

ISSUE 31



CAMPUS

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THE
SCIENCE ISSUE



that dramatic
new hairstyle
you got on
Pulau Tekong.



visiting your favourite aunt's house

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grandparents in their wedding finery
at a dalan Besar photo studio.



your first
cable car ride
to Sentosa.

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from the

PAST

that time a
monitor lizard
appeared in
your void
deck.



your BodyBuilding
uncle at the 1993
National day Parade



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2

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LARGE AND IN CHARGE

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Hidden amidst green valleys and sleepy towns are some of Taiwan's brightest tourism gems: the scenic railways. Built during the Japanese colonial period (1895-1945), these railway lines used to transport tons of timber and coal, and masses of workers, every day. Today, the big mines and factories are gone, and quirky, charming attractions - perfect for day trips - have taken their place.

by Teng Jing Kuan

WANDER-FUL TAIWAN

SCENIC RAILWAY ADVENTURES



PINGXI LINE

STATION: Pingxi - Jingtong (New Taipei City)
LENGTH: 12.9km
PRICE: Day Pass NT\$52 (concession NT\$28)

While Pingxi's night skies are most famous for coming alive with thousands of sky lanterns (*kongming deng*) every year during the Lantern Festival, there's so much more to the area that can be explored throughout the year.

Grab a day pass for the Pingxi Line, and start your journey at Jingtong Station. At Jingtong Old Street, you'll find the Railway Story House, a wooden 1900s building filled with vintage railway paraphernalia, and cute souvenirs. It's a short walk to the bright red Zhongpu Bridge; a local tradition involves writing a wish on a bamboo tube, which is then hung up on a tree near the bridge. It's probably wise to wish for good weather, because most of the other attractions along the Pingxi Line are outdoors!

Nearby is the Coal Mining Memorial Park, where little has changed since the heyday of Jingtong's mining industry. If you're sporty, there are plenty of hiking trails branching off from the railroad tracks. Just be sure to bring a map because the signage on these trails can be somewhat inconsistent.

Afterwards, make a quick stop at Pingxi station for a selfie with Taiwan's last remaining Japanese mailbox, and then head to Shihfen station where you'll find the spectacular Shihfen waterfall - a great place to watch the sunset.

STEAM LOCOMOTIVE



PINGXI JINGTONG



SHEN-AO LINE

STATION: Ruifang - Shen Ao (New Taipei City)
LENGTH: 4.2km
PRICE: Round-trip NT\$28

The Shen-Ao line is, strictly speaking, not one of the scenic railways, but definitely an interesting way to get out of central Taipei for a fun day trip. It branches off of the Yilan line at Ruifang station northeast of Taipei, and passes through the streets of Keelung, as well as some hilly wooded areas.

This line was built in the 1960s to link Ruifang to Shen-Ao port, but today it terminates at the National Museum of Marine Science and Technology. The museum houses 8 galleries and an IMAX theatre, and when you're done learning about the ocean you can head to nearby Radoumi coastal park, or cross the bridge to Heping Island, to actually see it.

If the tofu cube-shaped rocks at Heping Island make you hungry, return to Ruifang and take a short cab ride from there to Jiufen for some of its famous street food. Deep within the crowded maze of alleys, you'll find stalls serving anything from hot taro balls to crispy barbecued pork.

HEPING ISLAND



JIUFEN



Grab some street food at Jiufen

臺灣鐵路局
2011.10.05
國間車
后里回
↓
台中
新



NEIWAN LINE

STATION: Hsinchu - Neiwan (Hsinchu)

LENGTH: 25.9km

PRICE: Day Pass NT \$82 (concession NT\$42)

Hop onto the Neiwan Line at North Hsinchu station, to immerse yourself in the unique history and Hakka culture of the region. You'll pass timeless-looking fields and valleys and catch a glimpse of the famous suspension bridge over the Youlue River. In the springtime, you'll be treated to the sight of cherry trees in bloom. The line ends at Neiwan station, but this is where your adventures (on foot) begin...

Step back in time at the Neiwan Theater, built in 1930 for the town's miners. It now contains a Hakka restaurant, decked out in nostalgic mid-century decor (complete with a traditional provision shop), where you can enjoy retro Taiwanese movies while you sip some lei cha.

For more Hakka delicacies, head to Neiwan's bustling Old Street. One must-try local specialty is the rice dumpling (songzi) wrapped in ginger leaves. Also, be sure to stop at the Mudan Heitanggao (black sugar cake) stand, which produces some of the best handmade black sugar cakes in the country.

When you've eaten your fill, visit the museum dedicated to famous Taiwanese cartoonist, Liu Hsing-chin, where you might even bump into the man himself. Liu was born in Neiwan, and many of the town's tourists maps were designed by him.



YOUULUE RIVER



Dumpling wrapped in ginger leaf

Youlue river's famous suspension bridge



Step back in time at Neiwan Theater

GREEN TUNNEL



Hundred-year old camphor trees line the Green Tunnel

JII LINE

STATION: Ershui (Changhua) - Checheng (Nantou)

LENGTH: 29.5km

PRICE: Day Pass NT\$78 (concession NT\$40)

Jiji Line is the longest of the scenic railways. It begins at Ershui Station in Changhua County, and ends in Checheng, near Sun Moon Lake. Between Longquan and Jiji stations, you'll pass the amazing Green Tunnel - a tree-lined road where the hundred-year-old camphor trees have intertwined their branches to form a beautiful canopy.

Alight at Jiji town (which is known for its bananas) to explore this Green Tunnel, as well as nearby Wuchang Temple which has been left untouched ever since it was damaged during the 1999 earthquake. The beautiful tiled roof and ornate decorations on its eaves are still largely intact, but the temple's columns have completely collapsed.

At Shuili, you'll find the 30m long Snake Kiln, with its museum exhibits on traditional pottery techniques, as well as the world's largest pot - it's more than 6m tall!

From Shuili, you can take a Green Transit bus to Sun Moon Lake. This is Taiwan's largest lake, and it's surrounded by temples, fresh seafood restaurants and great bike trails.

WUCHANG TEMPLE



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BY KURSHUKA SARIF

SURPRISE, SURPRISE!

For curious minds, we've unravelled some of the most mind-blowing science facts about food that may never have crossed your mind – from mysterious ingredients with questionable names to genetically modified food and even packaging of food products. Be warned though, what you discover may be more than what you can handle.

POTATO CHIPS

Ever wondered why potato chips bags are always half-empty? No, it's not that the manufacturers are being stingy with their contents. What seems to be air filling up the bag is actually nitrogen gas. The purpose of having the bag filled with nitrogen gas is to ensure the potato chips stay fresh, as oxygen will cause spoilage and the potato chips to be soggy. The gas also bloats up the bag to prevent the chips from getting crushed.



BANANA

What if we tell you the bananas you see in supermarkets are all clones and genetically modified? No, we're not kidding. Without modifying the DNA of a Cavendish banana, what you get is a distasteful fruit full of seeds and very little flesh. In order to make it more palatable, it comes with a price – since genetically modified bananas cannot naturally reproduce, it has to be cloned and that makes it vulnerable to diseases. If one batch of banana is affected by a disease, the rest will follow suit.



YAKULT

Many have the perception that Yakult bottles come in small sizes as it's unhealthy to drink more than one serving. However, the reason behind its size is because of hygiene issues. With a larger bottle, it would increase the risk of infection with other bacteria. As a consumer is unlikely to finish the drink, opening and closing the bottle would expose the live probiotic bacteria to various airborne bacteria. When that happens, the content will turn bad easily.



L-CYSTEINE

Known as E920, L-cysteine is a food additive added to flour to stabilise the structure of bread. Though it sounds like a common ingredient, do you know what its source is? While some countries use synthetically-produced L-cysteine, it is also commonly extracted from animal sources (feathers, pig bristle) and even human hair. Rich in proteins, the extracted L-cysteine is then used to bake your biscuits, breads and cakes. As E920 is not permitted in wholemeal flour, it's the reason to why you should start eating wholemeal bread.

CONFECTIONER'S GLAZE

For all sweet lovers, that shiny coating that envelopes your tasty, sugar-filled confectionery is shellac; to be specific, secretions from a female lac bug. Found on its scales, the sticky substance is used for self-protection and waterproofing. Given its exceptional qualities, it's also used in floor polish and hairsprays other than just being a coating layer for your sweets and medicine. Don't let that bug you as it's approved by the United States Food and Drugs Administration.



CASTOREUM

Finding the word "castoreum" in the ingredient list is almost close to impossible when it's labelled as a natural ingredient. We won't question its naturalness but the level of grossness? You determine it. Excreted from the castor sacs of a grown beaver, castoreum is discharged along with urine from a beaver during the marking of its territory. As it has a similar scent to vanilla, it is most often used in perfume. According to a 2007 study by the Burdock Group, castoreum is also used in some food products – like chewing gum, gelatin and candies – as flavouring. The idea of it sounds gross but at least it tastes and smells good, no?



BY PARVEEN MAGHERA

WOMEN OF SCIENCE

Over decades, science has made leaps and bounds in every area imaginable; some of these advancements have been made by women but these often go unnoticed purely because it used to be a man's world. Here are some tenacious ladies of science who've made discoveries that weren't immediately recognised in the annals of science.

COMPUTER PROGRAMMER

ADA LOVELACE
(1815 – 1852)

Known as the "Enchantress of Numbers", Ada Lovelace (daughter of Lord Byron) was the founder of scientific computing. After English mathematician Charles Babbage proposed the "analytical engine" (what could have been the world's first computer), Lovelace developed an algorithm to compute data, making her the world's first computer programmer.



GENETICIST

NETTIE STEVENS
(1861 – 1912)

American geneticist Nettie Stevens was responsible for the huge biological discovery of the X and Y chromosomes. Although this finding is associated with Thomas Morgan, without Stevens' initial seed discoveries (which she made independently), he would not have been able to develop the findings successfully.

CYTOGENETICIST

BARBARA MCCLINTOCK
(1902 – 1992)

American scientist and cytogeneticist Barbara McClintock received the Nobel Prize in Physiology or Medicine some 30 years after her discovery. Ever since her unveiling of transposons, or 'jumping genes' (a sequence of DNA which allows scientists to single out superior chromosomes), it's now a common practice in the food industry for scientists to single out disease-resistant plants or grains for propagation. Her work was only recognised after a similar phenomenon took place with bacteria.



NUCLEAR PHYSICIST

CHIEN-SHIUNG WU
(1912 – 1997)

Nicknamed the "Queen of Nuclear Research", Chien-Shiung Wu, a Chinese American experimental physicist, was the authority on nuclear fission (the study of splitting or joining particles). Wu helped two scientists – Tsung-Dao Lee and Chen-Ning Yang – with a nuclear physics theory, and though she solved it all on her own, it was her two colleagues who received the Nobel Prize. Undeterred, Wu eventually became the first female president of the American Physical Society, receiving awards like the National Medal of Science for her work.

BIOPHYSICIST

ROSALIND FRANKLIN
(1920 – 1958)

British biophysicist Rosalind Franklin's work is one of history's many stolen discoveries. Having revealed the twisted and double-helical structure of the DNA, Franklin was robbed of her recognition when her theory was put forward by scientists James Watson and Francis Crick, who immediately recognised the importance and published the theory, and eventually got the Nobel Prize.

CHEMIST

STEPHANIE KWOLEK
(1923 – 2014)

While DuPont chemist Stephanie Kwolek has won numerous awards for her work in chemistry, she is best known as the inventor of the synthetic fibre that is the basis of Kevlar. In 1964, she created what seemed to be a failed milky liquid which she managed to spin into a thread – at five times stronger than steel, it became the world's strongest fibre. Today, this synthetic fibre is used in life-saving Kevlar suits, as well as in spacecraft, kayaks and helmets.

BY TENG
JING XUAN

MISCONCEPTIONS THAT RULED THE WORLD

Science, ideally, involves only pure facts and precise measurements, but the people behind science are never infallible. Experiments might get designed to prove what the "scientist" already believes. Or scientists might project their moral views onto neutral theories. And some scientists, like normal people, might be liars or idiots, or both.

Most bad science - like ancient astronaut theories - gets laughed at by the smarter members of the public. But, sometimes, misguided scientists can take over the world...



CRIMINAL BUMPS:

PHRENOLOGY

The Victorians enjoyed cataloging nature and making it predictable. Their factories were multiplying rapidly, and their empire was stretching across the globe like a giant glob of pink bubblegum that refused to come off the pavement of the planet. Naturally, they wanted to keep everything under control.

That's why phrenology, a "science" with German roots, found its real home in 19th century Britain. Phrenology basically makes conclusions about people's personalities, intelligence, and criminal tendencies based on head measurements. In Britain, it grew out of tiny medical societies, into a huge industry offering all sorts of pre-marital and workplace personality tests.

That may sound silly and harmless but take, for instance, two of the "truths" that all this measuring and produced:

1. Women's head shapes are evidence of their inferior political abilities and superior child-rearing capacity, so they should be denied the vote.

2. People from the tropics can never be truly civilised because they lack the brain "organs" for producing art.

The problem with phrenology was that it used vague evidence (cranial "bumps") and false premises to make strong generalisations. It correctly assumed that mental activity starts somewhere inside the head, but got the relationship between mind and matter disastrously wrong!



HYSTERIA

The composite image consists of three black and white photographs of a woman, likely Jeanne d'Arc, in various states of distress or discomfort. The first photo on the left shows her sitting up in bed, looking upwards with her hands raised in a gesture of anguish or prayer. The middle photo shows her lying in bed, looking towards the camera with a pained expression. The third photo on the right shows her lying down, with her head resting on a pillow, appearing to be in a state of unconsciousness or deep pain. Below these photos is a vintage advertisement for 'Vibration is Life'. The advertisement features a woman in a long dress and a small illustration of a person using a vibrating chair. The text in the advertisement includes the title 'Vibration is Life', a list of ailments it claims to cure, and the name 'WHITE CROSS Electric Vibrator'.

Vibration is Life

...the most powerful and effective means of curing all the following ailments: Rheumatism, Gout, Neuralgia, Sciatica, Lumbago, Backache, Headache, Migraine, Nervous Prostration, Debility, Indigestion, Constipation, Catarrh of the Bladder, Hemorrhoids, Piles, Varicose Veins, Ulcers, Burns, Scalds, Frostbite, Eczema, Psoriasis, and all other skin diseases. It is also a powerful aid in the treatment of all the following ailments: Asthma, Bronchitis, Emphysema, Hay Fever, Whooping Cough, Sore Throat, Tonsillitis, and all other throat and lung diseases. It is also a powerful aid in the treatment of all the following ailments: Heart Disease, High Blood Pressure, Diabetes, and all other diseases of the internal organs. It is also a powerful aid in the treatment of all the following ailments: Neuritis, Paralysis, and all other diseases of the nervous system. It is also a powerful aid in the treatment of all the following ailments: Epilepsy, and all other diseases of the brain. It is also a powerful aid in the treatment of all the following ailments: Mental Disease, and all other diseases of the mind. It is also a powerful aid in the treatment of all the following ailments: and all other diseases of the body.

WHITE CROSS Electric Vibrator

Vibrating Chair FREE



The Science of Spook

by Nina Gan

Have you, or anyone you know, experienced spooky stuff? In a country as superstitious as Singapore, it's no surprise that many people believe in ghosts. According to a 2013 HuffPost/YouGov poll, 45% of people believe in their existence. If you're not part of this percentage, then you'll probably appreciate these scientific explanations behind spooky happenings.

← Spectre or silent noise?

Seeing things

Have you seen an apparition in the corner of your eye, and then it vanishes when you turn to look at it?

When researcher Vic Tandy saw a grey 'ghost' near his desk, he discovered that the vibrations from a fan one floor below were causing a 'silent' noise (anything under 20Hz). Called **infrasound**, it causes a whole host of strange things to happen to your body, including the vibration of your eyeballs; human eyeballs resonate at 18Hz, and exposure to infrasound of that frequency can cause hallucinations.

Infrasound can be created by a whole host of events – traffic, lighting, the weather, even animals. You can't hear infrasound because our ears can only register vibrations of 20Hz or more.

Another explanation for the presence of an ethereal being is the state of your own body; if you're sleep deprived or doing a routine chore in a daydream state, your mind will fill in some creative blanks (a lady in red, perhaps?) at the corner of your eye.

Moving Ouija Boards

Ouija boards (or similar games) have always been a part of growing up – who wasn't curious about the afterlife? But did all the 'answers' really come from beyond?

When a group of people place their hands on the board, the pointers seem to move and indicate an answer. However, what they don't realise is that they are subconsciously moving it themselves. This is called the **ideomotor effect** – a slight movement in our muscles caused by the power of suggestion from our minds.

Who's deciding the answer?



Succubus 'devouring' sleeper

Paralysed in bed

Have you ever felt paralysed while lying in bed wide awake, with someone trying to strangle you or drag you across the bed, but you're unable to scream?

This phenomenon is all part of **sleep paralysis**, which happens when there's a disconnect between body and mind while coming in and out of REM sleep, and has been recorded countless times over the centuries. This paralysis mainly renders us helpless in a threat situation, and could explain demons of the Middle Ages (like succubi), or even alien abductions.

Someone next to you

We've all heard spooky tales of people being shadowed or visited by a dark being. In one report, a woman stated that a shadow copied her every move and even 'held' her.

This was part of a Swiss experiment, when scientists **electrically stimulated** the brain of a patient. The left temporo-parietal junction of the brain defines the idea of 'self', and by interfering with that area, the confused brain creates, and projects a copycat person.



Shadow figures or shock therapy?

In another experiment at Laurentian University, participants who've been applied with electromagnetic bursts to their right temporal lobes reported the presence of 'people', and in one case, a volunteer felt her leg 'dragged up the wall'.

Electromagnetic exposure also lowers melatonin levels, which makes people more prone to micro-seizures and hallucinations.



← Ghost or gas?

The House of Horror

If you've watched *Poltergeist*, you'll be familiar with the observations of a 1925 paper by William Wilmer – he documented a family home that was plagued by a host of ghostly scenarios including footsteps in empty rooms, dying plants and random hostile apparitions.

The cause? A faulty furnace that leaked **carbon monoxide (CO)**. CO poisoning causes oxygen deprivation that can lead to symptoms like delirium and hallucination right before death.

CAUTION
CARBON MONOXIDE
MAY BE PRESENT

Another cause for a poltergeist affair could be **electromagnetic (EMF) pollution**. Neuroscientist Michael Persinger found the correlation between locations with reported hauntings and places with increased geomagnetic activity. In a 1996 article in *NEXUS* by Alfred Budden, high levels of EMF (emitted from a nearby 40ft radio mast) were detected in a home that reported heavy paranormal activity including electrical items switching on and off, vases of flowers flying across a room and a heavy table that overturned itself regularly.

We all know that magnetic fields can affect electronic circuitry and cause metal objects to move (much like Magneto's power). The movement of non-ferrous materials can also be attributed to the effects of EMF, including the Hutchison Effect (when strong electromagnetic fields create a zero-gravity atmosphere), and acoustic levitation, when sound waves (like ultrasound) are able to move objects.

$$\frac{d\Phi_B}{dt}$$

Well breaking loose or Hutchison Effect?





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Cheat Sheet

By Ann D'Cruz

#31 The Science in Scientology

Often hitting the headlines for its longstanding pull with celebrities, and whether it qualifies as a religion, Scientology, more often than not, falls greatly on the wacky wayside; however, at its core, it aims to enlighten. So, instead of riding the tabloid wave, we're giving you the real deal on Scientology and the principles that pave its way as a religion.

BASIC FACTS

DEFINITION: Loosely translated to mean 'the study of knowing, in the fullest meaning of the word'.

CONCEPTUALISED BY:
L. Ron Hubbard in 1954

BELIEF: That enlightenment is achievable with the right mix of self-awareness, and a person's relationship with universes and other life forms.



L. Ron Hubbard,
founder of Scientology

its ordained leaders that include titles like the 'Director of Processing' who levels people up by paying heed to the different gradient scales found in Scientology (these scales are beacons to emotional and spiritual learning). There's also an 'auditor' who is trained to help followers with spiritual counselling; new individuals are called 'preclears', while those that have attained spiritual purity are called 'clears'.

WHERE DO THEY GET THEIR TEACHINGS?

Scientists get their information from the Eight Dynamics which, similar to a holy book, is a series of doctrines that spell out the various components of leading a spiritual life.

HOW DID IT ALL START?

Equipped with a creation theory like every religion, Scientology's human lineage begins with Xemu, an extraterrestrial being that ruled over 90 planets within the galaxy some 75 million years ago. Having been dealt the card of overpopulation, Xemu solved the problem by selecting individuals and dispatching them to volcanoes on Earth. After that, he dropped several hydrogen bombs on these locales, causing fire outbreaks which resulted in the demise of these individuals, thus releasing their spirits - which Scientology believes makes up its followers - which he froze in alcohol and glycol.

LIVING AS A SCIENTOLOGIST

Not falling far from the proverbial apple tree, Scientology too has a moral code of conduct to live by, and they include the basics: give more than you receive; respect the beliefs of others; love and honour your family; don't harm anyone else, etc.



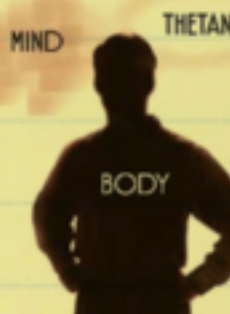
The Eighth Dynamic

WHO DO SCIENTOLOGISTS TURN TO?

The Supreme Being that reigns over the religion is called the Eighth Dynamic. Like any place of worship, the Scientology church has

THE DON'Ts

Paying special focus to the 'thetan', which is its term for 'spirit'. Scientology always highlights the importance of keeping the thetan clean and wholesome, so some of the constraints include staying away from alcohol, drugs, and any substance that might clog the spirit up.



OTHER RELIGIOUS OVERTONES

Some of these include the concept of reincarnation, however, in Scientology it's only applied to humankind. Scientology also has its religious holidays that include the birthday of L. Ron Hubbard, the anniversary of the maiden voyage of Freewinds (the ship which hosts advanced sessions of their spiritual counselling), and New Year's Eve.

FAMOUS SCIENTOLOGISTS

The list is endless, but some of the big names that grace the church are Tom Cruise, Danny Masterson, Elisabeth Moss, John Travolta, and many, many more!



John Travolta and
Tom Cruise

SCIENCE HACKS

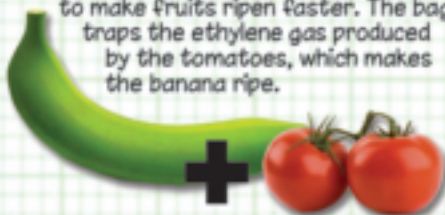
It happens way too often: we always find ourselves stumped by how to do everyday tasks when there are no clear instructions. Don't fret - here are some quick tricks and fun science shortcuts that will solve everyday problems by using items that are found in the average household, so that you can be on your way to becoming an amateur scientist.

RIPEN A BANANA

Ever find yourself craving to eat a banana, even though the bananas you buy off the supermarket shelves are still unripe and green? Here's what you can do to speed up the ripening.

ITEMS: Brown paper bag, two ripe tomatoes, unripe banana

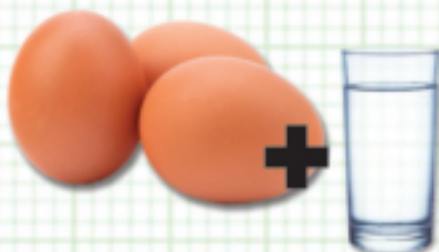
Placing the unripe banana along with the two ripe tomatoes into the brown paper bag and sealing the bag will naturally speed up the process of the banana ripening. How fast, you might ask? Well put on your helmet, because it's twice as fast. The trick lies in the ripe tomatoes. A plant hormone called ethylene is used to make fruits ripen faster. The bag traps the ethylene gas produced by the tomatoes, which makes the banana ripe.



ROTTEN EGGS

We all have eggs at home, and some of us won't know if they're fresh until we break them. To prevent cracking a rotten egg into a hot frying pan with the smell of a thousand farts floating in your kitchen, try this trick.

You'll need a tall glass, a cup or bowl, filled at least halfway with water. Place the egg in the water and watch if it sinks. Good eggs sink, bad eggs float. Why? Eggshells are porous, making them bumpy and grainy in texture. This also means that air and moisture can pass through their pores, allowing bacteria inside the egg to grow, thus creating a lower density, enabling the egg to float. Eggs that are 2 weeks old will normally be partially submerged. Whereas eggs that are about 1 month old will float.



EASY RUST SCRUBBING

Ever feel too tired to scrub the wok and cast iron pan from last night's dinner? Sure, there are rust removers that you can buy off the shelves of DIY stores, but it's going to be expensive. Here's one science hack you should remember, plus it's cheaper!

Coke has an ingredient called phosphoric acid that's used to add that sour punch in the super sweet soft drink. This ingredient is also a chemical used industrially as a rust and tarnish remover. Alternatively, give vinegar a try. It has the same acids that react with rust and break it down.

DON'T CRY FOR ONIONS!

What's new here? Your eyes start burning up like two fireballs of pain the moment you cut into an onion. Cutting up stuff with an ocean in your eyes can be dangerous.

When an onion is cut, the enzymes in the onion's cells escape. These enzymes give onions their taste and release a volatile gas that acts as an eye irritant - a natural defense mechanism in the plant. It is this gas that diffuses up to your eyes and creates that stinging sensation. You start tearing up, blinking and squinting, trying to flush the irritant out. The only way to not cry with an onion around, is to be nowhere near the onion. If you really do need to cut an onion up, either place the onion in the fridge and chill it for 30 minutes, or cut the onion under running water. This stops the gas from escaping the onion and coming up to your eyes. Otherwise, just wear goggles. You may look silly while cutting it, but the person laughing at you will be in pain and crying.



LET'S CHILL

So you have an unchilled beer bottle in your hand and you don't want to throw ice cubes in the drink. Grab a paper towel and wet it. Place the paper towel around your drink and have it chill in the freezer. The science behind it is the same as when you wear wet clothes - you get cold quickly. So by wrapping the bottle in a wet conductive layer, heat dissipates quickly.



WATER DAMAGE

Some of us would be all too familiar with this instance - having water in our electronic devices. Accidents can happen from time to time, whether it's a splash on our smart devices, or seeing our smart devices go for a swim in the toilet bowl. If you ever find yourself in this situation, pick up the device quickly and paper towel it.

Do not shake the device, and most definitely do not use a hairdryer. The heat evaporates the water, allowing water vapour to travel to other parts of your device. And shaking the device will only cause the water within the device to seep further into the other parts, causing more damage.

While not all of us have silica gel (or other special chemical drying agents) at home, another drying agent to use is uncooked rice. Like silica gel, uncooked rice absorbs moisture. Place your device in a sealed container or bag along with uncooked rice for 24 hrs, and let the rice work its magic.



THE FADING HEROES OF MEDICINE

BY AMOS ANG

Brave heroes. Colourful villains. A battle between good and evil set in an alien world. Good is eventually victorious and the heroes ride off into the sunset – all the ingredients for a riveting story. But this is no story. It's happening right now, and the outcome is a lot less certain.

ANTIBIOTICS AGAINST BACTERIA

While the battle between antibodies and bacteria has been waged since the dawn of time, humans – up until the fortuitous 'alliance' with antibiotics forged by Sir Alexander Fleming in 1928 – were usually on the losing side against these micro-bandits.

Since then, however, the tables have turned, with our species entering an unprecedented period of high life expectancy, no longer helpless victims to infection by bacteria.



I CREATED
THE FIRST
ANTIBIOTIC!

WE WILL
RESIST YOU!

BACTERIA FIGHT BACK

Bacteria though, are highly adaptive, and signs are emerging that the efficacy of antibiotics is fading. The cause? Human complacency that has set in among all of us, many of whom were not present during the dark ages before the alliance.

There is a flagrant disregard of the guidelines involving antibiotic usage, both by the user and supplier (doctors). These include users who discontinue the course of antibiotics the moment they feel better instead of finishing it, and exasperated doctors who are tired of explaining to stubborn patients that antibiotics are useless against the common cold (caused by viruses) even though they know full well that this contributes to antibiotic resistance.

This careless overuse has given bacteria a detailed insight into the workings of antibiotics and the ability to evolve into a new strain of ultra-resistant bacteria, codenamed SuperBugs. They have accomplished this feat through bouts of internal genetic engineering and modification, along with acquisitions of resistant genes from various bacterial species through their own unified species.

Recent field reports now indicate that the most notorious SuperBug, staphylococcus aureus (a.k.a MRSA), has managed to overcome even the toughest third-line antibiotic – vancomycin.

ANTIBIOTIC WAR

However, all is not lost. There are people who recognise that immediate action must be taken if we don't want to end up at bacteria's mercy again.

Should viable antibiotics no longer exist, most routine surgeries will become virtually impossible. Afflictions such as tuberculosis and pneumonia, normally considered treatable, will become incurable, and that's just the tip of the iceberg.

If you're wondering why the pharmaceutical industry is always developing new antibiotics, it is because the weapons we have today need to evolve with the enemy in the battleground of medical science. Initial contact has been made with Phages (viruses that attack bacteria), as part of a multi-pronged battle plan to tackle bacteria.

Even if you're not pharmaceutically-inclined, simply following the antibiotics guidelines and educating those that might still be in the dark is an important step in the battle against bacteria.

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THE LIST

MOST 'KA-CHING' SCIENCE EXPERIMENTS

Besides improving lives everywhere, the leaps and bounds science has made have helped us understand the world around us a lot easier. However, none of these would be possible without the moolah pumped into such projects. So here's a list of some of the most expensive science experiments ever conducted.

THE ISS

IN SPACE

THE INTERNATIONAL SPACE STATION (\$\$187.55 BILLION)

The International Space Station (ISS) orbiting the earth is the most habitable space environment (even with close to zero gravity). With six bedrooms, two bathrooms and a gymnasium, the orbital is home to six full-time space crew and serves as a platform for all types of scientific studies as well as a port for international (or perhaps intergalactic?) spacecraft.

CURIOSITY

CURIOSITY (\$\$3.13 BILLION)

Scouring Mars for any signs of life, Curiosity weighs in at 900kg and carries an equally hefty cost. Roving around the sand dunes of Mars since 2012, the Boeing-made robot has been feeding us numerous closeup shots of Mars, which have indicated that life once existed on Mars.

OOI

UNDER THE SEA

OCEAN OBSERVATORIES INITIATIVE (OOI) (SGD\$95.8 MILLION)

The Ocean Observatories Initiative was the first project to break deep-sea banks to place observatories in various regions throughout the American continent to monitor some of the most mysterious but volatile locations on this planet: our oceans. With water covering 71% of earth's surface, it's shocking that we've not even combed a fraction of our planet's oceans. Compared to space, deep-sea exploration is much closer to home, however it is equally expensive, difficult and dangerous.

ON LAND

THE INTERNATIONAL THERMONUCLEAR EXPERIMENTAL REACTOR (\$\$22 BILLION)

The work of 35 nations put together, the International Thermonuclear Experimental Reactor is the world's largest fusion reactor, harnessing nuclear fusion as a means of energy - clean energy, to be precise, as the reactor is environmentally-friendly. Standing at 30m tall, the project is designed to produce 500 megawatts of power, a feat that can power more than 375,000 homes.

LARGE HADRON COLLIDER (\$\$12.5 BILLION)

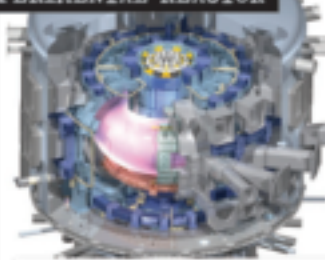
The experiment that some feared would swallow the earth, the Large Hadron Collider was conceptualised to reveal the much talked about 'God Particle' - the Higgs Boson, a particle that could lead to the understanding of the mysterious dark matter, as well as how the universe was created. Although the collider has uncovered a few findings over the years, this large undertaking has had no practical application so far.

ARTIFICIAL INTELLIGENCE

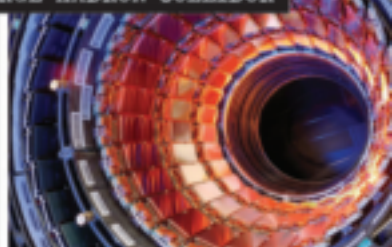
WATSON (\$\$2.25 BILLION)

It's not Emma Watson we're talking about here; Watson is a computer system with artificial intelligence. During its experimental stages, doctors used Watson to diagnose and treat illnesses in the body to help minimise human error. In the near future, Watson will be used in hospitals, and is likely to alter the face of medicine. There are also high hopes that Watson will be able to detect cancer in its early stages.

THERMONUCLEAR EXPERIMENTAL REACTOR



LARGE HADRON COLLIDER



WATSON



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Idea

CREATIVE INDUSTRIES
SPECIAL

By Nurshurina Sariff

The Business of Fashion

Have you always wanted to be part of the fashion industry but decided to forsake it, thinking you won't make the cut? Don't be discouraged, because there's a whole world out there waiting for you. Fashion is more than just sketching or sewing clothes or even being a fashion designer, so continue reading and be intrigued at the number of job opportunities in the fashion industry.



Pattern Maker

If you love putting IKEA furniture together, this'll be your cup of tea. The job title might make you think that pattern-making is all about doodling polka dots and paisley motifs, but 'patterns' in fashion are actually drafts of the final garment, made of paper or modelled in a computer program. Patterns are to fashion what floor plans are to architecture. You get to take the designer's conceptual sketch and make it work as a complete garment made of multiple cuts of cloth.



Fashion Journalist

No talent in sketching but have a knack for writing? Don't worry, you can apply for the position of a fashion journalist. Alternatively, you can start your own fashion blog. In order to be a fashion journalist, you'll have to keep up with fast-changing trends and maintain a good working relationship with your contacts. As you'll be working closely with photographers and designers to produce your articles, you wouldn't want to step on their toes.



Buyer

Do you love shopping and spotting trends? Being a buyer might be a suitable occupation for you. The job scope of a buyer includes planning and selecting a range of products to sell in retail outlets. It can be the most exciting job in the world but it can also be toughest, as you have to put yourself in the shoes of your consumers, and also take your budget into account. One wrong selection will lead to your boss knocking on your door, demanding an explanation for the losses.



Fashion Coordinator

Good news for those who loved dressing up Barbie dolls during their childhood days, because you can now do it for a living, except maybe on a mannequin. Being a fashion coordinator means you're responsible for creating looks (from the products picked by a buyer) for photo shoots, runways or stores. However, it's not just about mixing and matching clothes with accessories – the point of it is to promote the products to consumers.





Milliner

Don't be mistaken; being a milliner does not involve graining of wheat into flour in an artistic way but, rather, designing hats and headgear. If you find that bowler hats are too mainstream, you can try your hand at customizing them or coming up with a fresh design. All of the choices are up to you – patterns, fabrics, type of design and etc. Who knows, the Duchess of Cambridge might even wear your designs one day.



Footwear designer

Before you head down the path of being a footwear designer, you'll need to figure out what type of footwear you want to design. Footwear can be categorised as dress shoes, sneakers, boots or even according to gender and age group. Figuring this out is important because when you're aware of your consumers' needs, you'll know what details to look out for. Like any design job, being able to visualise is an essential skill to have.



Accessory Designer

When it comes to designing accessories, there are many aspects to it – jewelry, scarves, handbags and even belts. Depending on which you have interest in, that's the aspect you should specialise in (unless you're unbelievably skilled in everything). An accessory designer's main duty is to sketch designs and to prepare prototypes for pitching to clients – so that they can evaluate them before saying yes to production. After all, no one would want to invest in a product that won't earn him or her the big bucks.



Fashion Publicist

Only take on this job if you have the social skills of Ellen DeGeneres, for you'll be liaising with more people than you can count on your fingers and toes together. When there's a launch of a new collection, you'll be in charge of generating publicity by writing press releases and calling your media friends to RSVP for events. In other words, you're the person responsible for putting in a good word for your company to bring in new business opportunities.



Merchandise Planner

All that matters in a merchandise planner's mind is money, as their role is to keep track of the company's profits or losses. For instance, if the collection is making losses, they have the authority to stop selling it. However, it's not just a matter of snapping your fingers, as it requires analysing tens or even hundreds of sales records to back your action. You'll need a solid explanation for why the sales are decreasing, like poor customer service or products being too expensive. This is definitely not the job for you if you hate analysing numbers.

by Teng Jing Xuan

SO YOU THINK YOU CAN DRAW

Lots of people start off as kids who love to draw. By the time they start thinking about a tertiary education, some will have decided that they want to pursue a career involving drawing. But which one? There's more to drawing than fine art or manga – there are plenty of unusual niches under the umbrella of "illustration".



SCIENTIFIC ILLUSTRATOR

This is not a career for the faint-hearted. If you think you could handle dissecting fish genitalia or excavating termite mounds for your assignments, then you may make the cut. Jobs can vary, from museum exhibition diagrams, and graphics for educational publishing houses, to images for academic journals. You'll need an excellent eye for detail (some illustrators spot things that were previously unknown even to scientists) and a high tolerance for strange smells! Scientific illustrators must also draw what they "know", not what they "see", translating abstract concepts into clear, informative images.

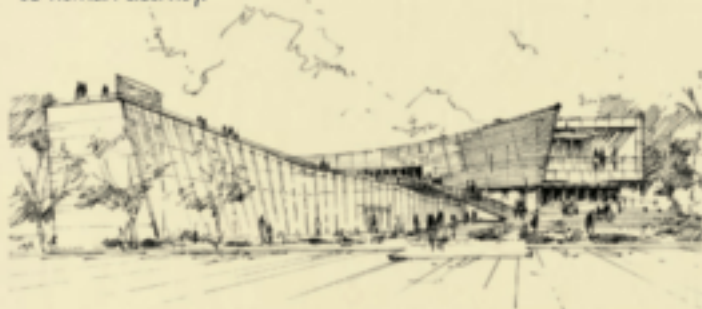


INDUSTRIAL DESIGNER

Almost every product around you started out as a drawing by an industrial designer. Industrial Designers conceptualise functional objects, but they're more than just engineers. They have to combine functionality and aesthetics into a marketable product, and study the needs and tastes of the relevant markets. The best industrial designers have joined the ranks of great masters of art, with products like the Airstream trailer (designed by William Hawley Bolus in the 1930s) and the Eames Lounge Chair (by Charles and Ray Eames, 1956) on display in the Museum of Modern Art in New York City.

ARCHITECT

Everyone knows that architects design in three dimensions. But not everyone realises that architects need drawing skills as well! To be a good architect, you need to create 3D spaces with 2D plans and sections, visualise movement through built space on a flat sheet of paper (or computer screen), and do all of that in an aesthetically appealing, easily understood manner. You have to be extremely dedicated – it'll take you approximately seven years in school, living off of instant noodles and two hours of sleep a day, to become qualified. If you're a landscape architect, you'll also develop an in-depth understanding of how climate, plants, and topography relate to human activity.



COURTROOM ILLUSTRATOR

Photography is prohibited in many courtrooms around the world, including Singapore's. How, then, do newspapers and other media illustrate their stories on high-profile, high-drama court cases? That's where the courtroom illustrator comes in. As a courtroom illustrator, you'll have to make quick sketches that capture the essence of important moments during court proceedings. Courtroom illustrators don't have time to draw a perfect likeness of the defendant, or to include all the furniture in the room in their sketches, so they need to determine the salient and irrelevant details of any scene quickly and accurately.

STORYBOARD ARTIST

Storyboard artists, as their job title suggests, lay out storyboards for film, television and advertisements. They consult directors and visualise what the camera will see, before the rest of the crew and cast even get to work. Superb draughtsmanship is not a prerequisite for this job, but you do need to clearly depict various camera angles, convey distance and scale, expressively render human figures and, most importantly, translate the director's unique visual style onto the storyboard. Similar skills are required for comic book storyboard artists, but, depending on their employer, comic artists have slightly more freedom in determining visual style.



by Sharon Magdalene

End Credits: Film crew roles

The media industry is varied and extremely specialized. Take the film industry, for example. With over 500 film crew members having a stake in each blockbuster film, it can be hard to keep up with the different job roles available on the big set. So, if you're looking to hit the behind-the-scenes of filmmaking, here's a list of roles that have floated past screens, but have rarely made the VIP hall of fame.

Best Boy

The term "Best Boy" is thought to have been borrowed from ex-sailors, who were hired to work the rigs in the early movie theatres.

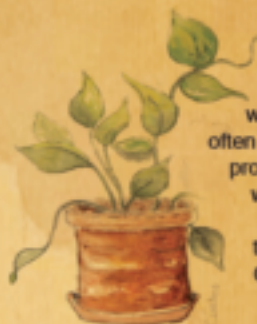
These days, best boys work in a similar fashion and are second in command specifically to the grip (camera or lighting) and electrical departments. Females in this role are also known as best girls. While it seems like a simple job, applicants with college degrees in film (or those with film experience) are preferred.

Foley Artist

A foley artist is the one who creates all the sound effects for a film, and ensures that these sound effects are in sync to the motion picture.

These sound effects are mostly sounds like footsteps, swishing of trench coats or even sounds made by kung fu moves. What most of us don't know is that, when a movie is dubbed in a foreign language, sound effects from the original clip are lost. That's the main reason why foley artists are hired during a film's post-production.

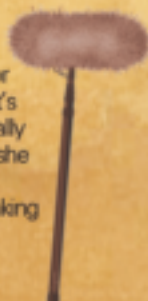
Greenskeeper



Called in specifically to dress up the set with real and artificial plants, a greenskeeper often works under the lead of an art director or production designer. Designing and landscaping with all sorts of material including rocks and gravel, the greenskeeper works closely with the grip department especially during filming. Off duty, the green-thumbed person can be seen tending to the plants or even crafting them into art pieces for backdrops.

Boom Operator

Savvy viewers may know what a boom operator does, but for the rest of us, we might think it's an explosive technician that's specific to Michael Bay's movies. The boom operator is actually responsible for microphone placement during filming. He or she uses a boom pole that's lightweight and sturdy for quick positioning of the microphone above or under the actors, making sure the boom pole stays out of the camera's frame. No qualifications necessary, but it helps if you know about sound engineering.



Breakdown Artist

If you think being a breakdown artist is all about hacking down props, sets, etc., then you're not very far from the truth. Breaking down garments to make new clothes appear dirty, faded and worn, a breakdown artist works closely with a costume designer to understand an actor's character so as to achieve the right tone and interpretation of the clothes. You didn't think actors wore second-hand clothes, did you?



Wrangler

The go-getter of filmmaking job roles, a wrangler is responsible for all things inanimate, including animals. Entrusted with the duty to search and procure any type of product required by the director - from custom cars and unique weapons to 101 dalmatians - the wrangler is the go-to person for gleaning anything for a movie set.

Dubbing Dramaturge

The dubbing dramaturge prepares for a movie's international distribution. When a movie is distributed to a country where the language differs from the movie's original language, the decision to dub or to provide subtitles lies with the distributor. Should the movie be dubbed, the dubbing dramaturge would use the international dubbing script and translate the dialogue into the national language of the country, making sure that they are translated with the correct placement in sync with the actors' lips.



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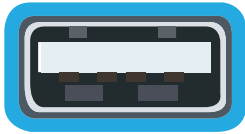
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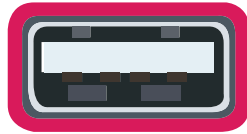
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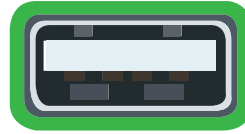




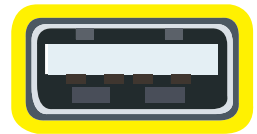
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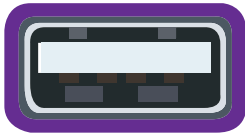
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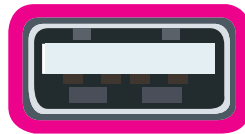
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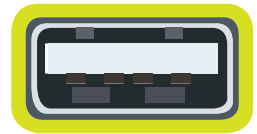
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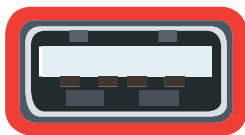
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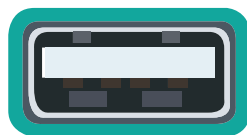
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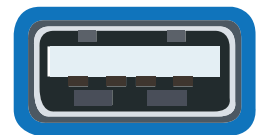
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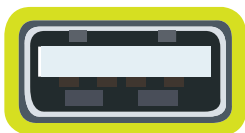
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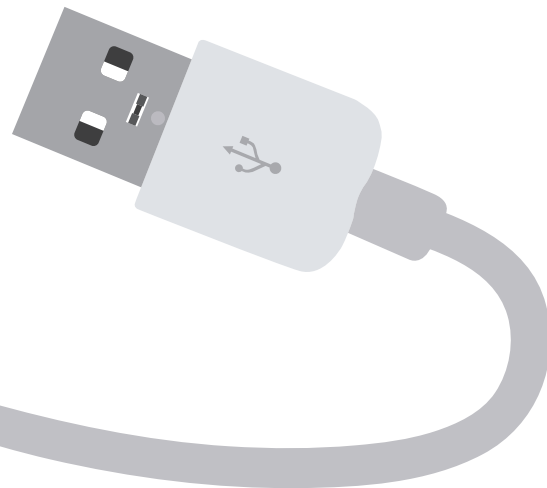
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BY CHERYL TAN KAY YIN

INCREDIBLY INSPIRING INVENTIONS BY TEENAGE GIRLS

Compared to our parents' generation, we are more inclined to follow trends and ideas instead of making them. However, in this silicon-centric generation, there are still teens out there who are turning simple ideas and everyday objects into amazing things. Be inspired by these teenage girls who prove that science is not just for the nerds...

ECO-FRIENDLY BANANA

Sixteen-year-old Turkish Elif Bilgin is not just an inventor but she's also a winner of the 2013 Science in Action award. Through a chemical process developed by Bilgin herself, she pioneered a technique for converting banana peels into bioplastics (the term that describes plastic made from renewable material). Her method enables the transformation of the starches and cellulose found in the outer layer of banana peels into non-decaying bioplastics. This could benefit many developing countries, such as Thailand, where approximately 200 tons of banana peels are discarded annually.



SUPER CHARGING

Imagine a device that can charge mobile phones in 20 seconds. Now link that invention to an amazing 18-year-old Californian girl who made it possible. Using nanotechnology, Eesha Khare developed a supercapacitor storage device with a large energy storage ability that can fit within a cell phone battery. Not only can the device charge the phone in less than a minute, it can also last for 100,000 charge cycles (compared to 1,000 of conventional batteries). Using the same principle, the device might one day also be able to power larger items like electric cars.



LIGHTING THE WAY

At 16, Ann Makosinski took the top prize at the Google Science Fair with her invention: a torchlight powered simply by body heat. Her inspiration came while she was talking to her friend in the Philippines, where frequent blackouts occur. Her invention uses Peltier tiles - which only need a 5° temperature difference to produce electricity - that power the LED lights in the device. This eco-friendly solution also reduces the waste of single-use batteries thrown in landfills. Ann's also starting up a non-profit company in the hopes of distributing the torchlights those in need.



PLAYING TO THE TUNE

Seventeen-year-old Marian Bechtel is not just a regular student from Pennsylvania, she's also an anti-war activist with a particular interest in landmines in warzones. This passion, coupled with incidental observation, led her to invent a low-cost device that acts as a mine detector based on the principle of using sound waves to locate landmines. Her inspiration came from an observation she made - when she played certain notes on the piano, she noticed that the strings of a nearby banjo vibrated as well.

POWERING UP ON WASTE

While other 14-year-olds were busy toying with their mobile phones, four Nigerian girls came up with a brilliant invention that could potentially save lives. The idea of a pee-powered generator sounds nauseating but don't underestimate its abilities. Their invention extracts hydrogen from the urine, which is then used to power up the generator. It can produce up to six hours of power from one litre of urine, making it a possible source of electricity to remote areas or in disaster zones.



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 etc@mdis.edu.sg

SCIENCE THAT SETS YOU APART

Turning to science to be a better person is a route often less travelled, since it draws its fair share of ethical backlash; however, serving more than just a fat textbook, behavioural science definitely has the capacity to drill a few good habits. We touch on some psychology experiments that might just teach you how to separate yourself from the herd.

LAB WORK

Stanford Marshmallow Experiment

Proving 'patience is a virtue' to be true; the marshmallow experiment conducted in the early 1970s involved giving several kids a marshmallow each. They were then told they could either eat the treat, or hold out for 15 minutes and be rewarded with another treat. Left unattended, only 30% of the kids waited for the second marshmallow. Later, reigniting the study during their graduation years, it was seen that the kids who chose to wait it out had better grades, and were seen to be more influential than those who did not.

LESSON: Patience and self-discipline will reward you (just not in 15 minutes).



Little Albert Experiment

Seen as one of the most unethical studies done, the Little Albert experiment placed an infant boy and a mouse in a room. The initial interaction between the duo was playful and amicable; however, over time, scientists added blaring horns to the mix whenever the mouse came in close proximity to the boy, which caused him to associate the raucous sounds with the mouse, edging him to cry whenever the mouse was near and causing an irrational fear to take root. The boy, whose identity has never been revealed, was said to have perished in his toddler years, but for other medical reasons.

LESSON: Your fears are really only as loud as you make them out to be.



Asch Conformity Experiment

Spotlighting that jumping on the bandwagon doesn't always translate to being the best option, the Asch experiment puts a clueless participant in a room with several other participants whose views and behaviours have been scripted (unknown to the actual participant). A pair of cards set to test participants' visual judgement is then revealed to the room, and the scripted participants then follow prior instructions to unanimously decide on the wrong answer. When it was time for the actual participant to answer, 75% of them conformed and answered similar to the rest of the confederates, even though the answer was obviously wrong.

LESSON: Your inner voice is not (always) crazy.



BRANDS GETTING IN ON THE ACTION

Carlsberg

Set in Brussels, the Carlsberg social experiment started off as an advertisement but it actually dug greatly into the human psyche.

With 140 burly bikers placed in a theatre, the aim was to pass a Carlsberg beer to the couple that was able to weave through this herd of aggressive-looking moviegoers to get to their seat. Out of the numerous couples that were thrown into the experiment, just a handful of them made it.

LESSON: Being lazy never gets you free stuff.



Facebook

One of the more recent experiments that raised furore, Facebook picked over 600,000 accounts and separated them into two batches. One batch had its newsfeeds filled with only happy information, while the other batch was drowned in depressing news. Through this study, it showed that Facebook had a huge say in livening or dampening someone's mood.

LESSON: Surrounding yourself with happy thoughts keeps you in the right frame of mind, and that Facebook is probably the mother of all evil.



BY NINA GAN

BODY OF SCIENCE

For those who want to be scientists but lack certain 'faculties', there is still a way to contribute to science and help create something new for the betterment of mankind. You can donate your mortal remains to science.

But what happens when you sign the Organ Donation Pledge Form and bequeath your body? You'd be surprised at the things science puts a body through. Here are examples of how some people become even more useful when they're dead...



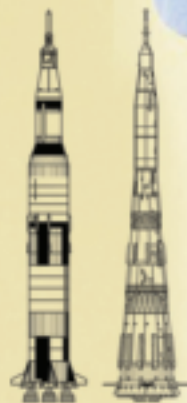
ANATOMY CLASS

In Singapore, as in other parts of the world, donated bodies are essential to medical schools for research and education. Generally, about 80% of bodies donated to science are used for anatomy lab dissections. While 3D technology has made dissections less gory, using real humans is essential for surgeons to hone their skills. For plastic surgery students in the US-A, cadaver heads are lobbed off for hands-on rhinoplasty or wrinkle-lifting classes. Gifting your body to medical schools has its plus side: after they're done, they normally hold a memorial service and/or cremate the remains of your remains.



TO INFINITY AND BEYOND

In 2007 NASA used three human cadavers to test the new space suits and seats of the Orion space capsule that's supposed to take astronauts to the moon in 2020. Engineers used cadavers to measure the extreme forces during the capsule's return to earth - even though crash test dummies were also used, the human bodies were necessary for monitoring the effects on actual organs.



CRASH TEST PUMMY

Contrary to popular belief, plastic crash test dummies are only used to measure impact in numbers. Only real humans can give researchers a more accurate result - like what a face looks like after being smashed through a windscreen - on how accidents impact the human body. Cadavers are, after all, immune to pain, with the dead actually saving about 8,500 lives a year.



Human cadavers are also used for studies on injuries from accidents - no live human would willingly submit to having their bones broken, for instance - so scientists can create better prevention methods. Or better protective equipment.

ARMY MUNITIONS TESTING

Back in the 19th century the US Army used bodies of fallen soldiers to test the effects of various guns and bullets. Testing ballistics on human cadavers is illegal in the Commonwealth these days, they use synthetic human surrogates, which don't accurately reproduce the effect of a real body blasted with a landmine, for instance. In 1999, the US Army used human cadavers to test the effectiveness of landmine footwear, the research resulted in a foot-saving boot. Human cadavers have also been used to test bullet-proof vests and non-lethal weapons (like air guns).

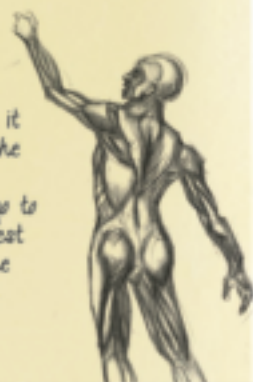


CSI LAB

Have you ever watched CSI and wondered how they know when and how a person died? That's because in medical forensics departments, real human cadavers in various stages of decay are studied. In the first stage, the skin simply sloughs off, inviting maggots. Then comes the bloat stage (pumped up by farting bacteria feeding off internal tissue). As the body pretty much dissolves itself from the inside, it finally leaks goo out of every orifice before leaving just the skin and bones behind. Certainly not a pretty way to go.

PLASTINATION

Another option for body donation is to mill it to the Institute for Plastination, where the body gets preserved and plastinated Body Worlds style. Most of the specimens will go to medical facilities, but donors can also request to be displayed for the world to see at the next Body Worlds exhibition for a shot at eternal fame.



Less than 40 Singaporeans donate their bodies to science each year, with 90% being "unclaimed bodies". Even if being blasted, bloated, shot into space and cut up to pieces isn't the way you want to go, just think of the lives you'll be able to save, even from the afterlife.

CRIME SCENE - DO NOT CROSS
CRIME SCENE - DO NOT CROSS
CRIME SCENE - DO NOT CROSS

Accidents Gone Right

Sometimes all you need is a little luck to make a big change. Here, we take a look at some of the world-changing discoveries that were made by accident.

By Lee
Jiamin

MICROWAVE OVEN

The microwave oven, a standard appliance in many households right now, was invented by Percy Spencer. Spencer was building magnetrons for radar sets, and noticed a candy bar in his pocket melting when he stood in front of an active radar set. Intrigued by the discovery, he then tried experiments with various food products like popcorn kernels and eggs. Seeing the potential in his experiments, Spencer created the first true microwave oven by enclosing the electromagnetic field generator in an enclosed metal box.



X-RAYS



From airports to hospitals, X-rays are now ubiquitous. Created by Röntgen, a German physicist, who first discovered that a fluorescent screen surrounded by cardboard in his lab started to glow whenever the cathode ray was switched on while he experimented with electrical currents. Röntgen then theorised that an unknown current must be running in space, and named his discovery X-radiation, with 'X' standing for unknown. To test his new theory, Röntgen went on to capture X-ray images, including a shot of his wife's hand, which garnered much interest from the science community and the public.

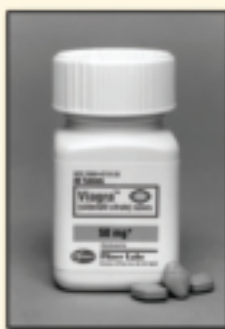
PACEMAKER



The pacemaker helps control abnormal heart rhythms and murmurs as it makes use of electrical pulses to prompt the heart to beat at a normal rate. It was an accidental invention by Wilson Greatbach, who was working as a medical researcher when he met two surgeons who were perplexed by the problem of patients suffering from irregular heartbeats. Greatbach, who later went on to become an electrical engineering professor, was working on an oscillator to record heart sounds, when he accidentally pulled the wrong resistor out of the machine. He re-assembled the oscillator, and it began to give off a rhythmic electrical pulse. Recognising the pulse as a pattern similar to a heartbeat, he took 2 years to perfect the device, which became the world's first pacemaker.

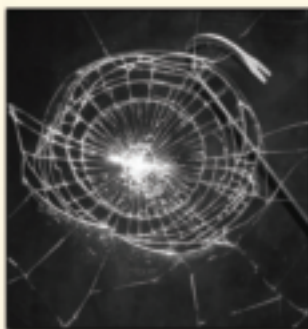
VIAGRA

Viagra started life as UK92480, a drug to be used as a new treatment for high blood pressure and a heart condition called angina. When the drug was ready to be tested on human patients in clinical trials, results were disappointing. Pfizer, the pharmaceutical company that developed the drug, was ready to abandon further trials when volunteers reported that the treatment led to erections. The company made use of this side effect and launched a new clinical trial to use the drug for erectile dysfunction, which proved successful.



SAFETY GLASS

Glass with additional features that make it less likely to break is called safety glass, which is commonly found in household appliances and the windows of cars or buildings. While working in his lab, Edward Benedictus accidentally knocked a glass flask off his desk. However, when the glass flask broke, it didn't shatter. After some investigation, Benedictus found out that the glass was once filled with cellulose nitrate, which had created a type of adhesive film on the inside of the glass, which prevented the glass from shattering. However, Benedictus only realised the potential of his discovery when he read about car accidents, in which people were severely injured due to shattering windshields. He then set to create Triplex, a shatterproof glass.



POST-ITS

It all started with a 3M chemist, Spencer Silver, who was tasked with inventing a strong adhesive for the aerospace industry. However, he created the opposite – a weak adhesive, and 3M thought the adhesive to be useless. Spencer wanted to sell the adhesive as a sticky surface for bulletin boards, and he imagined people attaching notes to the boards without using nails or tacks. The idea, however, didn't work out. About five years later, choir singer and fellow 3M chemist Art Fry had an idea of putting the adhesive on paper. The idea came about when Fry's paper bookmarks continuously fell out from his hymnal, and he desperately needed a way to open his hymnal to the right page without hassle. Fry took his idea to Spencer, who was elated, and the idea was later known as Post-its.

SUPER GLUE

Super Glue was actually invented twice by the same person – Harry Coover. The first time Coover made super glue was during World War II, when he was trying to create a plastic that could be used in gunsights. During his research, he discovered cyanoacrylates. However, cyanoacrylates were just too sticky and Coover concluded that the material was of no use in his research. Thus, cyanoacrylates were put aside. Coover came across the material again in the 1950s. This time, he was reheat resistant polymers for use in jet-airplane canopies. The stickiness of cyanoacrylates got in the way again during research, but it was then that Coover discovered the commercial properties of the material. Kodak Research Laboratories, where Coover was working, eventually marketed the product under the name "Eastman 910", though later it became known as "Superglue", the name it was patented under.



CHEWING GUM

Although it is believed that chewing gum has been around for quite some time, the man associated with the invention of chewing gum is Thomas Adams. Adams was given chicle, a natural latex, by former Mexican general and president Santa Anna, who was exiled in New York. Adams tried to develop the material as a replacement for rubber for rain boots and toys. However, the experiment failed. Out of exasperation, Adams popped a piece of the material into his mouth and surprisingly enjoyed the taste. He then decided to add flavors to the material, and soon opened his own chewing gum factory, where Adams New York Chewing Gum became the first chewing gum to be marketed to the public.



COCA-COLA

Coca-Cola was first produced by pharmacist John Pemberton, to cure headaches. Originally named "Pemberton's French Wine Coca", it was an alternative to the popular French Coca Wine, which was banned in parts of Georgia, where Pemberton lived. The main ingredients in his product were coca leaves and cola nuts, and when his lab assistant accidentally mixed carbonated water with the recipe, Coca-Cola was born. However, Pemberton was committed to selling his product as a medical remedy. Before Pemberton passed away, the rights to the Coca-Cola name were sold to Asa Candler, who realized the potential of Coca-Cola in the consumer world. Candler then began bottling the drink and selling it as a refreshing beverage in stores.



SACCHARIN (ARTIFICIAL SWEETENERS)

Saccharin, an artificial sweetener, was discovered by Constantine Fahlberg, who was working in a laboratory of Ira Remsen. One day in the lab, Fahlberg spilled a substance on his hand. Later at night, while having dinner, Fahlberg noticed that the bread he was eating tasted unusually sweet. He traced the sweetness back to the spilled substance, later named saccharin, by tasting various residues on his hands, clothes and chemicals in the laboratory. Saccharin was then used as a replacement for sugar in foods and many diet soft drinks.



POPSICLES

11-year-old Frank Epperson was trying to make soda pop by mixing soda water powder and water. He accidentally left the soda out in the cold all night. The next day, he found out that the concoction had frozen, with the stirring stick still in the cup. He later went on to make similar treats in his freezer, calling them Eppsicles – a combination of "Epperson" and "icicle". More than ten years later, he served Eppsicles to the public, and they were a huge hit. Realising the commercial value of his Eppsicles, he applied for a patent and began producing more flavours. He also renamed Eppsicles as Popsicles at the urging of his kids.

POTATO CHIPS

Sometimes even complaints can turn into accidental inventions! Hotel chef George Crum received a complaint from a guest one day about his fried potatoes. Too thick, too soggy, and too bland – were the complaints, and the guest demanded a new batch. Crum then decided to play a trick on the guest by slicing the potatoes paper-thin, then frying and over-salting them. To Crum's surprise, the guest loved the potatoes and asked for a second serving. Word of this new dish spread quickly, and it went on to become a massive hit.



CHOCOLATE CHIP COOKIES

Ruth Wakefield owned an inn with her husband, and she was in-charge of preparing recipes and cooking for the inn's guests. One day, while baking cookies, Ruth discovered that she had run out of regular baker's chocolate. Coming up with a substitute, she broke up a bar of Nestlé's semi-sweet chocolate and mixed it into the cookie batter. She assumed that the chocolate would melt and spread into the dough as it baked. However, after baking, she noticed that the chocolate chunks had only melted slightly. The cookies soon became extremely popular locally, and the recipe was even published in a Boston newspaper. As the popularity of the cookies increased, Nestlé saw a spike in sales of its semi-sweet chocolate bar. A deal was then struck between Nestlé and Ruth, where Ruth would be given a lifetime supply of chocolate and Nestlé would print the cookies' recipe on the packaging of every semi-sweet chocolate bar.



DOOMSDAY SCIENCE

FIVE PAST AND FUTURE END-OF-THE-WORLD SCENARIOS

Forget apocalyptic Hollywood plots and millenarian cults! Science causes its fair share of end-times fear:

LARGE HADRON COLLIDER

When CERN scientists turned on their Large Hadron Collider for the very first time on September 10, 2008, nothing much happened. Many had feared the collider would create a microscopic black hole that would grow and devour the entire earth, and they were proven wrong. In fact, microscopic black holes either evaporate instantly, or take forever to suck in even a tiny amount of matter. There's so much space between subatomic particles, that such a tiny black hole could actually pass through the earth for millennia and not touch anything!

DOOMSDAY RATING: 1/5

Something else will probably end the world before the LHC does. If you're still worried, check <http://hasthelargehadroncolliderdestroyedtheworldyet.com> for updates.



EATR

The Energetically Autonomous Tactical Robot (EATR) does exactly what its name suggests. It eats. It's able to use biomass as fuel, and was developed by DARPA (the same US government agency that gave us the Internet) for military use in situations where conventional fuel sources are scarce. The idea is that EATR feeds on plants as well as normal batteries. But a lot of things on this planet are "biomass" - like people. DARPA swears the EATR is vegetarian, but EATR project documents suggest chicken fat as a possible fuel source...

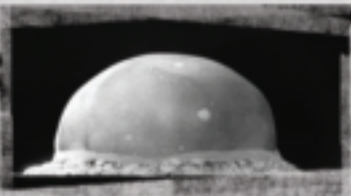
DOOMSDAY RATING: 2/5

It sounds like something out of a Michael Crichton novel, but at least EATR isn't able to reproduce. Yet.



OPERATION TRINITY

On July 16, 1945, US scientists detonated the first ever atomic bomb in a remote area of New Mexico. The bomb test was codenamed Operation Trinity, and there were fears that humanity was about to unleash an awful godlike power beyond its control. Trinity was kept secret from the public for decades, but in 1945 some in the know worried that it might set the atmosphere on fire and destroy the earth.



DOOMSDAY RATING: 3/5

Operation Trinity went off without a hitch: no worldwide incineration occurred, only global cold war for the next 50 years.

SUPER-AVIAN FLU

H5N1, or avian flu, is one of the deadliest viruses in existence. 60% of infected people die. Fortunately for us, naturally occurring H5N1 has trouble spreading between humans... for now. In 2011, virologist Ron



Fouchier created a strain of H5N1 that is airborne and spreads rapidly between lab ferrets. Ferret lungs are almost identical to human lungs, and Fouchier's research is currently stored on numerous hard drives and devices belonging to his peer-review group. It's only a matter of time before the information falls into the wrong hands!

DOOMSDAY RATING: 4/5

Super-H5N1 could wipe out more than half of humanity

BOOZE-MAKING BACTERIA

Turning plant waste into alcohol sounds like a lot of fun. That's what the US

Environmental Protection Agency thought in the 1990s, when they were about to approve the release of genetically modified bacteria that did just that. A biotech company in Europe had engineered *Klebsiella planticola* colonies to efficiently produce alcohol and fertiliser from discarded plant matter. But modified *K. planticola* does more than that. When it's done eating dead plants, it adheres to living plants, gives them alcohol poisoning, and converts them into more boozy sludge. Rinse and repeat, until all of earth's plant life is dead.



DOOMSDAY RATING: 5/5

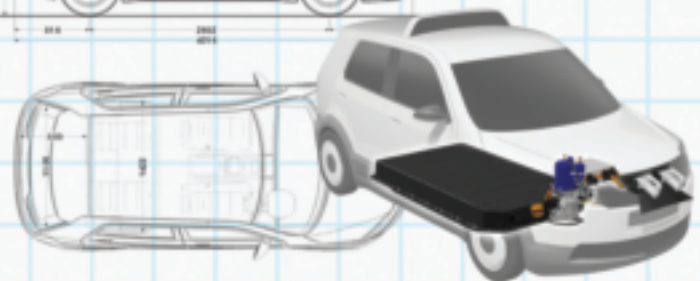
Researchers tested *K. planticola* in sterile soil and never suspected a thing - only one researcher used normal soil and stopped the whole project before it was too late!

BY
TENG JING XUAN

TROPIC TAXI



Plans for the EVA taxi,
the world's first ever
electric taxi



Taxis are incredibly inefficient. Yes, they're lifesavers when your bus is delayed by an hour, or when the only alternative is walking through a torrential downpour to the nearest MRT station. But the fuel usage, noise output and carbon footprint of a single cab ride are massive compared to the impact of, say, a passenger on a fully packed bus.

Of course, life would be harder without taxis as a transport option - they make up only a tiny percentage of Singapore's total number of vehicles, but they account for 15% of the total distance travelled in this country every day. Since we can't do without them, how do we make taxis greener and, hopefully, cheaper to power?

An international research team led by Singapore's Nanyang Technological University (NTU) and Germany's Technische Universität München (TUM) has found the solution: Enter the EVA taxi. EVA, the first ever electric taxi designed specifically for Singapore's needs, was unveiled at the 43rd Tokyo Motor Show late last year.



Super-fast charging in 15 min to
cover a realistic range of 200km

Electric cars have been around for a while now, but their usefulness has been limited by their long charging times and limited battery capacity. That's why the NTU-TUM team designed EVA's battery to be charged in only 15 minutes (much less than the usual 8 hours), with enough power for 200 kilometres of driving.

Such a uniquely powerful and quick-charging battery naturally produces a lot of heat, which could be dangerous in Singapore's sweltering climate. Don't worry, EVA's designers thought of that too - each battery cell is equipped with a thermal management system that minimises heat trapping.

The EVA comes
with plenty of
smart features



All this is contained in a monocoque (i.e. combining body and chassis in a single unit) shell constructed from carbon fibre reinforced polymer, which weighs in at 150kg less than a conventional steel car body of the same size. Lightweight yet strong, passenger-friendly and boasting some uniquely Singaporean technology, EVA could hit our roads some time in the near future. Keep an eye (and an arm to flag it down) out for this high-tech cab.

OUT AND ABOUT

GIVEAWAYS

THAT MOMENT

The boy band that has been known to send girls into a frenzy, One Direction is back with their second fragrance called 'That Moment'. It has a playful mix of fruity and floral hints, which is accentuated by the fusion of green apple, cucumber, tangerine and sweet-smelling flowers such as peony, and violet. Along with its undertones of musk inconspicuously reminding the wearer of the five young Brits, the perfume packaged in a pretty pink bottle emanates pleasantness that is not too overpowering, so you can use this any time of the day – not just on special occasions. 'That Moment' retails at S\$106.



JABRA CLASSIC

The Jabra Classic is the perfect Bluetooth headset for those who love multi-tasking, thanks to its wireless multimedia streaming and long battery life of 9 hours. Not only is it lightweight, the wireless feature of the headset has a range of up to 30m, making it possible for users to move around while staying connected. Available in 3 different colours, the Jabra Classic retails at S\$78.



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CAMPUS.SINGAPORE

ALEX GOOT
AND AGAINST THE CURRENT
LIVE IN SINGAPORE 2014



Alex Goot & Against the Current Live in Singapore 2014

When: 21 Aug | 7pm Tickets: \$78
Location: *SCAPE The Ground Theatre

Making their way to Singapore for the first time are Youtube sensations Alex Goot and Against the Current (Chrissy Costanza), who have collaborated in various covers like 'Counting Stars' and 'Beauty and A Beat', which garnered millions of views. You can anticipate a night filled with great music while you fist pump and groove along to it. Supporting their act are two of our local bands, Gentle Bones and The Summer States, so look out for them.

MOVIES

四大名捕 无问畏俱 终极一战
THE FINALE TO NO.1 MARTIAL ARTS BLOCKBUSTER



The Four III (August 21)

Cast: Crystal Liu Yifei, Collin Chou, Ronald Cheng, Deng Chao, Anthony Wong

The final installment of the trilogy, The Four III continues the protagonists' quest at the Divine Constabulary. Each nicknamed after their special skills, The Four are Emotionless (Crystal Liu Yifei), Iron Hands (Collin Chou), Life Snatcher (Ronald Cheng) and Cold Blood (Deng Chao). With Emotionless's departure, the remaining individuals join forces with the emperor's armies to counter a formidable kung fu master. With intensive martial arts maneuvers in the fight scenes and a plan to stop the kung fu master from gaining absolute power, there is no telling how badly defeated either side is going to be.

AS ABOVE, SO BELOW (September 4)

Cast: Ben Feldman, Edwin Hodge, Perdita Weeks

A team of American and British urban explorers head to Paris to explore the city's miles of twisting catacombs that lie under its streets. They stumble upon an ancient, uncharted maze of bones, unearthing one of the largest mass graves in history. Of course, they get trapped, and discover the darker secret that this city of the dead was meant to contain. The underground system of hidden caves and tunnels take the team through a journey of madness and terror, as this psychological thriller reveals the personal demons that haunt each and every one of the members.



PRODUCTIONS

6 - 24 Aug | 1pm & 8pm
Resorts World Theatre
Tickets: \$75 - \$175
Rock of Ages



Set in 1987, *Rock of Ages* tells a love story between a country girl and a metropolitan rocker set to the tune of the biggest hits of the 80's in LA's most famous rock club. With a mix of rock music and musical genre, *Rock of Ages* will leave you at the edge of your seat, making you want to dance along with the cast as they perform songs such as "Don't Stop Believin'", "We Built This City", "Can't Fight This Feeling" and "I Want to Know What Love is".



Cavalia

Gallop your way into a magical evening with this extraordinary production by Normand Latourelle - one of the founders of Cirque du Soleil. In *Cavalia*, horses and humans come together to celebrate beauty and nature in an awe-inspiring collaboration that stokes the imagination and leaves you marveling at the fantastic displays of horsemanship.

12 - 31 Aug
12pm, 2pm, 5.30pm & 7.30pm
Under the White Theatre Tent,
Bayfront Ave
Tickets: \$58 - \$228

27 Aug - 13 Sep | 8pm
DBS Arts Centre
Tickets: \$50 - \$70

Mies Julie

In this adaptation of the classic Swedish play *Miss Julie*, award-winning director Yael Farber tells a story of power, love, and gender equality through the lives of a black servant and his master's daughter. As they battle through their struggles, *Mies Julie* shines light at the state of South Africa, 18 years after the end of apartheid.



5 - 6 Sep | 8pm
Mastercard Theatres,
Marina Bay Sands
Tickets: \$55 - \$130

Beatlesmania-On Tour



With a completely new direction and cast, the world's best Beatles tribute band, *Beatlesmania*, will be coming to Singapore to give the performance of a lifetime. Unlike most musicals where they focus on dancing and singing, *Beatlesmania* describes the journey of the famous English rock band and how they started a musical revolution that affected all of our lives. With their tickets sold out in countries like Australia, Hong Kong and the US, you might want to grab your tickets soon.



12 - 13 Sep | 8pm
University Cultural Centre
Hall, NUS
Tickets: \$30 - \$70

Masterpiece in Motion

Singapore Dance Theatre presents its annual *Masterpiece in Motion*, which will showcase the work of international choreographers

such as Val Caniparoli's "Swipe", Nils Christie's "Fearful Symmetries" and Natalie Weir's "4Seasons". Expect a night full of breathtaking moments as you witness the highest level of ballet with your own eyes.



9 - 14 Sep | 11am, 1pm,
1.30pm & 3.30pm
Jubilee Hall, Raffles Hotel
Tickets: \$68 - \$248
(excluding booking fee)

Bubble Magic - Pep Bou's Wonderful World of Bubbles

A brand new show by Pep Bou, *Bubble Magic* will be staged in Singapore for the first time. Join the exuberant duo as they take you to a whole new world of creativity - bubbles of various forms combined with vibrant lighting, chirpy music and funky get-ups.



14 - 30 Aug | 2pm, 3pm & 8pm
Drama Centre Theatre
Tickets: \$49 - \$83

Hotpants

Directed and written by Dick Lee, *Hot Pants* will be making its long-awaited reappearance after its debut staging in 1997. Set in the early 1970s, the musical comedy focuses on the journey of three female schoolmates as they participate in an inter-school Talentime. Be prepared to have a good laugh as they go through a series of love and family dramas while trying to discover themselves.

GIGS

22 Aug | 7.30pm
Esplanade Concert Hall
Tickets: \$55 - \$130

Singapore Lyric Opera Gala Concert

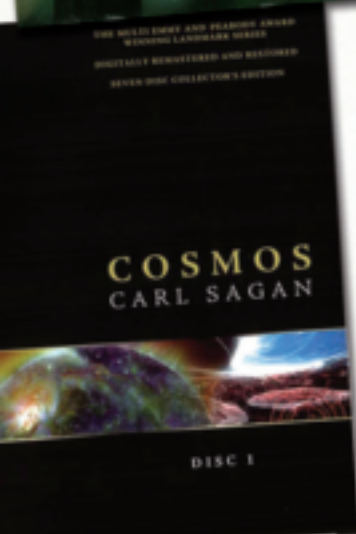
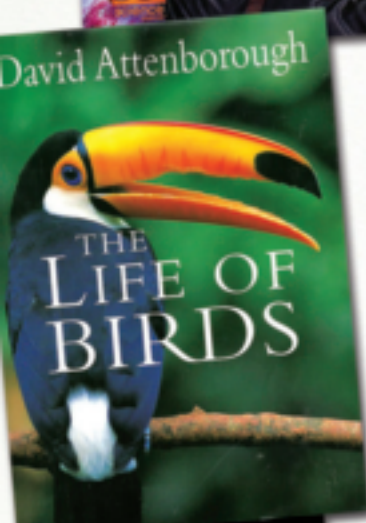
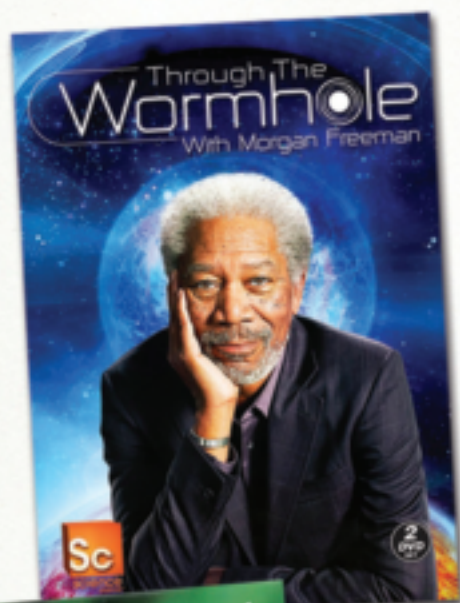
Join local conductor, Joshua Kanming Tan, as he leads the Singapore Lyric Opera Orchestra at this Gala Concert, which will also be the debut of two Asian singers, Kishani Jayasinghe and Arthur Espiritu. Look forward to some of the pieces that will be performed, including Faust's "The Jewel Song", Lehár's "The Merry Widow", Puccini's "La Bohème" and Giuseppe Verdi's "Rigoletto".

27 Sep | 7.30pm
Esplanade Concert Hall
Tickets: \$15 - \$75

Russian Night

Conducted by Gennady Rozhdestvensky, Singapore Symphony Orchestra's *Russian Night* will see the performances of Shostakovich's final symphony, the Fifteenth, Glazunov's First Piano Concerto and Liadov's "From the Apocalypse". Playing alongside with the orchestra is the famous Russian pianist, Viktoria Postnikova.





BY TENG JING XUAN

ANATOMY OF A PERFECT SCIENCE DOCUMENTARY

Everyone's had the experience of thinking there's nothing to watch on TV, turning it on anyway, and then getting sucked into an inexplicably addictive documentary on plant reproduction or the future of AI. What makes science documentaries so watchable, when the same topics covered by your lecturer would send you to sleep?

First, the **CHARISMATIC NARRATOR** draws you in. A godlike voice like Morgan Freeman's is a voice you can trust -- you wouldn't want just any old guide on your trip *Through the Wormhole* (2010). If you're taking a more fly-on-the-wall approach, David Attenborough's whispered explanations in perfect Received Pronunciation are the best for spying on the secret *Life of Birds* (1998). Dr. Brian Cox's dreamy delivery, complete with dramatic pauses, convinces you that you are in fact smart enough to understand *The Wonders of the Solar System* (2010).

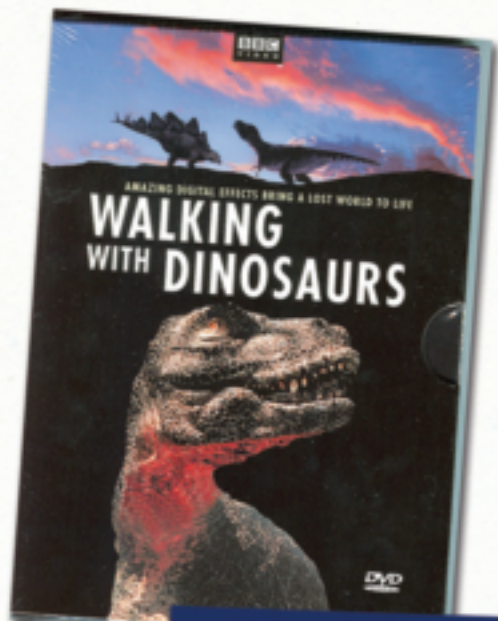
It's too late to switch channels by the time you meet the **LOVABLE CAST**. Whether it's the tiny matriarch of a *Meerkat Manor* (2005), a baby allosaurus called Big Al (*Walking With Dinosaurs*, 1999), or a pair of galaxies dancing a space tango, you'll quickly be introduced to a whole universe of non-human characters with compelling back stories. And these stories almost always end in tragedy.

That's right -- an **IRRESOLVABLE CRISIS** is the hallmark of a really good science documentary. It's established right away that *The Future is Wild* (2002), but not for that sad gerbil-monkey who is the last of the mammals. You already know how the dinosaur with the endearing name will die. And, obviously, any astronaut who falls into a black hole will never be the same again. Nothing you can do about that. But you just have to see how it happens.

After you've been humbled by things like death, inevitability, and panoramic savannah views, the **TIME-LAPSE SEQUENCE** hammers home that feeling of being small and insignificant. Some cute saplings have turned into a giant bamboo grove in the time it took you to move to the other side of your couch. That city crowd speeding past Dr. Michio Kaku as his silver hair gleams in the sun, perfectly stationary, tells you that even famous physicists waste Time (2006). What are you doing with your life? Watching this documentary.

You'd give up and go play some Flappy Bird or something if the programme was completely depressing. That's why most science programmes cheer you up with an **UPLIFTING REVELATION** or two. The late, great Carl Sagan was made of stardust (*Cosmos*, 1980), and so are you! If you're more into the Cretaceous Period than the Age of Aquarius: Dinosaurs aren't dead! They're alive and twittering away in your void deck. Life is beautiful and good.

But, wait a minute. The documentary comes to an end, and now the **OMINOUS END CREDIT MUSIC** destroys your mood. This is especially bad in physics documentaries. It almost always sounds like a cross between the Doctor Who theme song and 'The Ride of the Valkyries'. Next week, tune in to see why 98% of baby sea turtles never make it to their first birthday! You set up your TV to record the rest of the season. You're hooked.



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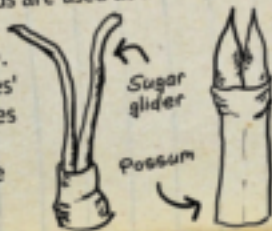
GETTING BEASTLY IN THE ANIMAL KINGDOM



NATURE'S NETHER REGIONS

While nature has created genitals for reproduction, the sheer variety – and weird designs – out there definitely challenge our take on the word 'penis envy'.

Take an echidna, for example: it has not one, but FOUR penis heads! However, only two of the heads are used at a time, which is a trait that it shares with reptiles (an ancestor of the echidna). Yes, reptiles – specifically 'squamates' like lizards and snakes – have penises with TWO heads. These are called 'hemipenes', which are stored inside the body until they're squeezed out (like toothpaste) for mating.



The weirdness doesn't stop there: marsupials (kangaroos, koalas, wombats, etc) all have double-headed (bifurcated) penises. Depending on the species, some have 2 separate, long protrusions (sugar glider), while others seem to have two nubs at the end of the penis (possum).



Multi-headed penises may sound gross, but most birds don't even have penises! So those that do – like the Argentine Blue-bill – compensate for the rest of their feathered brethren. Its penis is about the same length as its body (42.5cm) and when erect, it explodes from within like a corkscrew! Curiously, the female's vagina is also corkscrew shaped – so both sexes mate by literally 'screwing' around.

More strangely-shaped penises belong to insects of all shapes and sizes. Take, for example, those of weevils and beetles. We have no idea why they're shaped like medieval weapons, but we're glad you need a microscope to see them.

Weevil weapon



Tired of penises? Then we'll move on to the subject of testicles. Did you know that the bigger the bat's testicle, the smaller its brain? As it takes a lot of energy to develop both parts, bats have to choose between brain and balls. The biggest bat testicles account for up to 10% of its body weight, which translates to a man lugging two 9lb bowling balls – with the brains of an idiot.

A pair of dingbats?



If you're wondering where Hollywood gets their strange ideas for props or weird behaviors, look no further than the quirky and entertaining reproductive world of animals.

ANIMAL ONANISM

When it comes to the aforementioned body parts, you may be surprised that they're not always used for reproduction. Auto-eroticism does occur widely in the animal kingdom – while scientists debate about its evolutionary reason, it's clear that humans are not alone in enjoying the act.

Horses masturbate fairly frequently, and they do so by rocking their hips and bouncing up and down so that their penises rub and smack against their bellies. Moose don't need any contact with their penises at all; they seem to be able to bring themselves to orgasm just by rubbing their antlers on trees.

Our fellow apes (orangutans, chimps, etc) are among the most ardent and creative, using tools made of fruits and barks for the act.



Bears have been observed to enjoy a bit of oral stimulation; in Croatia, two captive brown bears were often seen in the act, with one giving oral sex to the other 28 times over the course of 6 years.

A new study on 20 male Cape ground squirrels in 105 masturbation sessions (what a job!) revealed that these furry critters actually consumed their own ejaculate after auto-fellatio! A hypothesis claims that the act could be a part of genital grooming to prevent disease...

While walruses mate during breeding season, they masturbate during the rest of the year. The males simply grab their penises with their flippers to get the job done. They're also flexible enough to perform auto-fellatio (yes, it is long enough) without injuring themselves with their tusks.

Dolphin, like walruses, also have long penises which they can manipulate like an arm! Being smart creatures, masturbation is fairly common and there have even been reports of dolphins using live wriggling eels for their pleasure. If that's not gross enough, there's even a case of a dolphin using a decapitated fish for the deed...



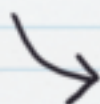
STRESS RELIEF

How much information from your biology class do you remember? If you're in medical school, we expect you to ace this. For the rest of you who fall asleep in classes and lectures, go ahead and test yourself. It's just like 'pin the tail on the donkey' but with more bits. No Googling for answers until you're done placing every organ in the body.

HOW TO GET STARTED

1. Cut out all the colourful organs carefully.
2. Challenge yourself by labelling the organs.
3. Start placing the body parts onto the figure.
4. Tip: you can enlarge the organs and make them into life-sized stickers for t-shirts or fun party games.

Place the cutouts onto this fella here

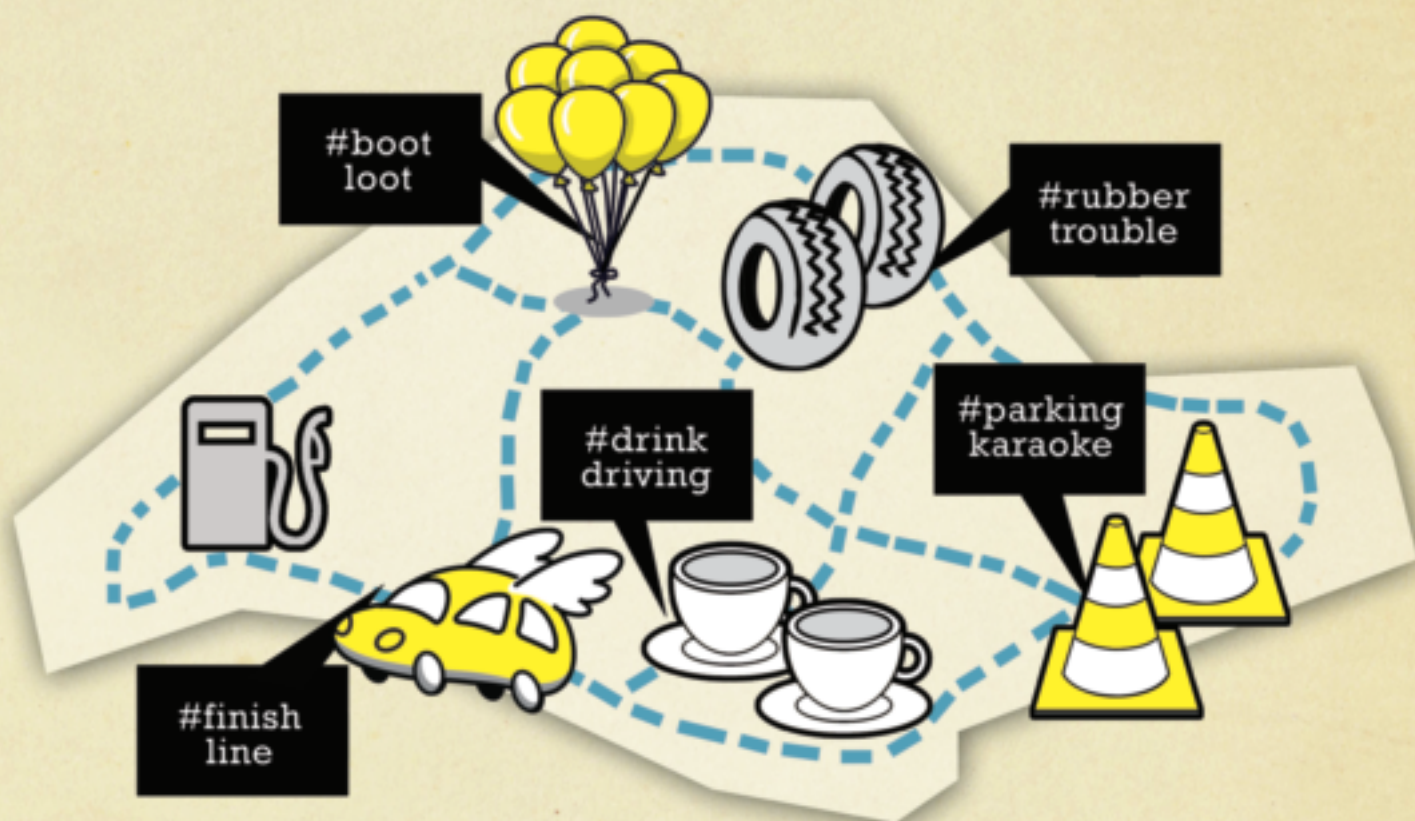


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