2025

BANGKOK PREP'S

SCIENCE

MAGAZINE

OUR FIRST ISSUE!

In this issue, you will see all things Science! From articles about key scientists, advice from our own senior students, and even a fun science experiment relating to electromagnetism and static electricity. Who doesn't like static electricity?! Trust us, you will not regret seeing this...

NOTE FROM THE EDITORS

This is the first edition of the Bangkok Prep science magazine. This magazine consists of fun experiments conducted by the team, interesting science facts, advice from your seniors and some fun activities along the way to accompany your read.

We would also like to thank Ms Herrera for bringing the team together and helping us create and publish this magazine. We were also able to conduct the fascinating experiments with her assistance.

Arsh Gupta - 12MB

Junmo Koo - 12TC

Sammy Perry - 7WG

Aryaveer Tripathi - 7LP

TABLE OF CONTENT

What life on MARS would be like

Environment

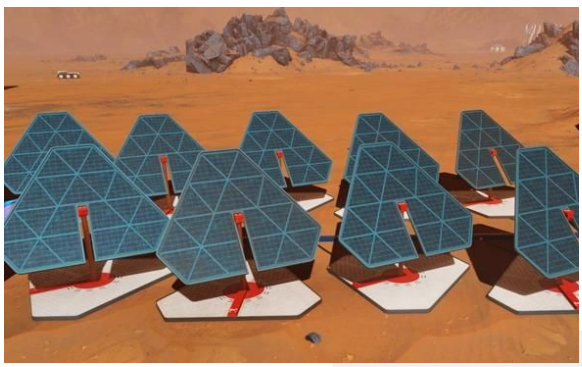
The atmosphere in Mars is made of 5% carbon dioxide so we cannot breathe the outside air. The average surface temperature is -63 degrees celcius so we would require specialised suits to keep us warm. Mars also doesn't have a magnetic field so dealing with direction and radiation from the sun would be difficult. Strong shelters would also be required to protect against the dust storms.

Food and Water

Water can be found from the frozen rivers underground and then be purified and cleaned for human use. All food will have to be brought from Earth or grown on Mars by building a greenhouse and using artificial light and recycled water. This means that everyone would have a plant-based diet and no fast food or luxury foods.

Everyday life

Just getting to Mars would take around 6 to 9 months. To get electricity, solar panels are a great option. There could also be back up energy from mini nuclear reactors which could provide the energy during storms. Accessing the internet would be really slow and sometimes not possible if the planets are at opposite sides of the Sun. You would feel a lot lighter and have to wear suits everytime you want to go out.



OPTIONS ADVICE FROM OUR SENIORS

1. Do your research. Look at the subjects' syllabus for a brief overview of the course. If you are targeting a university or a course, then check the requirements and recommended subjects.

2. Pick subjects that you find interesting. You're more likely to work hard if you enjoy a subject.

3. If you are good at a subject, then taking it **could** be worthwhile taking it. You might enjoy the subject content (which is why you should do your research).

Pip Purttiponthanee 12AB

If you don't know what to choose, cut out the subjects you would definitely dread. Try to align your subjects so they have topics that connect, i.e. physics and maths.

Prioritise picking subjects you enjoy and do well in rather than subjects you have no interest in. As long as you enjoy the subject, you'll be fine in the long run.

Dd Pattanayanon 12AB

OPTIONS ADVICE FROM OUR SENIORS

Pick subjects that align with what you want to be in the future, that said simply pick subjects you enjoy.

If you’re good at a subject but don't like it, then don't pick it. It'll be horrible in the long run as A-level content is quadruple that of IGCSE.

Also pick subjects that you're willing to revise outside of class.

Pradh Kaitkanarat 12PK

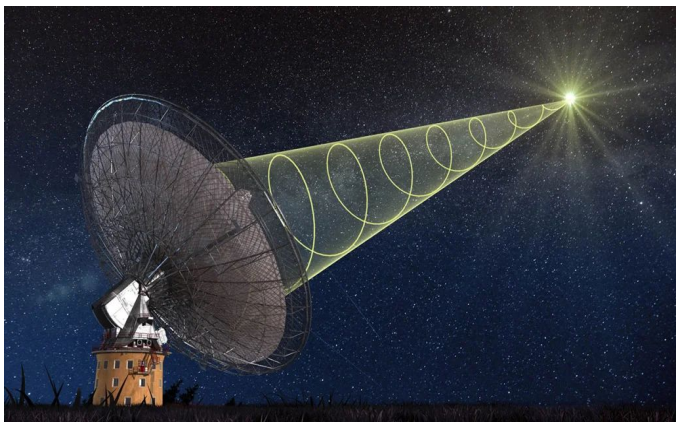
DID YOU KNOW...?

A DAY ON VENUS IS LONGER THAN A YEAR ON VENUS!

Venus has a much slower rotation than Earth, completing one whole rotation in 243 days. While it only takes 225 days to orbit the sun.

1 day on Venus = 243 Earth days

1year on Venus = 225 Earth days

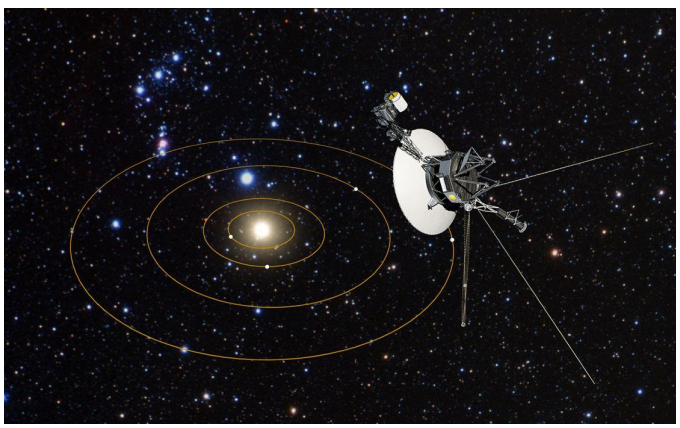


THE INTERNET WAS CREATED BY ACCIDENT!

Scientists were researching black holes by detecting faint radio waves when they discovered that they could send data signals wirelessly.

LIGHTNING IS 5 TIME HOTTER THAN THE SUN'S SURFACE!

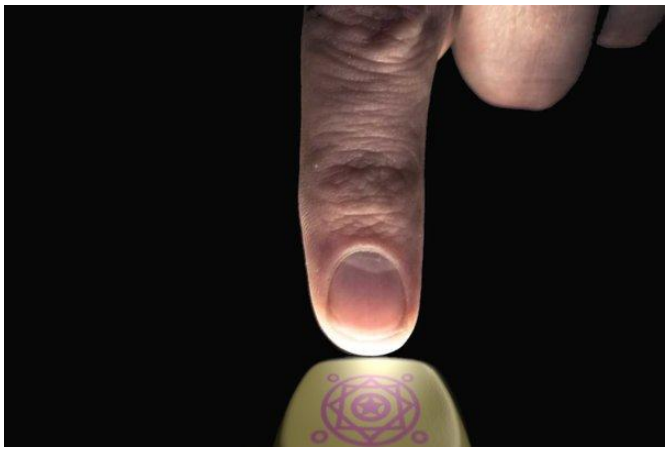
A single bolt of lightning can reach up to 30,000 degrees celsius while the surface of the sun is around 6,000 celsius. Yes, people have survived lightning strikes.



NASA HAS A SPACESHIP OUTSIDE OF THE SOLAR SYSTEM!

The Voyager 1 probe was launched in 1977 and is over 25 billion kilometers away from Earth, outside the heliosphere. It holds a golden record with images of Earth in case other life forms find it.

DID YOU KNOW...? (cont'd)

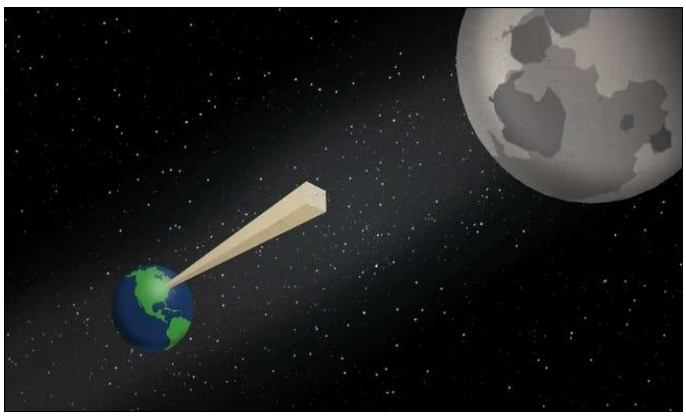


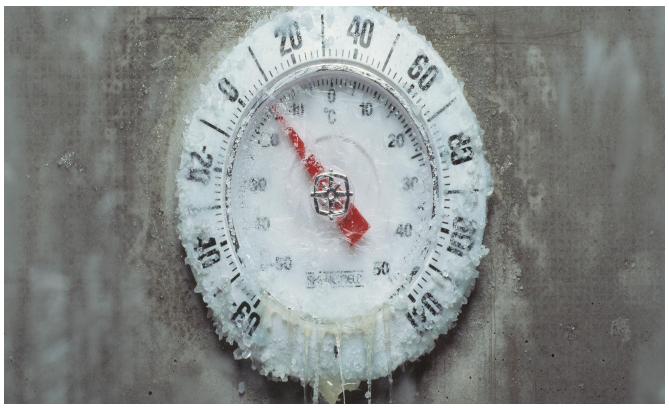
YOU HAVE NEVER ACTUALLY TOUCHED ANYTHING BEFORE!

The atoms in your hands and objects repel each other due to tiny electric forces. The resistance between them is what you feel.

IF YOU FOLD A PIECE OF PAPER 42 TIMES, IT WILL REACH THE MOON!

As the thickness of paper doubles with each fold, the thickness would exponentially increase with each fold, reaching the moon with 42 folds.





THE COLDEST PLACE IN THE UNIVERSE IS ON EARTH!

Scientists have cooled atoms to less than a trillionth of a degree above absolute zero in a lab. This is colder than anywhere else in the entire universe.

YOU AGE SLIGHTLY SLOWER ON AN AIRPLANE!

Einstein's theory of relativity states time is not universal. This means it is affected by gravity and velocity. The high velocity and weaker gravity make a negligible change in ageing.

SOLAR SYSTEM FACTS

Mercury

Mercury has a very large iron core, making it the most iron rich planet

The planet is also shrinking due to a cooling interior.

Mars

Mars is home to Olympus Mons, the tallest volcano in the solar system. 3 times as tall as Mt Everest.

Mars also used to have suitable conditions for life with water and a thicker atmosphere

The Moon

The moon has almost no atmosphere which means the sky is black even in daytime

We only ever see one side of the moon as it rotates in the same time it orbits

The Sun

The Sun makes up 99.86% of the entire Solar System's mass

The core can reach a temperature of 15 million degrees celsius

Venus

A day on venus is longer than a year on venus by 18 earth days

The air pressure on venus is 92 times stronger than Earth. It would feel like you're 1 km underwater

Earth

Earth is the perfect distance from the sun for life to exist, also known as the 'Goldilocks Zone'

Our planet rotates at 1600 kilometers per hour at the equator but we don't feel it because we move with is

Saturn

Saturn is the least dense planet, in fact it is less dense than water.

Although the rings can stretch out to 280,000 km, they are only few 10s of meters thick.

Neptune

It rains diamonds on Neptune due to its high pressure compressing carbon into diamonds.

Neptune was discovered using math. Astronomers noticed strange changes in Uranus's orbit and predicted the existence of Neptune.

Jupiter

Jupiter has the shortest day of all the plants, only 10 hours.

It is so huge that you could fit over 1300 Earths inside it.

This planet's largest moon, Ganymede, is even bigger than Mercury.

Uranus

Uranus is the coldest planet with the temperature falling as low as -224 degrees celsius

Its seasons are extremely long with each season lasting 21 Earth years.

WAT-ER YOU LOOKING AT?

A look at our real-life experiment!

Purpose

The purpose of this experiment is to find out how different materials with different electrostatic properties bend a stream of water.

Variables

INDEPENDENT VARIABLE

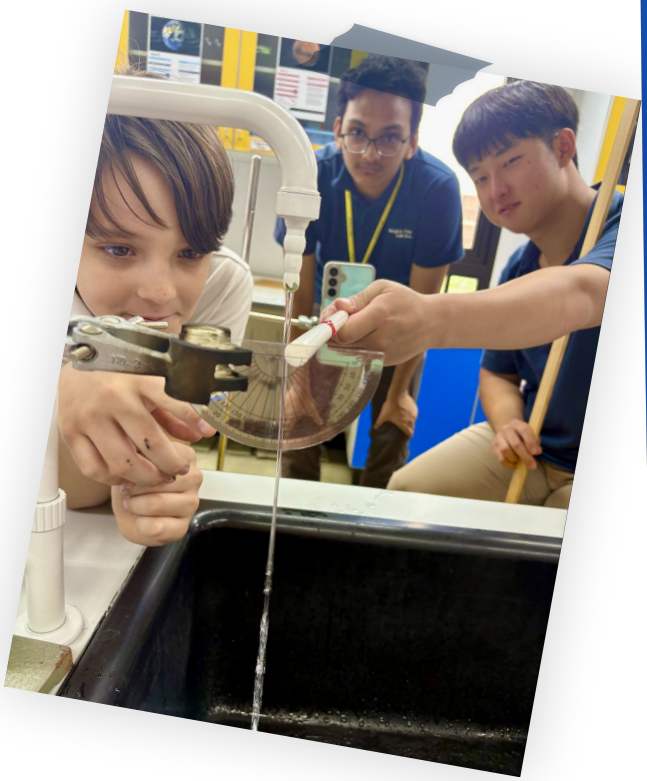
Materials (Tablecloth, Fleece, Cotton)

DEPENDENT VARIABLE

Angles of deflection of water

CONTROL VARIABLES

- Intensity of water stream
- Surface area of material
- Distance from the water stream

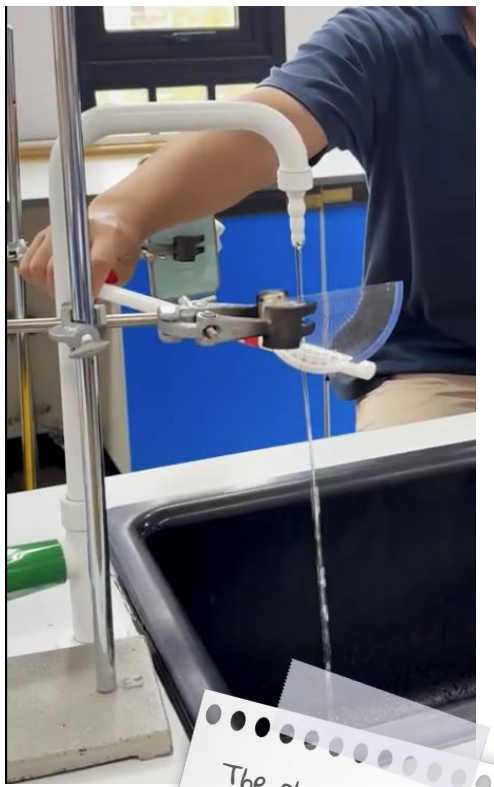


Materials and Equipment

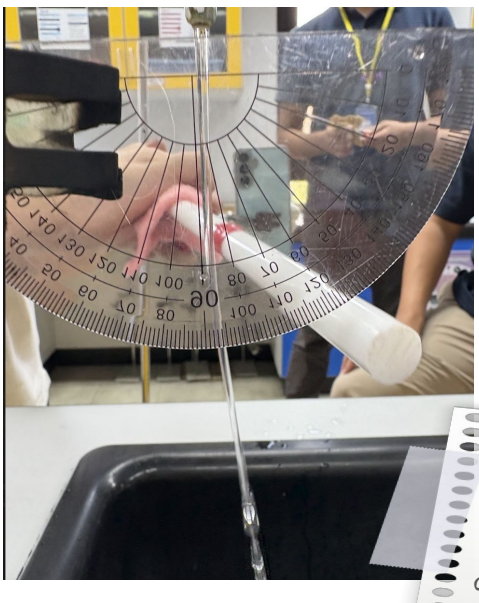
- Clamp Stand
- Phone (Camera)
- Protractor
- Glass rod
- Plastic rod
- Fleece
- Tablecloth
- Cotton

Procedure

1. Prepare the glass rod, plastic comb and wooden rod.
2. Measure 10cm of each material and wrap tape around the 10cm line.
3. Set up an ipad (or phone) parallel to the faucet - held up by a clamp stand, ready to record.
4. Turn on the faucet so that a little stream of water is running.
5. Use a clamp stand to hold up a protractor parallel to the stream of water. The 90 degree line must be aligned with the stream.
6. Hold a glass ros and use a piece of fabric to rigorously rub between the top of the rod and the 10cm line.
7. Use the end of the rod and hold it to the right of the steam, about 2 cm away from it.
8. Record, using the iPad or phone camera, the stream bending towards the rod and measure the angle of deflection using the protractor - do this about three times and record it in a table.
9. Repeat the same thing but with different materials.



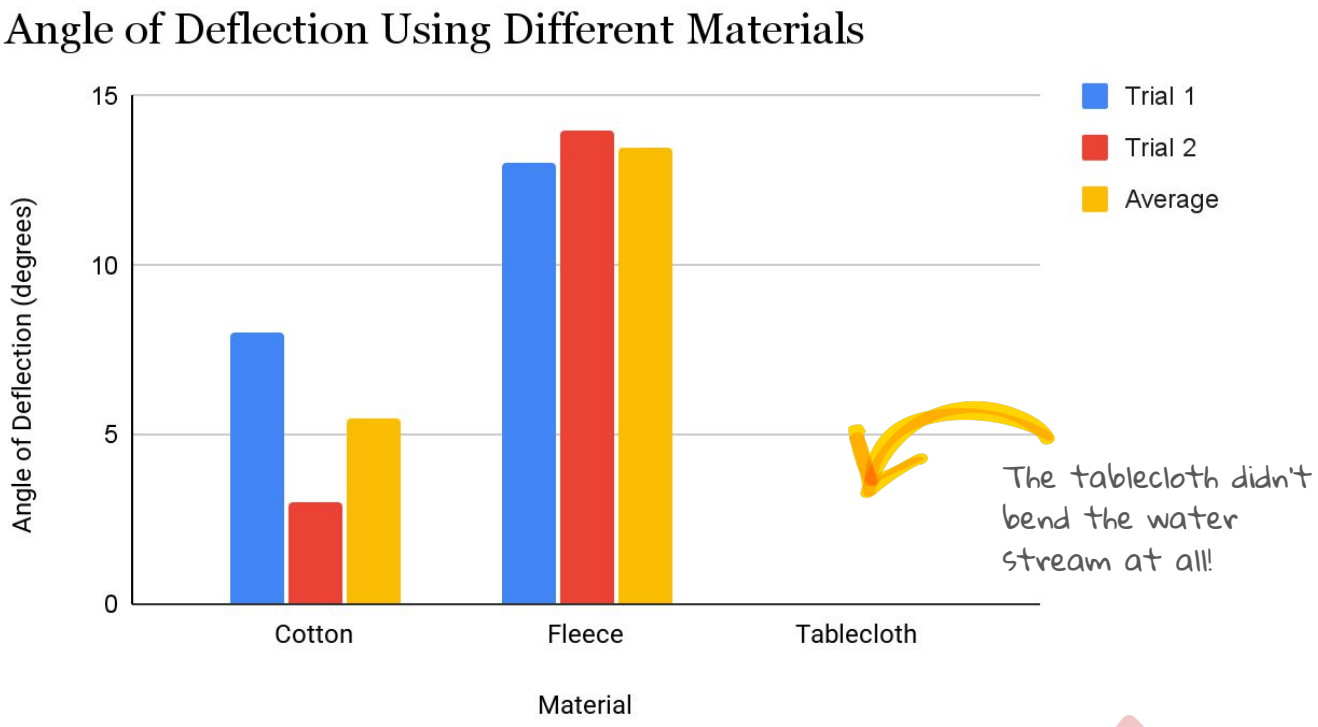
The phone camera should be set 90° to the protractor to avoid parallax error



The deflection is small so we used video technology to capture it!

Results

Material	Angle of Deflection (degrees)		
	Trial 1	Trial 2	Average
Cotton	8	3	5.5
Fleece	13	14	13.5
Tablecloth	0	0	0



Conclusion

The fleece rod had the largest angle of deflection of the water. This shows the fleece left the rod with the greatest electric charge when we rubbed them together.

The FACES of SCIENCE

Highlighting the faces of some scientists that may have been overshadowed by history.

BARBARA McCLINTOCK

Barbara McClintock was a geneticist who studied in the field of chromosomes and cells.

She discovered the 'jumping gene' which changed the genetical science field completely .
With her achievement, scientists got enhanced understanding in genetic regulation, mutation, and evolution.

She got awarded with the Nobel Prize in Physiology or Medicine in 1983 for her discovery of mobile genetic elements, She was the **first woman to win the Nobel Prize in that category.**.

MARIE CURIE

Marie Curie was a pioneering scientist born in 1867. She was the **first woman to win the nobel prize in physics** as she discovered the element 'radium'.

While studying uranium, she discovered a new element called 'radium', and she coined the term 'Radioactivity'. Moreover, she developed mobile X - rays to help the soldiers who were injured during World War I.

Her work inspired many scientific fields, including nuclear physics and quantum physics. This led to nuclear energy and power, which produce significant amount of electricity for our daily lives.

Chien-Shiung Wu

Chien-Shiung Wu, born in 1912, conducted the Wu experiment which disapproved a common assumption between physicists regarding parity symmetry, earning her the title “First Lady of Physics.”

This changed the understanding of the laws of nature as it was then proven that at the subatomic level, the ‘universe’ favours one direction over the mirror direction. This forced scientists to revise their theories about the universe leading to more accurate and advanced models, such as the Standard Model of particle physics.

Another one of her contributions was the Manhattan Project. Due to her expertise in nuclear physics, she worked on detecting radiation using beta decay and other problems regarding nuclear fission.

Wu **changed the way scientists understood the universe which impacts many studies today.** Furthermore, she encouraged women and Chinese people to study science.

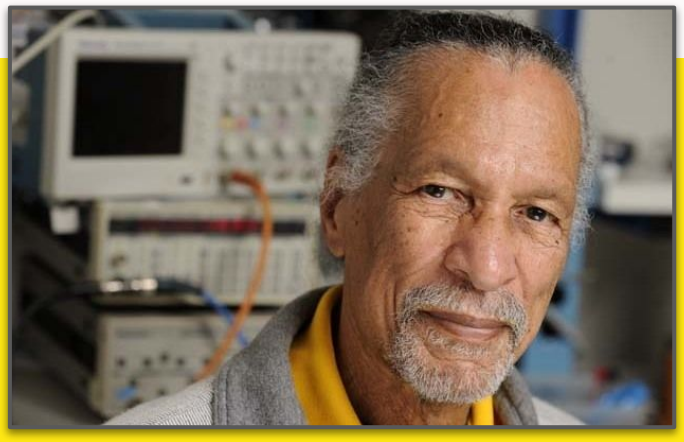
Sylvester James Gates Jr.

Sylvester James Gates Jr. is a renowned theoretical physicist best known for his advancements in the knowledge of supersymmetry, supergravity and string theory. These are advanced fields which attempt to explain the nature of the universe. In 1977, his doctoral dissertation was the first at MIT to focus on supersymmetry. His researched relied on using advanced mathematics to understand these complex ideas using visual tools such as Adinkra symbols, which help depict relationships in supersymmetric systems.

Adinkra Symbols

Beyond his contributions in the field of theoretical physics, he has become a prominent figure, serving on Obama's council of advisors on science and technology. He also promoted public engagement with science and appeared in various documentaries. In 2013 **he received one of the highest scientific honors in the United States: the National Medal of Science.** After an amazing career, he has set the path for future scientists to continue this study as he is currently the Toll professor of physics at University of Maryland.

JAMES EDWARD WEST



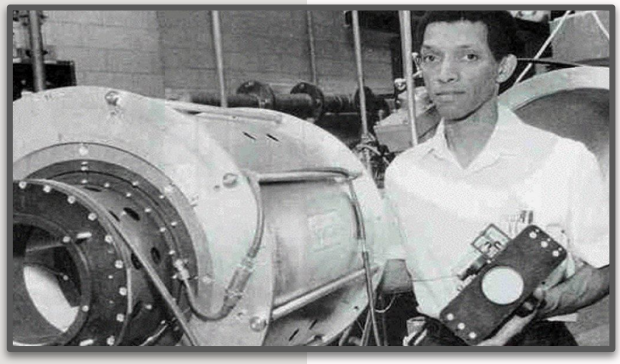
James was an acoustical physicist famous for co-inventing the electret microphone. This technology revolutionized audio recording and communication as prior to the invention, traditional microphones were bulky and expensive. Since he was a young kid, he was fascinated with electronics, taking apart old radios to study them. He began working at Bell Laboratories in 1957 where he collaborated with Gerhard Sessler to invent their enhanced microphone technology.

The impact of their invention is profound and lasting. Till this day, over 90% of all microphones used in devices rely on the electret technology due to it being compact and inexpensive. It also requires no external power source making it very efficient. Beyond his contribution to acoustical physics, he was also a strong advocate for diversity in STEM. He launched multiple initiatives to support underrepresented minorities in science and engineering. **His legacy can be measured in how his work continues to shape audio communications in this century.**

GEORGE ROBERT CARRUTHERS

George Robert Carruthers was an African American scientist. Additionally, he was also known for being an inventor and aerospace engineer at NASA. He is remembered as the inventor of the ultraviolet camera in 1972. George received numerous awards from NASA and went down into the National Inventors Hall of Fame. He also mentored and inspired a new generation of physicists

George was a leader in the field of space instrumentation. His ultraviolet telescope and camera were used in NASA's Apollo 6 mission. The significance of the instrument lay in its ability to capture information about the Earth's atmosphere, interstellar hydrogen clouds and even distant stars, all from the moon's surface, where Earth's atmosphere wouldn't cause any distortions. Furthermore, he contributed to the research of black holes, nebulae and other celestial bodies. Further in his career he developed more instruments enabling humanity to understand more than just the visible light.



PHYSICS MYTHBUSTERS

GUESS WHETHER EACH MYTH IS BUSTED OR CONFIRMED

ANSWERS ON THE NEXT PAGE

1. Gravity doesn't exist in space
2. You feel heavier during a roller coaster drop
3. A candle burns slowly in zero gravity
4. You can't stand still without using energy
5. Water can only be boiled using heat
6. We can only see one side of the moon
7. Pure water conducts electricity better than impure water
8. Heavy objects fall faster than light objects
9. You weigh less at the equator than the poles
10. A dropped bullet and a shot bullet hit the ground at the same time

PHYSICS MYTHBUSTERS

1. **BUSTED**
   Gravity is everywhere in space, that is what makes the earth orbit the sun and the moon orbit the earth. Astronauts don't feel weight because they are constantly in free fall.

2. **BUSTED**
   Suring a drop, you actually feel lighter because you are accelerating downwards leading to a smaller reaction force, so you feel less weight.

3. **CONFIRMED**
   With no gravity, the gases don't rise or fall resulting in the flame becoming spherical. As there is also less oxygen due to oxygen not falling anymore, the candle burns slowly.

4. **CONFIRMED -**
   When trying to balance, your muscles make tiny contractions to make you stable which requires energy. Hence, even to stay still you require energy.

5. **BUSTED -**
   Water boils when the pressure of it's vapor is equal to the pressure of the surrounding. Hence, in a vacuum, or really low pressure, water can also boil.

6. **CONFIRMED -**
   The moon rotates on its axis at the same rate as it orbits the Earth, also known as tidally locked. This means that we will always see the same side of the moon.

7. **BUSTED -**
   Pure water is usually a poor conductor. However, with salt ions and minerals, impurities, they can act as charge carriers and so the water conducts electricity well.

8. **BUSTED -**
   All objects fall at the same rate regardless of their mass, size or shape. This was tested on the moon when a hammer and feather reached the ground at the same time.

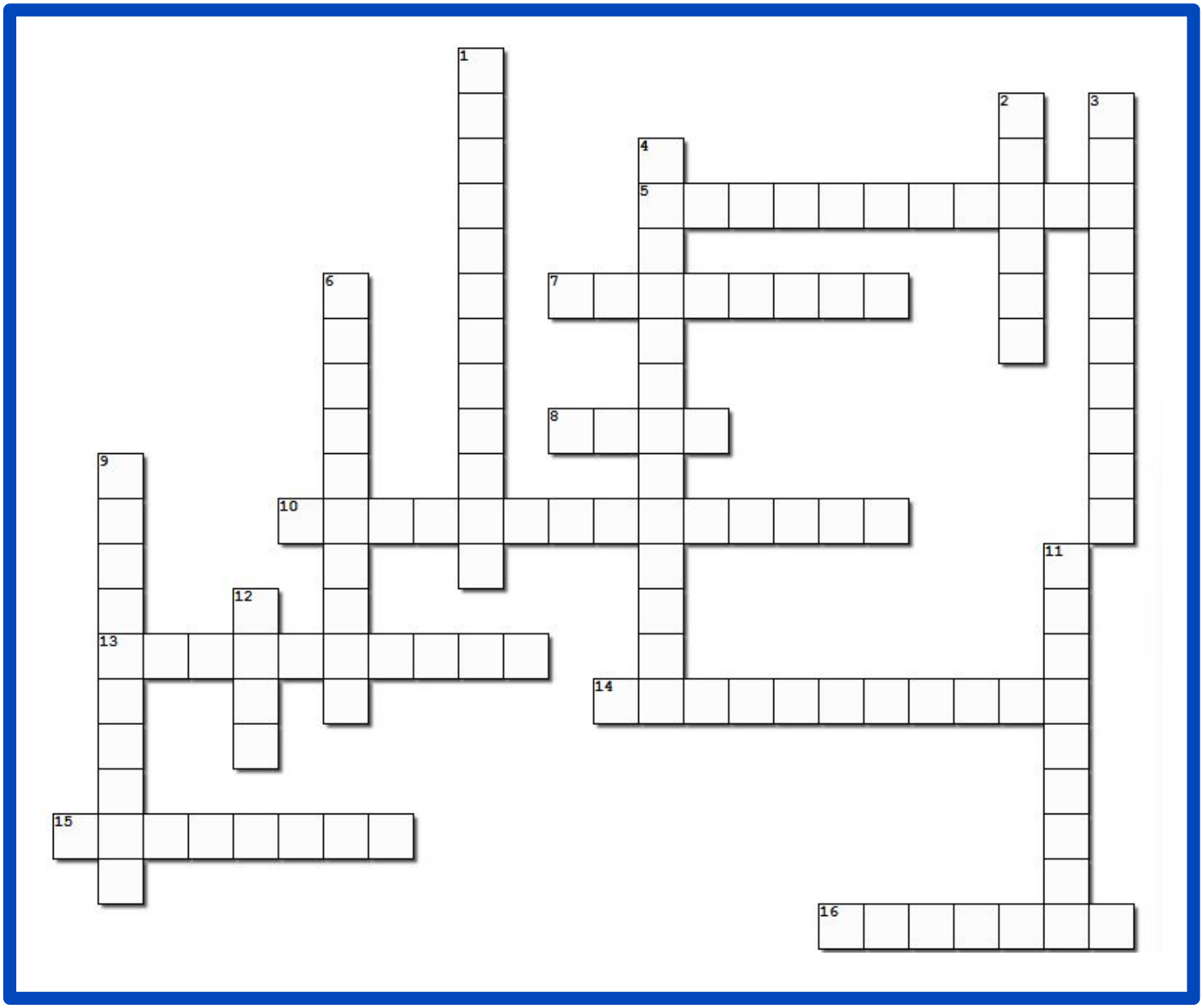
9. **CONFIRMED -**
   The Earth spins the fastest at the equator due to it's oblate spheroid shape. This creates a centrifugal force which reduces the effect of gravity making you weigh slightly less.

10. **CONFIRMED -**
    Assuming there is no air resistance, both bullets have the same vertical acceleration towards the Earth. This means both of them will hit the ground at the same time.

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

Bohr
Chien Shiung
Curie
Edison
Einstein
Faraday
Galilei
Heisenberg
Mayer
Meitner
Newton
Planck

Finished? Research about how these scientists' research affects life today.



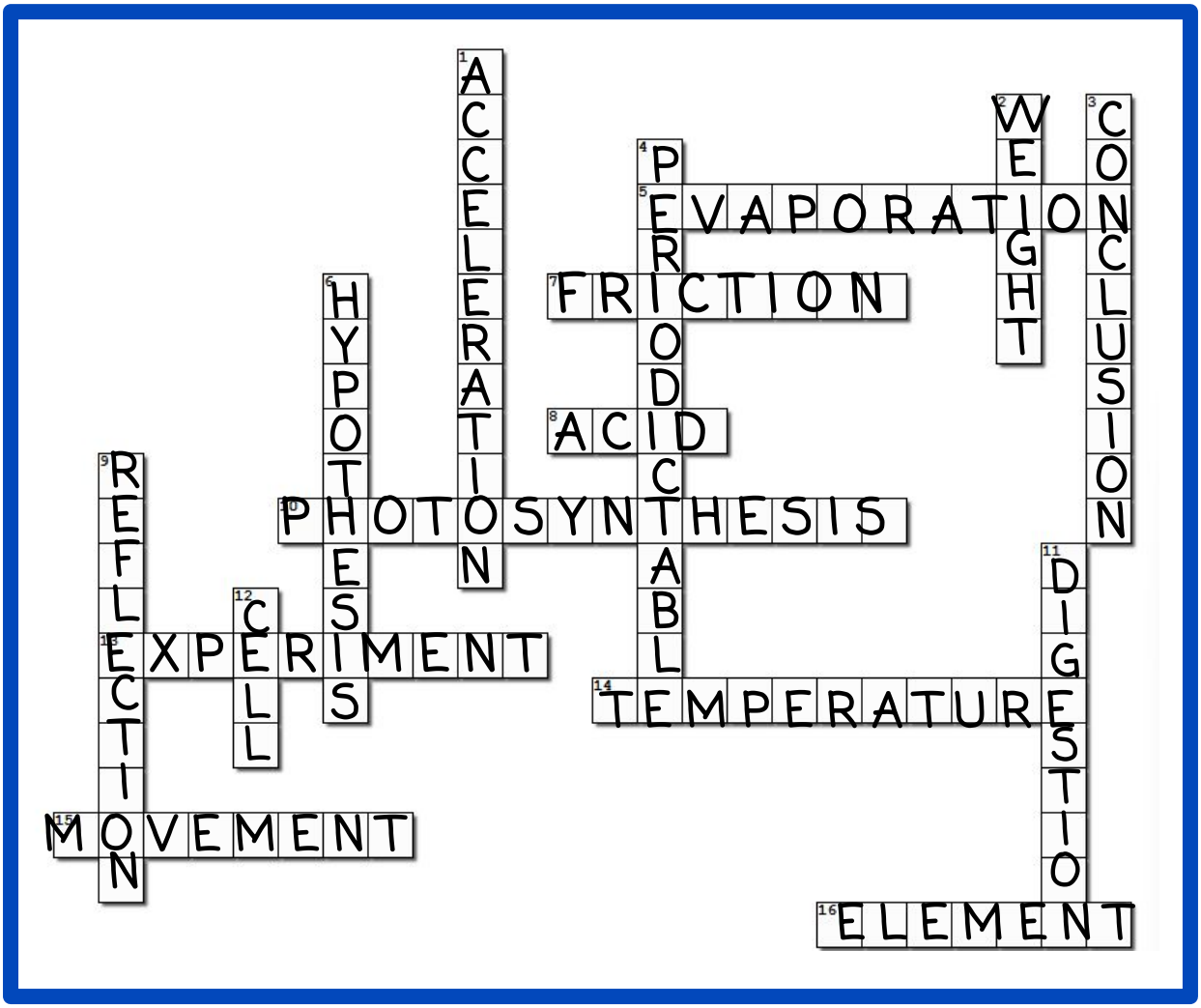
Across

5. When a liquid turns into a gas.
7. A force that resists motion between surfaces.
8. A substance with a pH of less than 7.
10. The process through which plants make food.
13. A test done to learn something or prove an idea.
14. How hot or cold something is.
15. The change in place or position of an organism or part of an organism.
16. A pure substance made of one type of atom.

Down

1. The change in speed over time.
2. The force of gravity on an object.
3. The final decision or result based on data.
4. A chart of all the chemical elements.
6. A possible explanation or prediction that can be tested.
9. When a wave bounces off a surface.
11. The breaking down of food inside our body so we can absorb it.
12. The smallest unit of life.

ANSWERS



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

DIY: Balloon Rocket

Materials

- Balloon
- String
- Straw
- Tape

Instructions

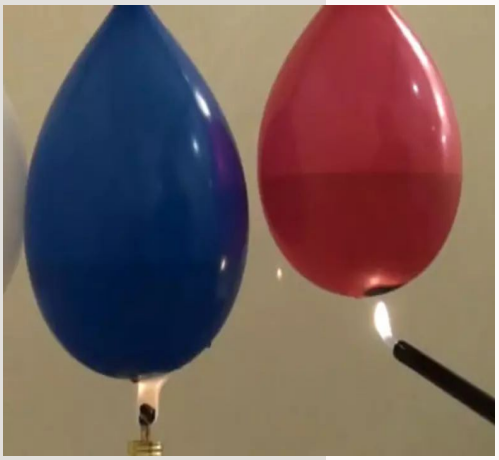
1. Put the string through the straw and tie the two ends far apart making sure the string is taut and horizontal
2. Then blow the balloon and tape it onto the straw (do not tie the end of the balloon shut)
3. Finally, let go and watch it zoom across the string

Explanation

The balloon follows Newton's third law, 'for every force, there is an equal and opposite force'. In our experiment, the air pushing out on the open end causes a force. This results in an equal force to be exerted in the opposite direction onto the balloon causing it to move.

Now try this:
If we let go of a blown balloon in space, will it move?

DIY: Fireproof Balloon



Materials

- 2 Balloons
- Candle
- Lighter
- Water

Instructions

1. Fill one balloon with air and the other balloon with air and water
2. Under parent supervision, light the candle and put the balloon with air over it
3. After it pops, try putting the balloon with air and water over the candle. This one should take longer to pop.

Explanation

This experiment showcases heat transfer and thermal capacity. In the air balloon, the rubber heats up, weakening it, and the air inside heats up moving the particles faster resulting in the pop. However, in the other ballon the water absorbs a lot of the heat due to heat transfer and the rubber stays strong allowing the balloon last longer.

Cars Braking to Stop

Every moving object has kinetic energy. Therefore, cars have kinetic energy when they are moving. In order to stop moving a car must lose all of its kinetic energy. From the law of conservation of energy, it is said that energy cannot be lost or created. So the kinetic energy in the car must be transferred to a different form of energy.

When the brakes of a car are pushed, brake pads are activated which and held against the spinning metal disks attached to the wheel. This causes friction which slows the wheels down and eventually the car comes to a rest. Here the kinetic energy is converted to heat energy.

Challenge
So why do cars brake slower on an icy surface?

Physics Around Us

Looking at a Mirror

Everything we see if because of light, which is a wave. A property of waves is the ability to reflect off surfaces.

When you look at a mirror, the light is reflected from your face and goes to the mirror. The mirror then reflects those light waves back, from which some enter your eyes.

Challenge
Why is your image in the mirror inverted horizontally?

Like watching YouTube?

Try these channels!

Veritasium

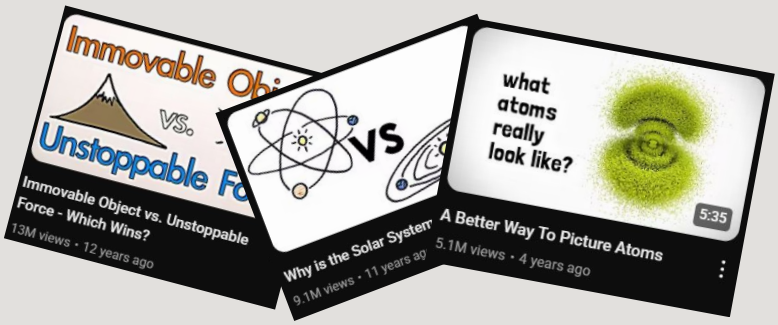
This channel offers high quality science videos with great visuals and diagrams. Derek, the youtuber, asks lots of questions for you to think about as well as answers to some common problems across many fields of science.

https://www.youtube.com/@veritasium

minutephysics

This channel has quick hand drawn animations used to explain complex concepts in more simple terms for everyone to understand. There are lots of fun questions explained as well, such as whether it's better to run or walk in the rain.

https://www.youtube.com/@MinutePhysics



SciShow

This channel explores science facts with engaging hosts in a form of short episodes. The content is easy to understand and answers questions of varying complexity. You can be sure to find something you like.

https://www.youtube.com/@SciShow