reserves in the two African countries.

4. What will happen to the cheetahs?

They will be transported to Kuno National Park, which is a wildlife sanctuary. The cheetahs will be quarantined for a month before being released into the wild.

5. How will the cheetahs help to restore the national habitat?

Antelope are one of the cheetah's favourite prey. Having cheetahs in India will restore a part of the natural habitat, helping to keep antelope populations in balance.

World's Fastest Animals

1. Which animals can only maintain their speed for short distances?

Cheetah, springbok, lion, kangaroo

2. Which animals can maintain their speed over long distances?

Pronghorn, wildebeest, blackbuck, African wild dog

3. How fast can a cheetah run?

Science News Answer Key

120.7 km per hour

4. **How fast can a lion run?**
80.5 km per hour
5. **Which animals can run at a speed of over 85 km per hour?**
Cheetah, pronghorn, springbok
6. **What is the cruising speed of a kangaroo?**
25 km per hour
7. **What are the special skills of a springbok?**
3-metre-high bounce-like jumps and sharp turns while running
8. **What is the sprinting speed of an African wild dog?**
66 km per hour

What Are Fossil Fuels?

1. **What are the three main fossil fuels?**
The three main fossil fuels are coal, oil, and natural gas.
2. **Why did coal become important during the Industrial Revolution?**
Coal was burned to power machines like steam engines and generators, which in turn powered ships, trains, and factories.
3. **What was discovered during the 1800s?**
In the 1800s, it was also discovered that you could burn oil and natural gas to generate energy. It was also discovered that oil could be refined to create gasoline and jet fuel. This triggered the transportation age of automobiles and airplanes.
4. **How have we come to depend on fossil fuels?**
We have come to depend on fossil fuels to power our transportation networks and factories, and to generate electricity and heat for our homes. We also use oil and natural gas to create plastics found in millions of

products we use every day.

5. **How were fossil fuels formed?**
All three fossil fuels were formed from small plants and animals that lived in shallow seas and lakes millions of years ago. When they died, they decayed into organic matter that sank to the bottom of lakes and seas. Over millions of years, that organic matter was covered by many layers of sediment. Heat and pressure gradually changed the organic matter into coal, oil, and natural gas.

Science News Quiz

BONE LOSS IN SPACE

1. One way to prevent bone loss is to **EXERCISE**.
2. **The study found that the bone loss was worse the less time the astronaut spent in space.**
False – The more time

CALGARY STUDENT CREATES LIFE-SAVING DRONE

1. **Why couldn't Max Du fly his drone outside?**
B. It was cold and snowy.
2. Du modified his drone into an indoor robot that could help someone suffering from a **HEART ATTACK**.

DEALING WITH WATER SHORTAGE

1. **Singaporeans use about 430 million gallons of water in what time period?**
C. A day
2. Singapore is investing in new **TECHNOLOGIES** that will help it clean and reuse existing water supplies.

CHEETAHS MAKING A COMEBACK IN INDIA

1. British officials offered money to hunters who killed cheetahs as part of an effort to make the country safe from deadly predators.

True

2. The word “cheetah” comes from the Hindi word “chita,” meaning “**SPOTTED ONE.**”

WHAT ARE FOSSIL FUELS?

1. What are the three main fossil fuels?
A. Coal, oil, natural gas
2. The reason they are called “fossil fuels” is that they are made from the **FOSSILS** of organisms that once were alive.