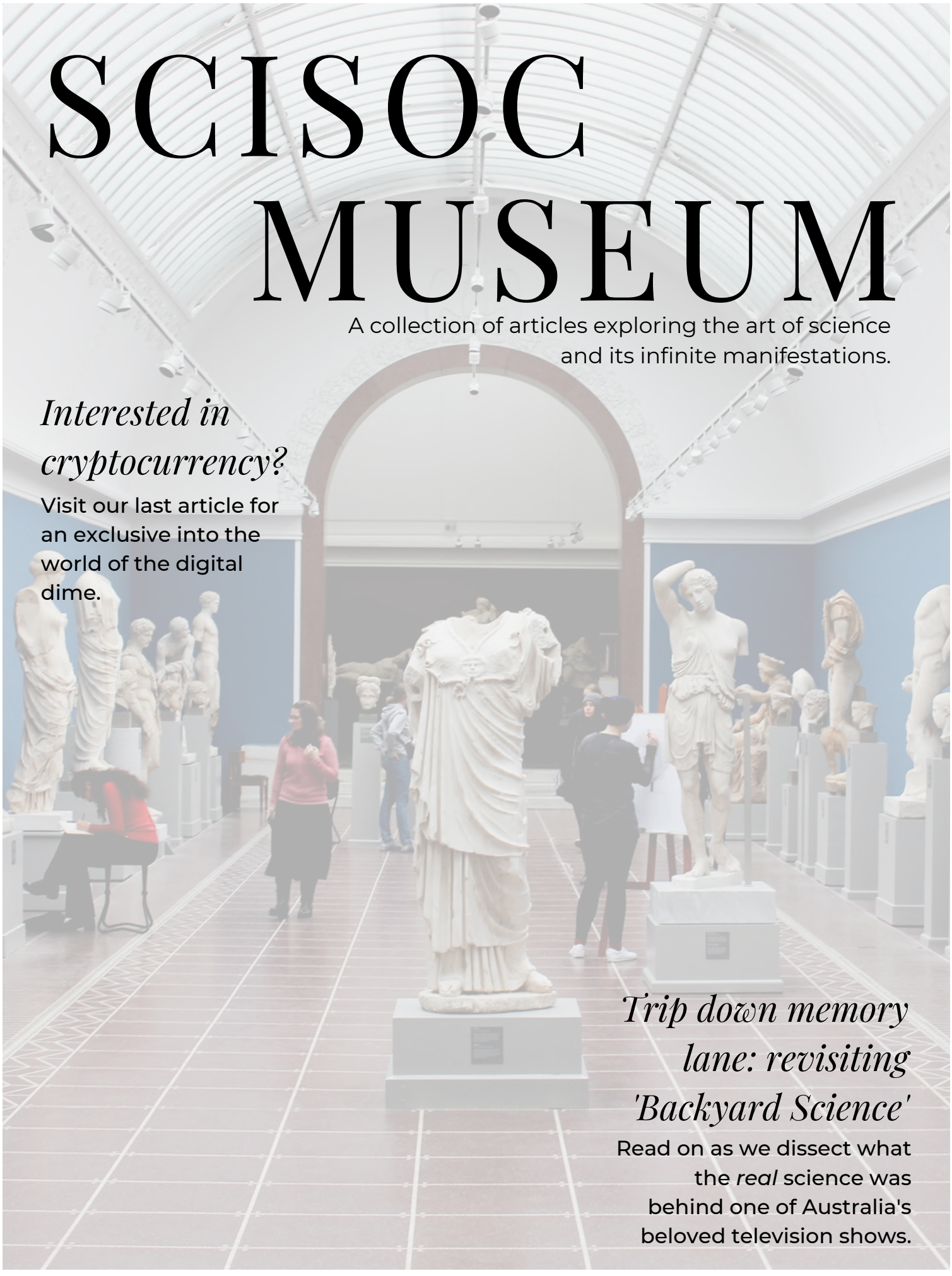
SCISOC MUSEUM

A collection of articles exploring the art of science and its infinite manifestations.



Interested in cryptocurrency?

Visit our last article for an exclusive into the world of the digital dime.

Trip down memory lane: revisiting 'Backyard Science'

Read on as we dissect what the *real* science was behind one of Australia's beloved television shows.

A myriad of exhibits await you!

SCISOC UNSW

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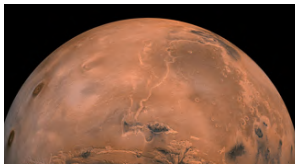
THE REAL LIFE OF THE MARTIAN

When the world is in shambles, the first course of action for every normal planetary settlement is to find another! Mars has been under the microscope over the past decades for its potential in being a new home for humans, and we're going to dissect what it takes for the human race to survive on Mars.

Five major resources that researchers have collectively decided that these Martian settlements would need are energy, water, oxygen, food and construction materials.



OXYGEN >

In April of 2021, NASA's Perseverance rover managed to split carbon dioxide into oxygen, approximately generating ten minutes worth of oxygen. The instrument on the rover called MOXIE is designed to be like a tree; breaking off components of CO2 in Mars' atmosphere to create O2. Its main purpose is for fuel creation and has not been designed for long-term stays or colonies on Mars. However, if a scaled-up version was created and established on Mars, the potential for a breathable planetary colony is not too far away!

Image Credit: NASA/JPL-Caltech/MSSS

WATER >

Water can be extracted via ice and hydrated minerals located on Mars. However, this still remains a pressing issue as there is no liquid water on Mars, and with the recent lakes found on Mars' surface, there is no real affirmation that they can be a proper life source due to the high concentration of salt and the state of the water in each lake.

Image credit: Twentieth Century Fox Film Corporation

FOOD >

There is non-perishable food available from Earth for astronauts to use, however, these will only serve as emergency rations. This means that in order to survive, fresh food must be produced on Mars. As well as non-perishables, naturally-grown and sourced food such as algae and insects will most likely be part of the diet on Mars. Establishing an insect farm is an effective use of resources, as it would only require a small amount of water while providing a calorie-dense meal.

In order for plants to survive on Mars like they do on Earth, they need the same conditions. Lighting is crucial for food production and this will occur indoors under artificial lighting. Plants would be protected by a thick layer of Martian soil on top of the inflatable habitat from radiation. The Mars atmosphere provides CO2 for plants to breathe, and water can be obtained through recycling and the soil on Mars. Recycling human waste or importing them from earth can provide nutrients for the plants. The overall aim of the colony is to be independent from the food received from Earth.

FIRST EXHIBITION

THE REAL LIFE OF THE MARTIAN

ENERGY >

Energy production on Mars will most likely involve nuclear or solar energy, or both. The Kilopower project run by NASA is exploring the idea of using a nuclear fission power system to facilitate long-duration explorations on planetary surfaces. One issue with relying on nuclear energy is that fissionable materials such as thorium and uranium are difficult to extract and refine on Earth, hence it would prove more difficult on a small-scale Mars colony.

Image credit: Mars One

UNSW SCISOC
(b. 2012)
Magazine article
The Real Life Of The Martian 2021

Solar energy is another option for energy production on Mars and has proven successful as discerned from the numerous solar-powered probes sent over. However, it comes with its slew of issues as well. Sunlight on Mars is only 43% as intense compared to on Earth because of Mars' orbit. As well as this, the constant threat of dust storms can cause electrical failures for long periods of time, and solar power is only efficient for a partial year, and best at the equator. There are greater seasonal variations in production of power further from the equator, and at polar latitudes, solar power practically cannot be made for as long as half a Martian year (1.9 Earth years) as the Sun falls below the horizon.

The general consensus is that, like on Earth, energy needs to be derived from a multitude of different sources to power humans on Mars, and the colonies themselves must sacrifice everyday necessities with this compromised environment.

CONSTRUCTION MATERIAL >

The most common material on Mars is silicon dioxide, a basic component of glass. Thus, glass products including fiberglass, and structures can be constructed on Mars in the same way as they are on Earth. The ubiquity of clay-like materials in Martian soil can also construct ceramics. There are also plentiful other materials on Mars including iron, titanium, nickel, aluminum, sulfur, chlorine and calcium.
Another readily available Martian construction material is Regolith, which is deposited over Mars by asteroid collisions over billions of years. It mostly consists of silicon dioxide and ferric oxide, with some amount of aluminum oxide, calcium oxide and sulfur oxide. Researchers believe that Regolith could be a potential alternative for concrete on Mars. But can Martian concrete act as an alternative in terms of strength? Tests conducted at Northwestern University mixed melted sulfur with JSC Mars-1a, a regolith simulant, in a ratio of 1:3 and found that Martian concrete's strength under compression, bending, and splitting was found to be much weaker than concrete made using Earth sand. Another experiment was conducted with a 1:1 sulfur to sand ratio, and it's composition's compression strength was 60 megapascals, doubling Earth composition's compression strength at 30 megapascals. Living conditions on Mars will most likely be underground in order to protect Mars settlers from cosmic radiation and intense cold.

After a close examination of the five major resources to survive on Mars, it is clear that Mars' resources offer much potential for the human colony. However, the foundation supporting human colonisation on Mars extends beyond these basic five resources and we will have to wait to ensure that the conditions of the red planet are safe, realistic and habitable in the long term.

By Hayley Vuong & Helena Jin

COVID-19: A YEAR TO REMEMBER

A look back at how the new deadliest pandemic has shaped the wider world and our response.

Written by Bud Truong and Bing Jiang

In just over a year following the discovery of COVID-19, it has globally infected over 167 million people, claiming over 3.46 million lives. The deadly pandemic has forced researchers and governments to collaborate worldwide on reducing its transmission and dealing with the infected. As new strains of the COVID-19 virus (SARS-CoV-2) arise, scientists and researchers race to develop adaptable vaccines in an effort to treat those most vulnerable to the virus.

UNSW SCISOC (b. 2012)
COVID-19 , 2021
Magazine article
The world state following the most recent pandemic

Bats are infamous carriers of pathogens and horseshoe bats were no exception. While some speculate that SARS-CoV-2 was artificially produced in a lab, comparing its genome to other coronaviruses revealed a natural pattern of evolution which debunks this theory.Viruses like SARS-Cov-2 use glycoproteins - proteins surrounded by slippery sugar molecules - that bind with two other glycoproteins to form a 'trimeric' unit. The spike unit has 3 different functions being: binding to the target cell, fusing with the cell membrane and allowing the spike to sit on the viral envelope.

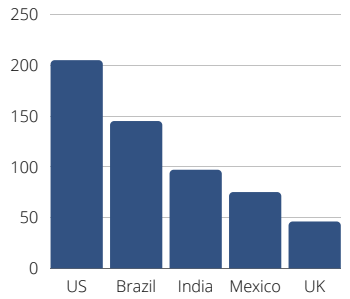
The SARS-CoV-2 strain is potent as it possesses a spike protein, ACE-2, that binds well to the membrane of human cells and is responsible for most of the damage in the lungs. Our body cells have a negatively charged, fatty outer layer that shields the enzymes,proteins and DNA inside.Viruses continually change and introduce new variation that aids in their spread or reproduction. This usually occurs due to the processes of mutation and recombination where two different strains of a virus infect a cell and combine genes.

The Vaccine

The first Covid-19 vaccine's development began in a French taxi, as Andrew Polland and John Edmunds (UK Scientific Advisory Group for Emergencies) neared the airport. On the way to present his group's research for typhoid fever, they discussed a new virus emerging in China, concluding that it had catastrophic capabilities and called for a vaccine. His team inserted the spiked proteins (which contained the DNA for SARS-CoV-2) from the surface of the coronavirus to another weakened strain of a virus that causes the common cold in chimpanzees.

This strain has been genetically mutated such that it is impossible for it to reproduce in humans and is essentially harmless; thus, the birth of the AstraZeneca vaccine. They investigated the MERS-CoV, a previous coronavirus outbreak during 2012, which had a mortality rate of 35% and hypothesised that immune responses against the spiked proteins could offer valuable protection against the new coronavirus. The MHRA (Medical Healthcare Regulatory Agency) has reported such cases only occur four times in a million UK injections. In just over a year, a combined global response in research and development of vaccines enabled Australia to roll out a major vaccination program on 22 February 2021.

Fig 1: Countries with the most coronavirus deaths (thousands)



Source: National health agencies Sep 27, 2020

Though all vaccines come with inherent risks, the stringent testing and known benefits of AstraZeneca, far outweighs the potential harm caused by the virus.A vaccine is not without its caveats, with multiple reports of CVT (Cerebral Venous Thrombosis), a blood clot in a cerebral vein in the brain, after receiving a vaccination shot.

Source: NDTV
"What top european agency said on AstraZeneca use amid concerns"

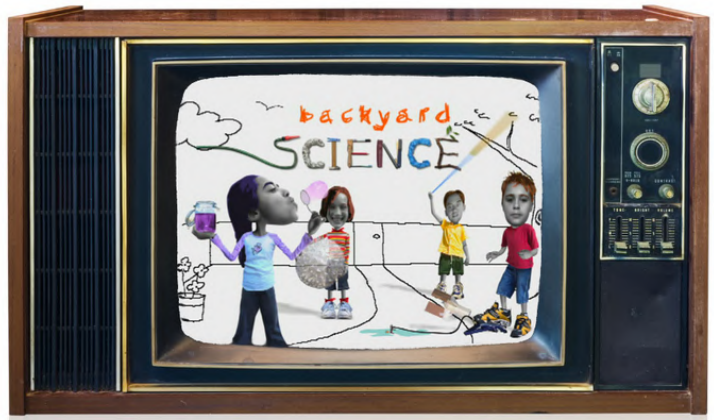
Source: Forbes
"Hurting Healers: Covid-19's Deadly Toll On India's Doctors"

SCISOC EDITION

FIND-A-WORD

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

Laboratory
Photons
Experiment
Report
Scales
Drag
Ecologist
Observation
Measure
Calculation
Engineer
Science
Volume
Dissect
Energy



A Deeper Dig into 'Backyard Science'

... WHAT EXACTLY WENT DOWN IN THAT KID'S BACKYARD.

By Christian Nguyen and Hayley Vuong

If you were a kid of the noughties, you'll remember watching that oh-so-familiar Backyard Science introduction play out on your television, and then buckling down for a series of experiments that you couldn't wait to try out yourself.

We're going to dig a little deeper into the real science behind these party tricks and what *exactly* went down in that kid's backyard.

I. Build your own rocket

Growing up, we've all heard of or tried the Mentos and Coca-Cola experiment. Similar to that nature, these kids aim to reach even greater heights by building a backyard rocket! With just some fundamental knowledge about physics and chemistry, you'll also be able to replicate their experiment and make some of your own improvements. Get ready to *launch* right into how this is all done!

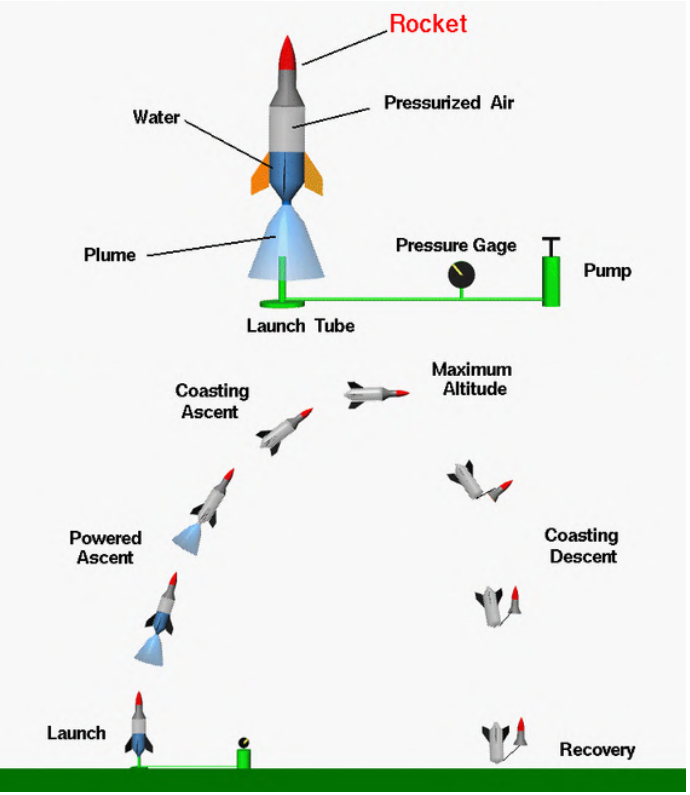


Diagram credit: grc.nasa.gov

To get a bottle rocket to propel into the air, we must create a steady build-up of pressure inside the bottle. In the video, one of the kids adds baking soda (sodium bicarbonate) to lemon water in the bottle as this chemical reaction produces carbon dioxide (CO_2) as a byproduct. The production of CO_2 increases the pressure within the bottle to a point where it blows the cork out and propels the rocket upwards. From a physics standpoint, Newton's First and Second Law of Motion effectively explain this experiment.

Newton's First Law

"Every object in a state of uniform motion will remain in that state of motion unless an external force acts on it."

Initially, the rocket is at rest and all forces are balanced as the weight of the rocket is balanced by the normal force of the launchpad holding it up. Once the baking soda is added to the lemon water, the build-up of pressure from the production of CO_2 provides just enough strength to cause the cork to be blown out. The fluid subsequently escapes downwards from the rocket providing thrust (an upwards force), allowing the rocket to propel upwards.

"For every action (force) in nature there is an equal and opposite reaction."

SIR ISAAC NEWTON'S THIRD LAW

Newton's Third Law

"For every action (force) in nature there is an equal and opposite reaction."

All forces act in pairs, similar to how a balloon full of air is released into the sky, when the fluid escapes the rocket it provides a strong downwards force towards the ground that is accompanied by an equal and opposite force (thrust) which propels the rocket into the air.

Image credit: Backyard Science Season 1 Episode 1
1: *Baking soda and lemon water*
2: *Air pressure*

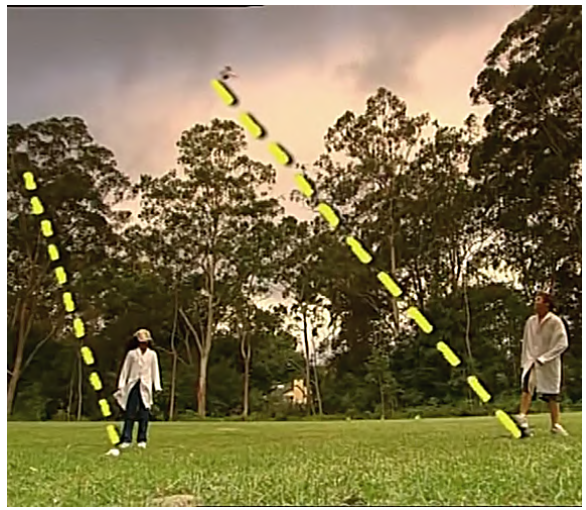


Image credit: Backyard Science Season 1 Episode 1
Trajectories of the two rockets

Improvements

There are two simple improvements regarding aerodynamics that you can make in your own experiment to create a more efficient rocket: adding a nose cone and fins.

Nose Cone:

In the subsonic range, having a parabolic shape for the nose cone is generally better for the rocket than a pointed one. This will minimise drag and allow the rocket to propel a further distance.

Fins:

The purpose of fins is to help keep the nose of the rocket pointed into the wind by adding surface area to the rear of the rocket. This moves the centre of pressure downwards on the rocket, making it easier to propel upwards for longer before falling.

Ideally, use three to four fins on the rocket to increase stability as any more would lead to unnecessary weight and drag.

Although trying this experiment certainly won't make you an accredited physician, chemist, or astronaut, it's a great way to realise the vital role physics and chemistry play in understanding our world. As peculiar as it seems, without an apple dropping on someone's head or a dense point exploding in space, we probably wouldn't be where we are today!

II. Create your own kimchi

The aim of this young girl's experiment is to observe the impact of yeast in making kimchi, a beloved Korean side dish consumed by millions of people across the world. She realises that the cup with yeast mixed into the flour and sugar ends up visibly 'doubling in volume' as a result of the creation of CO2 gas bubbles.

This right here, folks, is called fermentation! The fermentation equation familiar to most of us may be the ethanol fermentation equation:

$$C_6H_{12}O_6 \longrightarrow 2C_2H_5OH + 2CO_2$$

However, of the 3 types of fermentation, the one that occurs when making kimchi is called lactic acid fermentation (lacto-fermentation).

Lactobacillus, the bacteria produced, protects foods from microbial spoilage and also gives kimchi its acquired taste.

This is the same kind of anaerobic respiration that happens within your muscles when you begin feeling pain or fatigue! Evidently, one tastes good and one doesn't, but it shows that lacto-fermentation is beneficial for the body. *Lactobacillus*, the bacteria produced, protects foods from microbial spoilage and also gives kimchi its acquired taste. The production of lactic acid is an anaerobic one i.e. occurs in the absence of oxygen, and involves sugars being broken down, which is the impact of adding yeast.

The creation of gas as seen in the video is visible proof of oxygen being extracted from the system in order to create carbon dioxide, which also prevents any oxygen-attracted bacteria or mold from forming.

The initial step of salting the vegetables also creates a wall of protection from pathogens like Salmonella from entering the cabbage and all other ingredients, thus making it practically impossible to make inedible kimchi. Though that can be easily refuted, what is *important* is the science behind the beloved taste of kimchi broadcasted on mukbangs and dramas alike, and it can be seen right in your own backyard.

We hope this was a deep enough dig into two experiments shown on Backyard Science and what goes on behind the scenes of life's everyday happenings!

UNSW SCISOC (b. 2012)
Backyard Science (2003 -)
Australian educational children's television show

Image credit: Backyard Science Season 2 Episode 11

Disaster in the water

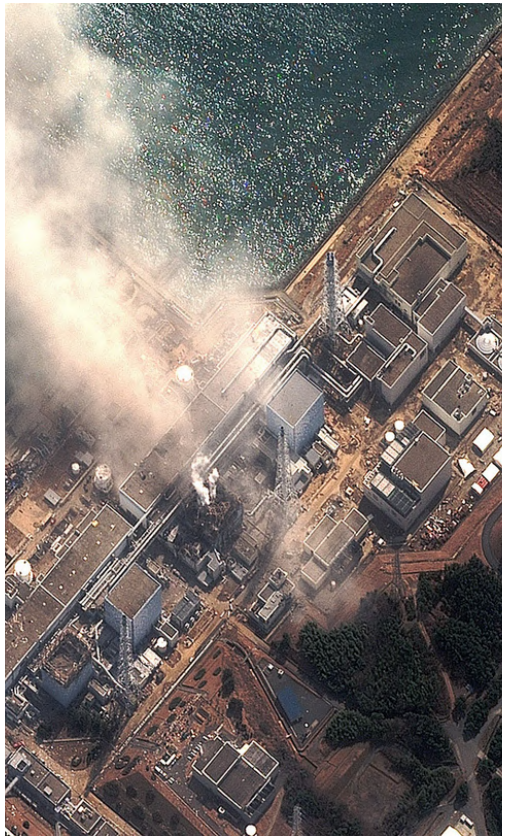
SAVING OUR OCEAN FROM THE TRAGIC DISASTER OF THE FUKUSHIMA NUCLEAR EXPOSURE

10 years ago, on 11 March 2011 at 14:46 local time, the most powerful earthquake in Japan struck east of the city of Sendai. It triggered not only a tsunami over the main island of Honshu, but a 9.0 magnitude quake that was so strong that it shifted the Earth off its axis.

18,000 people were killed. The entire town was wiped off the map. But it did not stop there.

A gigantic wave flooded the reactors at the Fukushima nuclear power plant, sparking a major disaster as radiation leaked from the plant into the atmosphere and the Pacific Ocean. 150,000 people were forced to evacuate from the area.

Now, it's a decade later. The zone remains in place and most residents have not yet returned. It is believed by authorities that it will take up to 40 years to safely remove nuclear waste, fuel rods and more than one million tonnes of radioactive water at site. This, however, has already cost Japan trillions of yen. More than one million tonnes of water were used to cool the melted reactor, and now this radioactive water is kept in tanks by the operator Tokyo Electric Power Co (TepCo). But with these tanks expected to fill up by 2022, an alternative must be found before they run out of space.



"Releasing into the ocean is done elsewhere. It's not something new. There is no scandal here,". More radiation has been released into the Pacific by the US, UK, and France during the 1940s to 60s as a result of nuclear weapon tests.

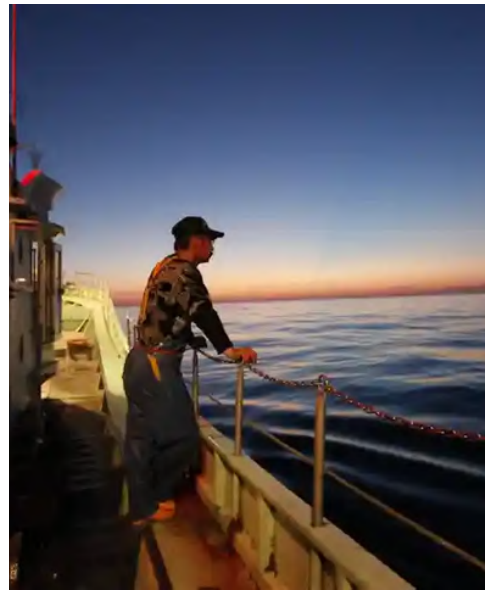
So, who's against this situation?

The first one is the group of fishermen in Fukushima. They say that it could ruin their reputation as fishers and can affect their jobs and livelihood, since more than 20 counties are still imposing restrictions on Japanese food imports. Not only this, but the fishing industry has mentioned that their loca consumers will be opposed to buying their local product, hurting their own Japanese general economy.

The Japanese government has now approved plans to release more than one million tonnes of contaminated water from the destroyed nuclear plant into the ocean. According to the Japanese government, the water will be diluted and reprocessed before being released into the ocean, removing all radioactive materials except for tritium.

The tritium wastewater is due to be released into the sea starting in around two years and over several decades. Whilst Japan argues that the water is safe, diluting the water poses no scientifically detectable risk as stated by scientists.

The element remaining in the water will only pose a threat to human health in large doses, and the half-life of tritium of around 12 years means that it will gradually disappear from the environment over a period of decades. International Atomic Energy Agency (IAEA) Director General Rafael Mariano Grossi has also pointed out that



Not only this, but even though the South Korean government eased their grievous concern on the matter, the Japanese are restricted from bringing any imports into their shores. China has also urged Japan to make wise decisions on their imports, such as the Chinese foreign ministry spokesman Zhao Lijian urging Japan to "act in a responsible manner'. However, the US seems to be slightly more lenient on the matter, displaying their trust by stating that the global community should wait for Japan to "adopt an approach in accordance with globally accepted nuclear safety standards".

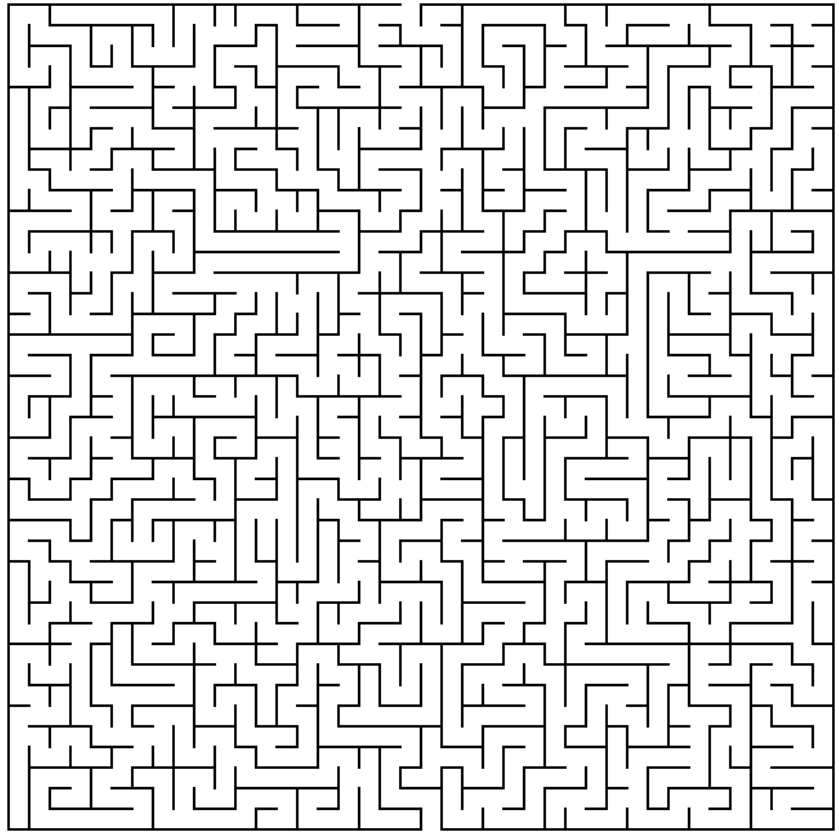
UNSW SCISOC (b. 2012)
Disaster in the Water (2021 -)
Magazine Article
Fukushima Nuclear Exposure

The second stakeholder are environmental groups such as Greenpeace, who are seriously concerned about releasing water into the ocean. Also, various Non-Governmental Organisations have stated that Japan's plans to release water into their ocean shows their unethical decisions which have 'failed the people of Fukushima'.

Whilst this disaster in the ocean is a tragedy that impacts both the current and the future generation, what we can do at the moment as a global community is to watch Japan's activity as a crucial part of the global economy.

SCISOC EDITION

MAZE



SHINYA YAMANAKA

THE MAN WHO REVOLUTIONISED BIOLOGY

"I can see any failure as a chance"
- Shinya Yamanaka

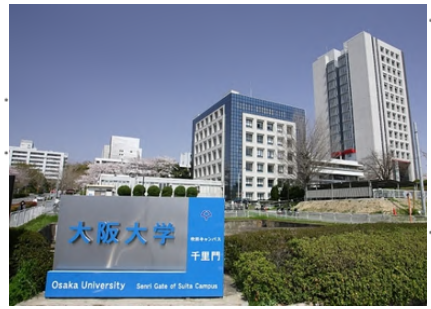
Shinya Yamanaka is the winner of the 2012 Nobel Prize in Physiology or Medicine for his revolutionary discovery in the transformation of stem cells to specialised cells. Hailed as perhaps one of the most revolutionary leaps in modern medicine, the transformation of stem cells unlocks multitudes of potential for cell rejuvenation, which can be used in a wide variety of conditions including diabetes, heart disease, Parkinson's disease, and spinal cord surgery.

Shinya Yamanaka, born in 1962, is a Japanese biomedical stem cell researcher with an extensive medical background of being an orthopaedic surgeon and an assistant professor in the University Medical School of Osaka. He had lost his father to Hepatitis C, a disease with no known cure at the time, which prompted him to switch from being a surgeon to a researcher, stating that he felt "helpless and useless" despite being a doctor.

His first experiment as a biomedical researcher was to experiment the ways in which blood platelet activating factors controlled the blood pressure in dogs.

Illustrated by Tadaomi Shibuya

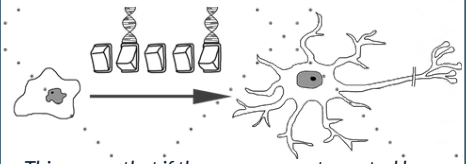
Further down his career, he would change his field of study to embryonic stem cells.



Osaka University | *Photo by Smapse*

Stem cells are the fundamental, most basic cells capable of being produced, and when subjected to the perfect conditions, they are able to replicate themselves (daughter cells) before transforming into specialised cells, which are cells with specific functionalities. This means that if there was a way to control how these cells transformed, the production of heart cells, liver cells or other vital cells needed for treatment would be possible.

Stem cells are the fundamental, most basic cells capable of being produced, and when subjected to the perfect conditions, they are able to replicate themselves (daughter cells) before transforming into specialised cells, which are cells with specific functionalities.



This means that if there was a way to control how these cells transformed, the production of heart cells, liver cells or other vital cells needed for treatment would be possible.

The development of such a research has allowed for the progress in understanding diseases and their development within the human body through observing specific triggers and interactions between the stem cells and virus. Stem cell transplants are capable of replacing cells damaged by chemotherapy, with the procedure known for its long-term irreparable damage to the body, allowing a safer fight against cancer and blood-related diseases.

Due to the ability of being a near-perfect replica of human cells, stem cells are also able to test the effectiveness and safety of trial procedures and products before human experimentation.

And it doesn't stop there.

Stem cells also have the capability to prevent ageing completely. The complex process of ageing is the result of many environmental factors, genetics and daily, natural wear and tear on the human body. Overtime, such damages accumulate, causing our cells to become incapable of replicating and eventually dying off. Stem cells have the capability of halting that process completely through the injection of new body cells as replacements. There is ongoing research on stem cells being used in age-related macular degeneration (AMD) therapy.

If proven effective, it would be possible to restore sight in retinas where the retinal pigment cells have stopped working due to old age.

As such, Shinya Yamanaka has made one of the most monumental developments of human health and wellbeing, opening the doors for many others to continue with limitless possibilities. With the introduction of advanced medical rejuvenation procedures being the key to a possible future ageless society, Yamanaka's name will be known for centuries to come.

WRITTEN BY JULIA HAN AND BING JIANG

UNSW SCISOC (b. 2012)
Shinya Yamanaka, 2021
Magazine article
2012 Nobel Prize Winner

EXHIBIT X
CRYPTOCURRENCY?

Written by Bud Truong & Christian Nguyen

"A digital asset designed to work as a medium of exchange wherein individual coin ownership records are stored in a ledger existing in a form of a computerized database"

If you haven't been living under a rock for the past decade, cryptocurrency probably brings to mind names like Bitcoin, Ethereum or Dogecoin. Essentially, cryptocurrency is a type of digital currency which can be used to buy and sell almost anything as well as being decentralised meaning many individuals keep track and verify its transactions.

The first cryptocurrency, Bitcoin, was launched in 2009 by Satoshi Nakamoto in response to the 2008 Global Financial Crisis in hopes that it would provide a way for people to not rely on companies, banks and large institutions for control over their money

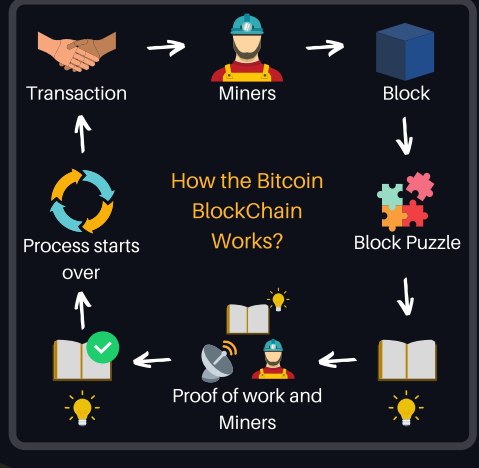
Since then, cryptocurrency has become more widely accepted and countless new ones have been developed and released due to the concerns over existing cryptocurrencies' secureness, environmental concerns and need for new technology.

BITCOIN

Just as the Reserve Bank of Australia mints new currency, new Bitcoin is created whenever a 'block' is added to the blockchain. Inside each block of max size 1 MB, Bitcoin transactions are stored which contain the Bitcoin address of the user sending the Bitcoin and the user receiving the Bitcoin after it has been verified by miners on the blockchain.

The Bitcoin blockchain relies on a 'Proof of Work' system where miners must generate a valid hash that is less than or equal to a target value. The system ensures a new block is added to the chain approximately every 10 minutes whereby after every 2016 blocks the target value's difficulty is adjusted to maintain this time. When a miner generates a valid hash first, they are rewarded with a Bitcoin 'block reward' which halves every 4 years.

It should be noted that there will only ever be 21 million Bitcoin in circulation and so, all Bitcoin is expected to be fully mined by 2140.



POO COINS AND DOGECOIN

Recently, Elon musk's tweets about Dogecoin have caused its price to skyrocket. Its legitimacy has been furthered by Musk's acceptance of it as payment to send a 40 kg satellite into space. You may be thinking to yourself, what is Dogecoin?

Originally considered to be a 'poo coin' and 'meme coin', Dogecoin is now commonly referred to as an 'alternative coin' (otherwise known as altcoin). Created in 2013 by Billy Markus and Jackson Palmer as a joke in response to the craze surrounding cryptocurrency at the time, it functions very much in the same way as bitcoin, utilising a blockchain where each block contains transactions verified by miners and each time a block is added a miner is given a 'block reward'.

Some key differences are:

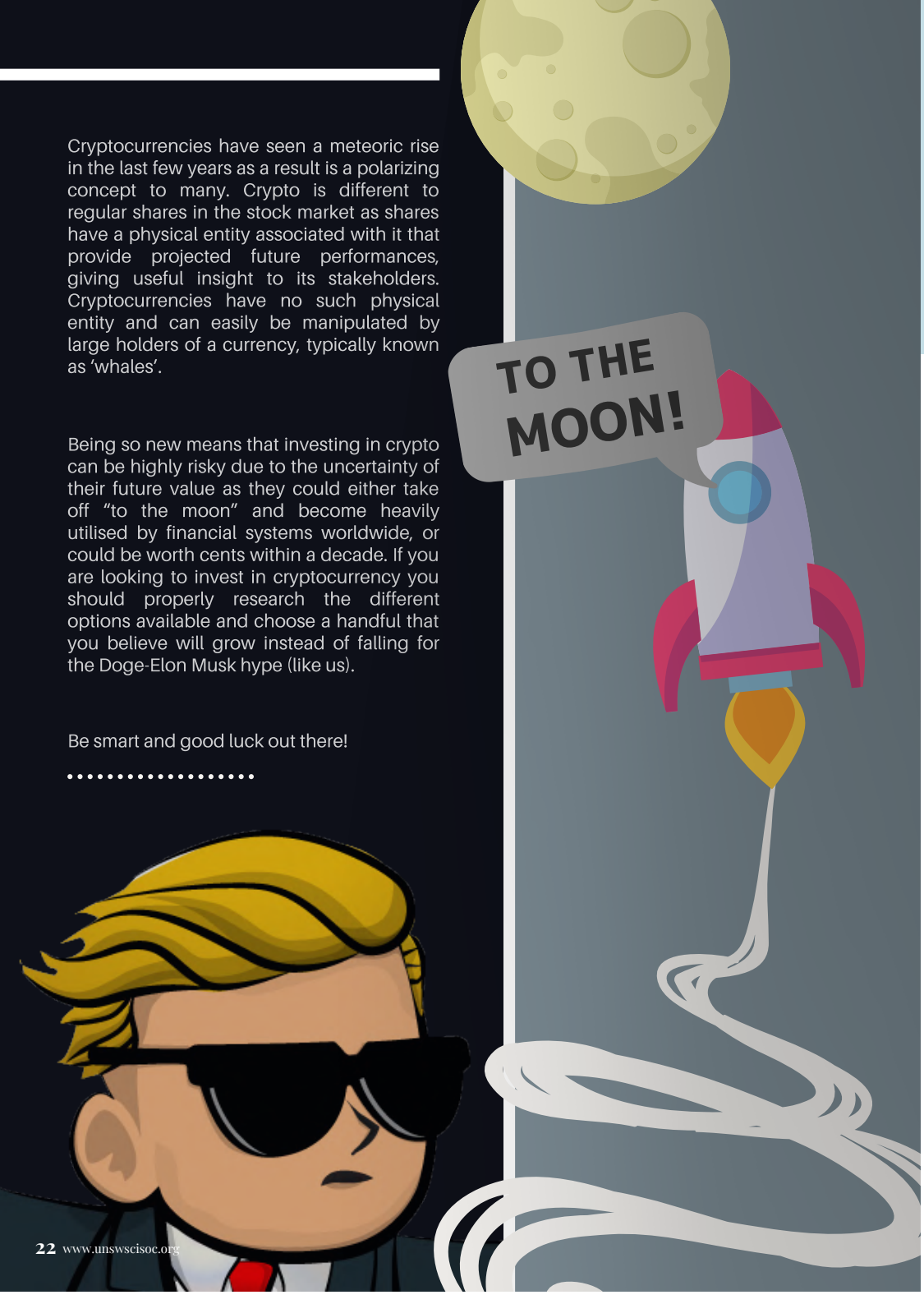
- *There is no limit on the number of Dogecoin that will be in circulation (currently 129 billion)*
- *The block creation time is only one minute meaning transactions are much faster than Bitcoin.*

UNSW SCISOC (b. 2012)
Cryptocurrency?, 2021
Magazine article
The state of cryptocurrency in the 21st Century

Cryptocurrencies have seen a meteoric rise in the last few years as a result is a polarizing concept to many. Crypto is different to regular shares in the stock market as shares have a physical entity associated with it that provide projected future performances, giving useful insight to its stakeholders. Cryptocurrencies have no such physical entity and can easily be manipulated by large holders of a currency, typically known as 'whales'.

Being so new means that investing in crypto can be highly risky due to the uncertainty of their future value as they could either take off "to the moon" and become heavily utilised by financial systems worldwide, or could be worth cents within a decade. If you are looking to invest in cryptocurrency you should properly research the different options available and choose a handful that you believe will grow instead of falling for the Doge-Elon Musk hype (like us).

Be smart and good luck out there!



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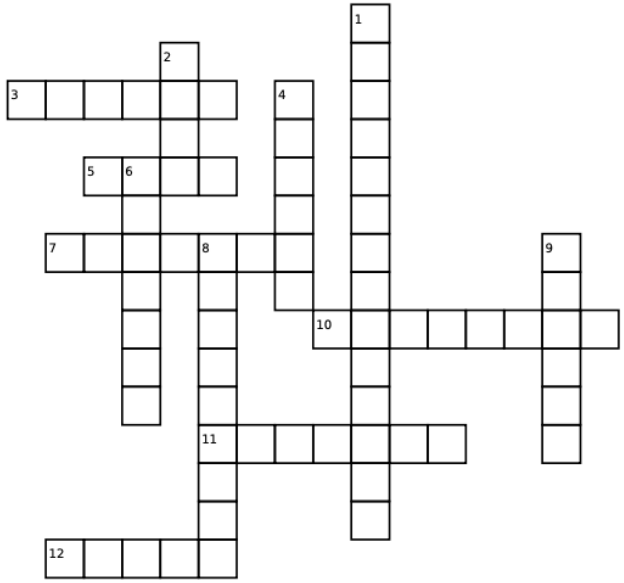

Down:

1. a digital currency in which transactions are verified and records maintained by a decentralized system using cryptography
2. an alcoholic drink made from yeast-fermented malt flavoured with hops
4. semi-solid food prepared from milk
6. any organic compound whose molecule contains one or more hydroxyl groups attached to a carbon atom
8. a violent shattering or blowing apart of something
9. a building in which objects of historical or artistical interest are exhibited

Across:

3. a baby cat
5. 4th planet in the solar system
7. relating to nucleus or an atom
10. an individual animal, plant, or single-celled life form
11. a study of field of the physical and natural world
12. a country in Asia, known for cherry blossoms

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