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(including the History & Philosophy of Science)

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# St Benedict's Catholic School

The Catholic Secondary School for West Suffolk

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Editor-in-Chief: Associate Editors: Mr J Gregory Mrs F Green, Mr F Sousa and Mrs R Blewitt

# Welcome to the third edition of Volume 3

There are some outstanding contributions from our young scientists – examples of scientific method planning; predators in the Animal Kingdom (look out for the Human predators!); some really impressive pieces of research into a number of history's most famous scientists; and some papers on human reproduction – look out for the sextuplets!

#### This July marks the 50<sup>th</sup> anniversary of Apollo 11.

The primary objective of Apollo 11 was to complete a national goal set by President John F. Kennedy in a speech on May 25, 1961: to perform a manned lunar landing and a safe return to Earth. As President Kennedy stated, this objective should be achieved "...before this decade is out."



At exactly 21:17:39 BST on Sunday July 20, 1969, the first part of the objective was achieved – the first manned landing on the Moon.



The Apollo missions carried a crew of 3, in the case of Apollo 11 they were (L-R in the photo) Neil Armstrong, Commander; Michael Collins, Command Module Pilot; and Edwin 'Buzz' Aldrin, Lunar Module Pilot. Only Armstrong and Aldrin would descend to the lunar surface in the Lunar Module, leaving Collins in orbit in the Command Module.

The final descent and landing phase, mostly on 'automatic pilot', was not without its drama and

suspense. The on-board guidance computers became overloaded with information and repeatedly sounded alarms. Nevertheless, Armstrong and Aldrin continued the descent and, with clear visibility of the lunar landscape ahead, they realised that they were coming down in a boulder-strewn area some way from their intended landing site. Armstrong took over manual control to overfly this area in the expectation of finding a smoother spot beyond. By now they were down to just 100ft altitude but, critically, they had less than 60 seconds fuel remaining. Would they make it?

History confirms that they did, with just less than 30 seconds-worth of fuel left!

Although they were supposed to take a rest period, Armstrong and Aldrin were keen to carry out the next part of the mission – actually setting foot on the Moon.

It had always been part of the plan that Neil Armstrong would go first and, at 03:56:15 BST (about 6½hrs after landing) he duly placed a first step on the Moon with the famous words: *"That's one small step for Man, one giant leap for Mankind."* 

STOP PRESS: After a 3 year, \$5 million restoration project, on 29<sup>th</sup> June NASA proudly reopened the Apollo Mission Control Center in Houston, Texas. The ribbon was cut by former NASA employee Christopher Kraft, who was one of Apollo's Flight Directors during the Apollo missions, including Apollo 11.



# Volume 3 - Number 3 – July 2019

# Table of Contents

YEAR 7 AUTHORS DOMINATE THIS EDITION DUE TO THE FACT THAT, THIS TERM, YEAR 8s HAVE BEEN CONCENTRATING ON PRACTICAL SCIENCE, WITH HAND-WRITTEN PLANNING, ALTHOUGH WE HAVE BEEN ABLE TO INCLUDE SOME EXCELLENT EXAMPLES.

CHARMANEE WISSNER 8GSE (Patientia)	Separation techniques	Page 1
MALWINA MUNTEANU 8PNR (Humanitas)	Separation techniques	Page 2
HARMONY CLUCAS 8PNR (Humanitas) KEILEIGH DIXON 8GSE (Humanitas) LEILAH JOGEE 8GSE (Humanitas) AMILIE FROST 8RZA (Humanitas) CARMEN LEACY 8GSE (Patientia)	Planning a salt extraction practical	Page 3
KATIE DUNN 8SOA (Patientia) IMOGEN DAVY 8SOA (Humanitas)	Salt extraction	Page 4
CHARLES BUSHELL 7NOX (Humanitas)	Synanceia – the stonefish	Page 5
LILIA PAYNE 7TAY (Patientia)	Great White Sharks	Page 6
POLA PASIK 7TAY (Industria)	The Tsetse fly	Page 7
CHLOE MARTELINO 7NOX (Humanitas)	The Box Jellyfish	Page 8
FREYA AITKEN 7CKD (Caritas)	The Jaguar	Page 9
FERNANDA LOPEZ-CLIFT 7WRB (Patientia)	The Jaguar	Page 10
RAFAEL MARTINEZ 7WRB (Patientia)	The Tiger	Page 11
LEO GERALD 7HLM (Caritas)	Predators – the Killer Whale	Page 12

# Table of Contents continued.....

TOBY MARTIN 7CKD (Caritas)	Predators	Page 14
<b>CHRISTOPHER J MORRISSEY</b> <b>7WRB (Caritas)</b>	Predators	Page 15
JOHN FEELY 7NOX (Humanitas)	Spinosaurus	Page 17
MIA SELIGMAN 7NOX (Patientia)	Thomas Edison	Page 18
MILAN BIJU 7HLM (Humanitas)	Benjamin Franklin	Page 20
MEGAN HALL 7WRB (Industria)	Benjamin Franklin	Page 21
ROSE GIRISH 7TAY (Humanitas)	Benjamin Franklin	Page 22
ANGEL JOSE 7WRB (Industria)	Benjamin Franklin	Page 23
MATTHEW OLIVER 7CPR (Caritas)	Alessandro Volta (1745-1827)	Page 25
ROMILLY FINDLEY 7HLM (Patientia)	Nikola Tesla	Page 27
PHOEBE HARPUR-DAVIES 7CPR (Caritas)	Nikola Tesla	Page 29
THOMAS HARVEY 7NOX ((Patientia)	How does a baby develop?	Page 31
COSIMA BAGNALL 7WRB (Industria)	All about reproduction	Page 33

# WHERE TO NEXT?

#### The 50<sup>th</sup> anniversary logo includes the phrase 'NEXT GIANT LEAP', but where to?

NASA and other space agencies are planning to set up a permanently manned space station in orbit around the Moon (rather like the International Space Station in Earth orbit) which will serve to develop the technologies and procedures that will be needed to get to Mars and set up a permanent colony there. This plan will also enable us to continue our exploration of the Moon,



which ended with the last Apollo mission (Apollo 17) in 1972.

**EDITOR'S NOTE**: It is often helpful in science education to invite students to map out their ideas as a poster, either to explain a number of related principles or to plan an investigation. The following pages contain some notable examples.

Evaportation and distillation into the beaker apportation seperates the salt to the water they leave H Distullation is process where iom the sea water. The The steam condenses into land you can drink seawater 8 C Without any salt in it. blockappe and cools down The steam travels through This is how it works South -The worker evaporat oviden se Then water args On derser becourse and Enero NOS EVADORO up. then Distillation Salt is le ranslers molecul a minture are soluble chromatography seperates subtances in a mixture. It works when the futrate (water) Filtration Rithering Seperates a quidform a solid. One of the Wamples is seperating sand in it, but water puricens Conical flask A SUND sourcing the muture of walk the water particles are -futer paper and stand into futer paper. -Futer funnel Filter paper has tiny holes able to pass through the work will pass t Soluent on water. You do pup ndo - clamp r iltration Chromotography for min pros Some Filler paper Wer Dass Sand residue in the

SEPARATION TECHNIQUES Charmanee Wissner 8GSE



### PLANNING A SALT EXTRACTION PRACTICAL Harmony Clucas 8PNR, Keileigh Dixon 8GSE, Leilah Jogee 8GSE, Amelie Frost 8RZA and Carmen Leacy 8GSE





Page 4

# SYNANCEIA – THE STONE FISH Charles Bushell 7NOX

**Synanceia** is a genus of fish of the family Synanceiidae, **stone fishes**, whose members are dangerously venomous and even fatal to humans. It is one of the most venomous fish known. They are found in the coastal regions of the Indo-Pacific.

Synanceia are primarily marine, though some species are known to live in rivers. Its species have potent neurotoxins secreted from glands at the base of their needle-like fin spines which stick up when disturbed or threatened. The vernacular name of the species, the stonefish, derives from its grey and mottled camouflage similar to the



colour of a stone. Swimmers may not notice them and inadvertently step on them, triggering a sting. When the stonefish is disturbed, it may inject an amount of venom proportional to the amount of pressure applied to it. A study published in 2018 reports that stonefish also have the ability to extend a sharp, specialized spine known as a lachrymal sabre as an additional defence mechanism.

Stonefish are masters of camouflage and can blend in so perfectly with their surroundings that their prey, predators, and even human SCUBA divers have trouble seeing them at all. They almost always sit perfectly still, on the sea floor, in their preferred habitat of coral and rocky reefs, and their colours are often a perfect match for the substrate. Some individuals have even been observed with algae growing on them.

The stone Fish is the master of surprise and it strikes so fast that fish surrounding it don't even know what's happened if a fish come too close it will strike and the fish not knowing what will happen is swallowed whole, completely unaware of what has just happened, it is slowly digested in the stone fishes stomach for a long time (a slow painful death). This super-fast strike makes the stone fish a good predator because the other surrounding fish have no idea of what danger they're camouflage also plays a part too.

The stonefish is one of the most venomous fish in the world, their stings being extremely painful and potentially lethal. In 2015 researchers at Monash University (Australia), using *X-ray crystallography*, succeeded in discovering the structure of the lethal factor in the stonefish venom: a protein called STONUSTOXIN (SNTX).

The work, published in *Proceedings of the National Academy of Sciences (PNAS)*\*, reveals that this lethal component of stonefish venom is actually an ancient relative of a human immune protein, PERFORIN.

What is even more remarkable is that this discovery has provided unexpected insight into a crucial human immune response that is responsible for the failure of up to 30% of bone marrow transplant therapies for treating leukaemia. The structural insights obtained from the SNTX of stonefish venom are now being used to develop immunosuppressant drugs to improve the success rate of transplant therapies.

\*Stonefish toxin defines an ancient branch of the perforin-like superfamily. Andrew M Ellisdon, et al; *PNAS*, vol 112, no 50, **December 2015** 



# THE TSETSE FLY Pola Pasik 7TAY

### The tse-tse fly

#### [ pronounced: telsee – British, or seesee – American ]

Also known as tiktik flies, they are actually one of the deadliest creatures on the planet. Usually found in the tropical areas of Subsaharan Africa. These flies are parasites that live off animals and humans blood. The tsetse have been extensively studied because of their role in transmitting disease. Scientists have discovered around 23 species of these rare and horrible insects. These pests can cause uncomfortable human sleeping sicknesses and animal trypanosomiasis.

Tsetse can be distinguished from other large flies by two easily observed features. The tsetse fold their wings completely when they are resting so that one wing rests directly on top of the other over their abdomens. The Tsetse flies also have a long proboscis, which extends directly forward and is attached by a distinct bulb to the bottom of their heads.

However, strangely, if the tsetse is hungry and is unable to find any blood around him, they are then attracted to water or sometimes sugar which isn't easy to find.



**EDITOR'S NOTE:** The author added a personal comment as follows...

I think that the tse-tse fly is a good predator because it is small and hard to see or capture. It is also similar to a normal fly, so people wouldn't usually be able to identify it.



**FROM THE EDITOR:** The school has a lunchtime history club called the *MOSQUITO CLUB* which the editor helps to run with Mr Wallace (Head of RE). Having read the previous paper about the predatorial tsetse fly, the editor could not resist adding a short piece about another tse-tse, famous in aviation circles: the De Havilland DH98 Mosquito MkXVIII, which was also nicknamed the *TSETSE*!

Only a small number of this particular version of the Mosquito were produced and were notable for having a converted 6-pdr (57mm) anti-tank gun fitted. They were not used against tanks though, but German submarines and shipping. The weapon, known as a *Molins Gun*, gave the Mosquito a devastating 'bite', hence the nickname!



# THE BOX JELLYFISH Chloe Martelino 7NOX

#### <u>What is it?</u>

The Box Jellyfish is a carnivore and weighs up to about 2kg (4.4lbs). They have extremely venomous tentacles that can kill a person even before they get back to shore. But some Box Jellyfish are not venomous; however, if you do see one, still get away no matter what people say!

They are coloured pale-blue and are transparent which helps them to camouflage in the open water where they hunt for fish and shrimp.

#### <u>Their venom</u>

Their venom is one of the deadliest in the world and contains toxins that attack the heart, nervous system and skin cells. Their stings are so painful that humans have been shocked to death or drowned, but if there are survivors, then they would still experience extreme pain and scarring from the tentacles.

#### Where do they live?

Box jellyfish live off the coast of Australia and throughout the Indo-Pacific region.

#### **Adaptations**

Box Jellyfish are highly advanced because they develop their ability to move rather than just drift, jetting at up to about 4 knots. They also have eyes grouped in six on the four sides of their bell. Each cluster of eyes includes lens, retina, iris and



cornea although, without a nervous system, scientists are not able to find out how they process what they see.

# **THE JAGUAR** Freya Aitken 7CKD

These beautiful and powerful beasts were prominent in ancient Native American cultures. In some traditions the Jaguar God of the Night was the formidable lord of the underworld. The name 'Jaguar' is derived from the Native American word *yaguar*, which means "he who kills with one leap."



#### <u>Hunting</u>

Unlike many other cats, jaguars do not avoid water; in fact, they are quite good swimmers. Rivers provide prey in the form of fish, turtles, or caimans – small, alligator-like animals. Jaguars also eat larger animals such as deer, peccaries, capybaras and tapirs. They sometimes climb trees to prepare an ambush, killing their prey with one powerful bite.

#### **Behaviour**

Most jaguars are tan or orange with distinctive black spots, dubbed 'rosettes' because they are shaped like roses. Some jaguars are so dark they appear to be spotless, though their markings can be seen on closer inspection.

Jaguars live alone and define territories of many square miles by marking with their waste or by clawing trees. Females have litters of one to four cubs, which are blind and helpless at birth. The mother stays with them and defends them fiercely from any animal that may approach – even their own father.

Young jaguars learn to hunt by living with their mothers for two years or more. Jaguars are still hunted by humans for their attractive fur. Ranchers also kill them because the cats sometimes prey upon their livestock.

# Predators have featured throughout mankind's literary history in many ways, shapes and forms; for example, who can forget the predatory crocodile, nemesis of Captain Hook, in JM Barrie's *Peter Pan*.

One notable predator first appeared in the film *Predator* released in 1987, a creature that was literally 'out of this world'! It was an extraterrestrial creature whose species had evolved to hunt advanced, intelligent lifeforms on other planets for sport. The skulls of its victims were worn as trophies of the kills.

Although the film has come to be regarded as a 'great action-thriller' in the science fiction/horror genre, it can also be viewed as an allegory – we humans consider ourselves to be the premier, dominant species on Earth, top of the species web and with no natural predators. What better way to convince us of our vulnerability and induce humility than to confront us with a species capable of our being hunted to destruction.



If we have ambitions to reach out into the Universe, perhaps we should not take our dominant status for granted, for who can tell what might be waiting for us...out there?

# **THE JAGUAR** Fernanda Lopez-Clift 7WRB

- Scientific Name: <u>Panthera onca</u>
- ♥ Type: Mammal
- Diet: Canivore
- ♥ Average lifespan in the wild: roughly 12-15 years
- ♥ Weight: 100-200 pounds
- ♥ Height: head + body= 5-6 feet

Jaguars are the biggest cats in South America. They normally have a Tan or an orange coat of fur with distinctive black spots on them. Although you can get black jaguars which the black spots are hard to see, but they are quite rare.

Most cats don't like going in water or getting wet but the Jaguar dose not fear water and often swims across water to get to there prey such as Caimen. They are infact very good swimmers. They also eat other prey like deer, peccaries, capybaras, and tapirs.



Jaguars normally live alone and mark their territories by scratching and making claw marks on trees. When a female has a litter she normally has 2-4 cubs. As the cubs are blind at there birth she protects them fiercely and attacks all the animals that go near them, including their Father.

Sadly they are still hunted as their fur is nice to use as a decoration and if they kill livestock.

The tiger's stripes help them to camouflage in the environment they're in and is helped by the fact that their pray doesn't have very good eye sight.

tiger's territories can span from 20km to 400km and in general the tigers in the colder regions have bigger territories. Tigers mark their territories by scratching on trees and scent marking

tigers love water, they like to use it to cool down and bathe on the hot days

> On average tigers live up to 14 years old, once mature they spend most of their time alone and hunting for prey

There is only 3000 to 4500 tigers thought to be left in the wild and a few subspecies have been hunted to extinction for example the bali tiger

> tigers have white spots on their ears at the moment noone really knows why they have them but it is believed that it could be so that the cubs can see their mother's in the tall grass, another theory is that they act as false eyes so nothing comes fom behind it

The tiger is the worlds biggest cat, a male tiger can grow to over 3m long and weigh more than 300kg

tigers vision in the night is 6 times better than that of a humans which helps when hunting in the dark

# PREDATORS – THE KILLER WHALE

Leo Gerald 7HLM







# **PREDATORS** Christopher John Morrissey 7WRB



### Carcharodontosaurus

The Carcharodontosaurus was one of the fiercest predators of the prehistoric age. It's name translates to 'shark toothed lizard'. It weighed 6,000-8,000kg and was 8-14m long. Palaeontologists estimate it may have had a bite force of around over 19,000 newtons. It lived from 145-72.1 million years ago within the mid-Cretaceous period.



**EDITOR'S NOTE**: Christopher Morrissey's paper contained three examples of predators – the previous page dealt with a rather nasty snake and a dinosaur, now extinct. The author impressed the editor with his presence of mind in choosing, as his third predator, humans.



According to a recent report by Carolyn Gramling posted on SCIENCENEWS.ORG, a media release from the INTERGOVERNMENTAL SCIENCE-POLICY PLATFORM ON BIODIVERSITY and ECOSYSTEM SERVICES, IPBES (May 2019) entitled *'NATURE'S DANGEROUS DECLINE UNPRECEDENTED – SPECIES EXTINCTION RATES ACCELERATING'* suggests that at least 1 million species (plant and animal) are under threat of extinction ...and it's OUR FAULT!

It is known from the fossil record that, throughout geological time, there have been at least five mass extinctions, the most recent (and famous) being an event around 65 million years ago that led to the extinction of the dinosaurs (as well as many other species). These extinctions occurred long before humans evolved and were all caused by catastrophic natural events. However, according to the IPBES report, as many as 1 in 8 animal and plant species on Earth are in danger of becoming extinct.

The report contains many other sobering numbers: More than 40 percent of amphibian species are threatened, along with 33 percent of marine mammals, 33 percent of sharks and reef-building corals and 10 percent of insects. Right now, the rate of global species extinctions is tens to hundreds of times faster than the average extinction rate was over the last 10 million years. And if human activities continue unabated, the rate of extinctions will continue to accelerate.

The report cites 5 main reasons humans are responsible for this unprecedented increase in rate of extinctions:

- LOSS OF HABITAT
- OVERFISHING THE OCEANS
- NOT TACKLING CLIMATE CHANGE QUICKLY ENOUGH
- CONTINUING TO POLLUTE THE ENVIRONMENT
- INTRODUCTION OF INVASIVE SPECIES TO VULNERABLE AREAS

UNLESS WE START TAKING THESE ISSUES SERIOUSLY, WE WILL BE RESPONSIBLE FOR THE NEXT MASS EXTINCTION

# SPINOSAURUS John Feely 7NOX

Living in Africa, Spinosaurus had a 2 metre long spine rising above its back. Its head was also 2 metres long and its body was 17 metres long, 4 metres longer than T-Rex.

Spinosaurs lived during the mid-Cretaceous period in Africa and is the biggest predator ever to have walked the Earth – an 11 ton colossus. Chemical research on their bones and teeth shows that they lived more like a crocodile and hunted in water as well as on land. Spinosaurs' teeth evolved to grip prey instead of tearing their flesh, which meant that they had to have really strong arms.

The Spinosaur's nose was covered in small holes like a crocodile so that it could sense prey in water without seeing it. Spinosaurs hunted *Onchpristis*, an 8 metre long sawfish, as well as other aquatic species and land-living herbivores.

Climate change meant trouble for Spinosaurs because there were a lot of droughts. Spinosaurs would then have to compete for food on land, particular against a 13 metre long dinosaur called *Carcharodontosaurus*, which would fight using its mouth and claws. In fact, Spinosaurs eventually died out because of climate change 94 million years ago, when sea levels rose and swamped its usual hunting grounds – that's why the biggest carnivore ever to walk the earth became extinct.



**EDITOR'S NOTE**: The author also included a brilliant piece of imagination by designing his own predator for modern times, based upon his knowledge of the Spinosaur and other carnivorous dinosaurs – called a *PLATED LIZARD*, it looks and acts like a Spinosaur, but has rows of plates next to its huge spine. It is 8 metres long, stands 5 metres tall and is incredibly strong, with hugely powerful jaws.

Plated Lizards live in Australia where they hunt kangaroos, dingoes and crocodiles, as well as koalas and snakes.

# THOMAS EDISON Mia Seligman 7NOX

Thomas Edison is known as the greatest inventor America has ever had and has made over 1000 patents in his life, which is more than anyone else has accomplished. Out of those 1000 patents, 389 of them were for the electric light and power. Some of his greatest inventions that he made were the phonograph, the motion picture and the light bulb.

Thomas Edison was born on the 11 of February 1847 and died on the 18 of October 1931 of diabetes. Surprisingly, he did not do well in school, so he had to be home schooled by his mother. Thomas Edison started to become interested in communication when he was taught how to use a telegraph operator by a man whose daughter he saved from a runaway train while he was selling newspapers. After he became interested in communication, he based many of his inventions on it.



The most famous thing Edison is known for is the electric light bulb. However, Edison did not make the first light bulb. He made the twenty-third bulb. His bulb is the best known because it was longer lasting and did not overheat. It took Edison 1000 tries to get the light bulb finished and when a reporter asked how he felt about failing a thousand times he said "I didn't fail a thousand times but it took 1000 steps to make the light bulb."

Edison started working on the phonograph in 1877. This was the

first invention that could record and then play back sounds. The first thing Edison recorded were the words to *Mary Had a Little Lamb*. "He was awed and astonished to hear them played back to him. Or, perhaps, he was the first of millions of people to dislike the sound of his own voice on recording" (by www. historyhit.com). The phonograph quickly expanded all around the world and was also famous in WWI for allowing soldiers to send messages to others. This was one of the inventions that made Edison even more



"Our greatest weakness lies in giving up. The most certain way to succeed is always to try just one more time."-Thomas Edison" Another inventor, Nickola Tesla, worked with Thomas Edison, but they had many arguments and were very different. One of the main things they argued over was the technology for electricity. Furthermore, they didn't like each other's inventions. Edison disapproved of many of Tesla's ideas and said everything he did was impractical instead of promoting him. In Edison's life he made over a thousand patents while Tesla made around 300.



# "Many of life's failures are people who did not realize how close they were to success when they gave up."

If Thomas Edison did not exist Tesla would have made many of the things that Edison invented possible and would have been more famous then he was back then. However, he would have found it harder to show his inventions to the world without Edison. We can thank Edison for many things that we use today. Although we do not use the same exact inventions that Edison designed, he gave other inventors ideas to improve his-inventions. Overall, Thomas Edison is a very important part for electricity and many other things we use today.

# "If we did all the things we are capable of, we would literally astound ourselves."

#### Websites used

413

http://www.edisonmuckers.org\_\_\_\_Nikola tesla Thomas Edison and the history of electricity www. History.com Thomas Edison the history of the phonograph www.indiatoday.in

# **BENJAMIN FRANKLIN** Milan Biju 7HLM

What's the first thing you see when you hear the name Benjamin Franklin? Maybe you've seen the picture of him with a kite on a string with a key? Ben franklin is a very famous man for many reasons: he not only played a role in the 1700s as a Founding Father of the United States of America, but he was also a writer and **inventor**. An inventor is someone who designs and creates new things for people to use. Mr Franklin invented many things that we still use today. His ideas range from science and health, to maps, music and more.



#### <u>Who was he?</u>

Benjamin Franklin (1706-1790) was an American inventor and politician. He invented many things, such as bifocal spectacles, a heat-efficient stove, fins for swimming and a musical instrument called a glass armonica. His most exciting invention was the lightning rod.

#### The iron rod experiment

Before the arrival of Franklin's invention, buildings in his time were often destroyed and caught fire by lightning strikes. He was fascinated by this so he did an experiment using an iron lightning rod. His rod attracted lightning, redirecting it down the side of buildings and safely to the ground. Franklin made key discoveries about the relationship between lightning and electricity. He discovered that electricity flows like a fluid and never goes away. What happens when things get struck by lightning? They burn!

Since Benjamin Franklin was always trying to create things that would better people's lives, he created the lightning rod: a metal rod

that sits on top of your house with a wire going to the ground so that the electricity from a lightning strike can flow to the ground and become harmless, saving the house. Now, when you see the picture of Benjamin and the kite, you can remember that he discovered a way to save your house from lightning.

#### The kite experiment

In one very famous and dangerous experiment, Franklin was said to have flown a kite during a thunderstorm to attract lightning and prove that it was a form of electricity. He had a metal key attached to the kite string that led to a jar that collected sparks of electrical energy.

#### What did he find out after the experiments?

By 1747, Benjamin franklin began conducting a series of electrical experiments that would make him a household name around the world and help pave the way for his crucial involvement with the French government during the Revolutionary War many years later.

It was during this time that Benjamin franklin discovered what we today call positive and negative charge. It was commonly thought that electricity was created by friction, as when a cloth is rubbed against something. But Franklin discovered that electrical charge was held statically in positive and negative charges in various items and, rather than being 'created', electricity is only transferred from one item to another. This is what we call today 'the principle of conservation of electrical charge.'





#### Why are Benjamin Franklin's experiments still important today?

Benjamin franklin's discovery about lightning is important because, if he hadn't discovered electricity, we wouldn't have power that we use in everyday life and we would still be burning candles. Franklin proved that lightning is a form of electricity with his famous (and very dangerous) kite experiment. This led to his discovery of positive and negative charges and to his development of terms that we still use today: battery, conductor, condenser, charge, discharge, electric shock and electrician. So he allowed us to understand the complicated and infinite energy source that is electricity.



#### Sources of information – websites:

- BBC History
- Benjamin Franklin
- Wikipedia

# BENJAMIN FRANKLIN Megan Hall 7WRB

#### About Benjamin:

Franklin was a well-known scientist. He was born on the 17<sup>th</sup> January 1706 in Boston, Massachusetts Bay, British America and died on the 17<sup>th</sup> April 1790 (age 84). He had a wife called Deborah Read whom he married in 1730 and she passed away in 1774. The Franklins had three children: Willian, Francis Folger and Sarah. Benjamin Franklin had only two years of formal education at Boston Latin school and at a private academy before he left to join his family business which was a candle and soap making company.

#### His work:

Benjamin was an American polymath (a person with a wide knowledge of subjects) and one of the Founding fathers of the United States of America. He was also a leading author, printer, political theorist, politician, inventor and much more. As an inventor, he is known for the lightning rod, bifocals, the franklin Stove amongst many other inventions. He founded many civic organisations, including the Library Company, Philadelphia's first fire department and the University of Pennsylvania.

#### Some interesting facts:

- He became a hit writer as a teenager
- He spent half of his life in unofficial retirement
- He designed a musical instrument used by Mozart and Beethoven
- He created a phonetic alphabet
- He was a fashion icon in France

#### Some quotes:

"Tell me and I forget, teach me and I may remember, involve me and I learn." "Guests, like fish, begin to smell after three days." "By failing to prepare, you are preparing to fail." "Well done is better that well said." "In this world nothing can be certain, except death and taxes." "Any fool can criticise, condemn and complain – and most fools do."

# BENJAMIN FRANKLIN Rose Girish 7TAY

#### <u>Early life –</u>

Benjamin franklin was born on January 17, 1706 in Boston. His father was Josiah Franklin, who was a soap and candle maker. Benjamin was the tenth child of a total of seventeen. His father encouraged him to enter into the clergy; however, Josiah could only afford for Benjamin to go to school for a year.

In Benjamin's childhood he loved to read. At the age of 12 Benjamin used to sell small booklets containing information or argument about a single subject. At the age of 15 Benjamin and his brother started *'The new England Courant'* (the first newspaper in Boston). He wanted to write for the newspaper too, but he knew his brother would never let him.

#### Benjamin and Electricity -

Benjamin noticed many similarities between electricity and lightning. For example, they both create light, make extremely loud crashes, are attract3ed to metals, etc.... On his observations Benjamin thought that electricity and lightning were the same thing. Some people shared the same belief, however no one had tested it before.

Franklin decided to send several letters to a fellow scientist who lived in London. This scientist and many others in London thought Franklin's letters contained some valuable information. In 1751 the letters were all published in a little book called '*Experiments and Observations on Electricity*.' In one of the letters there was a plan for how to prove that lightning and electricity are the same. This is a

famous experiment called the 'Kite Experiment' (or 'the Kite and Key Experiment.')

#### Benjamin and the Kite Experiment -

It all started on one June afternoon in 1752 as the sky began to darken over Philadelphia. Franklin was waiting for an opportunity like this to test the electrical nature of lightning. For

it to work he had to get a simple kite made with a large silk handkerchief, a hemp string and a silk string. He also had to use a metal house key, a Leyden Jar (a device that could store an electrical charge for later use) and a sharp length of wire.

He was originally going to do this experiment on a Philadelphia church spire, but then realised that he could reach the same goal with a kite...and it worked! This led to his invention of the modern lightning rod.

#### <u>Sources of information – websites:</u>

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- www.benjamin-franklin-history.org/early-life
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### BENJAMIN FRANKLIN Angel Jose 7WRB

Benjamin franklin was born in Boston, Massachusetts, USA on January 17, 1706. He was the tenth son of soap maker, Josiah Franklin. Benjamin's mother was Abiah Folger.

Josiah intended for Benjamin to enter into the clergy; however, he could only afford to send his son to school for one year and clergymen needed years of schooling. But, as young Benjamin loved to read, Josiah had him apprenticed to his brother James, who was a printer. After helping James compose pamphlets and set type which was extremely hard work, 12-year-old Benjamin could sell their

products in the streets. Later, when Benjamin was 15 his brother started '*The New England Courant*' the first "newspaper" in Boston. As an adult, Benjamin established a strong and thriving printing business and was very successful in this career.

By 1749 Benjamin retired from business and started concentrating on science, experiments and inventions. This was not new to Franklin. In 1743 he had already invented a heat-efficient stove – called the Franklin Stove – to help warm houses more efficiently. As the stove was invented to help improve society, he refused to patent it. Among Franklins other inventions are swim fins, the 'glass armonica' (also known as harmonica) and bifocals.

In the early 1750s Franklin turned to the study of electricity. His observations, including his kite experiment which verified the nature of electricity and lightning, brought Franklin international fame. He did not invent electricity, but he discovered many things about it previously not understood.

#### **Franklin's Kite Experiment**

Before Franklin started his scientific experimentation, it was thought that electricity consisted of two opposing forces. Franklin showed that electricity consisted of a "common element" which he named "electric fire." Further, electricity was "fluid" like a liquid. It passed from one body to another – however it was never destroyed.

This is how his famous experiment happened: on a June afternoon in 1752, the sky began to darken over the city of Philadelphia. At that time Benjamin Franklin decided it was the perfect time to go fly a kite. He had his materials at the ready: a simple kite made with a large silk handkerchief, a hemp string and a silk string. He also had a house key, a Leyden jar (a device that could store an electrical charge for later use) and a sharp length of wire. His son, William, assisted him.

Franklin and his son "Took the opportunity of the first approaching thunderstorm to walk into a field," British scientist, Joseph Priestley, wrote in his account. "To demonstrate, in the complete manner possible, the sameness of the electric fluid with the matter of lightning. Dr Franklin, astonishing as it must have appeared, contrived actually to bring lightning from the heavens, by means of an electrical kite, which he raised when a storm of thunder was perceived to be coming on." Franklin had constructed a simple kite and attached a wire to the top of it to act as a lightning rod. To the bottom of the kite he attached a hemp string and to that he attached a silk string. The last piece of the puzzle was the metal key. Franklin attached it to the hemp string and, with his son's help, got the kite aloft. Then they waited. Just as he was beginning to despair, Priestly wrote, Franklin noticed loose threads of the hemp string standing erect "just as if they had been suspended on a common conductor." Vol 3, Number 3 July 2019

Franklin moved his finger near the key and, as the negative charges in the metal were attracted to the positive charges in his hand, he felt a spark. "Struck with this promising appearance, he immediately presented his knuckle to the key, and the discovery was complete. He perceived a very evident electric spark," Priestly wrote. Using the Leyden jar, Franklin "collected electric fire very copiously." This "electric fire", or electricity, could then be discharged at a later time.

Franklin's work became the basis for the *single fluid* theory. When something is being charged, such as a car battery, electricity flows from a positive body, that with an excess charge, to a negative body, that with a negative charge. Indeed, a car battery has plus and minus signs on its terminals.



Franklin wrote to a friend, Collinson, that *"I feel a Want of Terms here and doubt much whether I shall be able to make this intelligible."* Not only did Franklin have to posit theories, he also had to create a new language to fit them. Some of the electrical terms which Franklin coined during his experiments include ones we still use today:

• battery	<ul> <li>conductor • positively • negatively</li> </ul>	•charge	•plus
•condenser	•minus	•armature	

### Did you know?

#### Benjamin Franklin's face is on the 100 dollar bill.



Franklin is one of the 'Founding Fathers', the only one who put his name to all three of the founding documents of the United States: the Declaration of Independence, the Treaty of Peace with Great Britain, and the Constitution.

#### <u>Sources of information – websites</u>

- <u>www.fi.edu/benjamin-franklin/kite-key-experiment</u>
- <u>www.ushistory.org/franklin/info</u>
- <u>www.history.com/topics/american-revolution/benjamin-franklin</u>

# ALESSANDRO VOLTA (1745-1827) Matthew Oliver 7CPR

Ever wondered what our lives would be like without electricity?

Electricity can be defined as the set of physical phenomena associated with matter that has a property of electric charge. The presence of an electric charge, either positive or negative, creates an electric field. The movement of electric charges is an electric current, which also produces a magnetic field.

Towards the end of the 18<sup>th</sup> century, electricity was a hot topic in the scientific community. People, such as scientists and doctors, were conducting various experiments to try to create electricity and use it. Benjamin franklin had carried out a kite experiment, drawing electricity from lightning in 1752.<sup>1</sup>



Attaching a metal key to the bottom of a wet kite string, he flew the kite in stormy weather conditions, causing sparks to jump from the key to the back of his hand. Leyden jars were invented in 1746, used to store charge and produce a spark of electricity.<sup>2</sup> Doctors treated certain patients with electric shocks.<sup>1</sup>

However, the scientific community was not able to further their research realistically on any practical use of electricity, until a source of continuous current could be maintained.

In 1800 a certain Italian scientist, Alessandro Volta, invented the first electric pile, the forerunner of the modern battery, providing the first source of continuous current.<sup>3</sup>

Alessandro Volta was born in Italy to a wealthy noble family.<sup>3</sup> His family were religious and sent him to the Como Jesuit school and a local seminary. He was pulled in different directions: his teachers wanted him to enter the priesthood, while his family preferred him to study law. However, he was obsessed by physics and especially by electricity.

Volta eventually left school, but at age 18, his regular correspondence with the scientific community inspired him to start conducting experiments in the laboratory of a family friend. At 24, he presented a paper on "On the forces of attraction of electric fire", discussing his theory of electric phenomena. At 29, he became a professor of physics at a local grammar school, called the Royal School of Como, and he continued to conduct experiments on electricity in his spare time.<sup>3</sup>

A year later, he improved a simple manual capacitive electrostatic generator that was invented in 1762 by a Swedish scientist, Johan Carl Wilcke. This generator was renamed by Volta as *"perpetual electrophorus"*, and it could transfer charge to other objects through electrostatic induction.<sup>3</sup>

The following year, the bubbling of methane gas at Lake Maggiore caught Volta's eye and set about to isolate the gas successfully.<sup>4</sup>

Aged 33 in 1778, Volta was made professor of physics at the University of Pavia.<sup>3</sup> Already well-known in the scientific community, Volta became even more famous with his great contribution to science, the voltaic pile, invented as part of a scientific dispute with Luigi Galvani.<sup>2</sup>

Galvani started to conduct experiments in 1780 with dissected frog legs mounted on iron or brass hooks, which jumped or twitched when touched with a probe of another metal. He was convinced that he had found a new form of electricity, generated by the frogs' muscles. He called the phenomenon "animal electricity", publishing his work in 1791.<sup>5</sup>

Volta was not convinced and realised the important aspect of Galvani's experiments was the two dissimilar metals – the iron or brass hook, and the probe of some other metal. Volta tested various combinations of metals by placing them on his tongue. The saliva in his mouth, like the frog legs, conducted electricity, producing a bitter taste. Volta grew more convinced that animal tissue was not essential for conduction of electricity.

Volta assembled a stack of alternating zinc and silver discs up to thirty discs high, separated by brine-soaked cloth. The column was stabilised by three vertical rods. A steady current flowed when a wire was connected to both ends of the pile. Volta became obsessed and experimented with different types of metals, enabling the amount of current produced to vary. He also noticed that the current could be increased or decreased by adding or removing discs from the stack.

In 1800, aged 55, Volta officially reported the electric pile to the Royal Society in London. His fame grew as he travelled to Paris to demonstrate his hugely successful invention.

The scientific community embraced his device and hailed its practicability for research. In 1800, William Nicholson and Anthony Carlisle were able to use the current generated by the device to decompose water into hydrogen and oxygen.<sup>1</sup> Sir Humphry Davy and Michael Faraday visited Volta in Milan in 1814.<sup>7</sup> This inspired Davy to build his own batteries, therefore discovering electrolysis (using electricity to create a chemical reaction) in the process. Thus the important field of *electrochemistry* was born. It also led to Michael Faraday carrying out his pioneering research on electromagnetism.



Illustration from "On the Electricity Excited by the Mere Contact of Conducting Substances of Different Kinds", Alessandro Volta<sup>1,6</sup>

Volta's fame even reached the ears of the French emperor Napoleon, who bestowed many honours on Volta, including making him a Count of Lombardy in 1810. Napoleon had attended Volta's demonstration in Paris in 1801.

Volta eventually retired from research and teaching, and settled down to a quiet life. His incredible dedication to experimenting, and obsession with electricity, have made a huge impact on us all. His portrait has appeared on currency and stamps. His name has been honoured in the unit of electrical potential – the volt – the electromotive force that drives the current.

#### **REFERENCES**

- <sup>1</sup> https://simple.wikipedia.org/wiki/Electricity
- <sup>2</sup> https://en.wikipedia.org/wiki/Leyden\_jar
- <sup>3</sup> https://www.britannica.com/biography/Alessandro-Volta

<sup>4</sup> https://www.worldofchemicals.com/171/chemistry-articles/alessandro-volta-methane

- <sup>5</sup> https://www.corrosion-doctors.org/Biographies/VoltaBio
- <sup>6</sup> The Philosophical Transactions of the Royal Society, 1800
- <sup>7</sup> BBC A History of the World: Volta Battery www.bbc.co.uk



# NIKOLA TESLA **Romilly Findley 7HLM**

Nikola Tesla was Serbian-American а electrical engineer, mechanical inventor. engineer and futurist, who is best known for his contributions to the design of the modern alternating current electricity supply system.

**BORN** 10 July 1856 DIED 7 January 1943 (aged 86)



Tesla conducted a range of experiments with mechanical oscillators/generators, electrical discharge tubes, and early X-ray imaging. He built a wireless-controlled boat, one of the first ever exhibited. Throughout the 1890s, Tesla worked on wireless lighting and worldwide wireless electric power distribution in his high-voltage, high-frequency power experiments in New York and Colorado Springs. He proved that you could send power short distances without wires – even today, we have yet to prove how to send power long distances without wires. Another Tesla invention combined radio with a remote-controlled device. We would now call it a robotic drone.

He was ahead of his time! In 1893, he spoke about the possibility of wireless communication with his devices, a bit like today's mobile phones. Tesla tried to put these ideas to practical use in his unfinished Wardenclyffe Tower project, an intercontinental wireless communication and power transmitter, but ran out of funding before he could complete it.

Tesla became well known as an inventor and would demonstrate his achievements to celebrities and wealthy patrons at his laboratory, and was noted for his showmanship at public lectures.

All in all, Tesla was a very cool dude. He hung out with albert Einstein when they and other scientists took a tour of a wireless station in New Jersey in 1921.

Without Tesla's vision and brilliance, electric cars wouldn't be possible. I think that, if he were alive today, Nikola tesla would be very pleased and impressed with today's electric cars - especially the 'Tesla' named in his honour!





Several million volts of electricity are discharged at Nikola Tesla's laboratory in Colorado. Tesla expected that anything that needed electricity would get it from the air. YUGOSLAV PRESS AND CULTURAL CENTRE/NEW YORK TIMES



The World System broadcast tower (Wardenclyffe Tower Project) that Nikola Tesla built in Shoreham, New York. It was torn down for scrap in 1917 to pay Tesla's hotel bill at the Waldorf Astoria.

HANDOUT/NEW YORK TIMES

Page 28

# **NIKOLA TESLA** Phoebe Harpur-Davies 7CPR



# **Inventions**

Tesla held over 300 patents. His most famous was for the alternating current (AC).

#### Alternating current:

The alternating current was invented by Tesla and George Westinghouse. It competed against Thomas Edison's Direct current (DC) causing them to became rivals. However it soon became evident that the alternating current was much better at powering houses since an AC current could travel 100s of miles through a wire and produce a bright white light. <sup>1</sup>

#### Amazing inventions that were never made:

Nikola invented many things that could have changed the world. However, all these inventions were seen to be ahead of his time and were never made.



The death ray: The death ray was a machine that would send out invisible beams of electricity and would be able to shoot down planes from miles away.

The weather machine: The weather machine was a machine that was thought to control the weather. Some people believe that it is used by organisations today and explains strange weather patterns.

The thought camera: The thought camera was a way of showing thoughts in picture.

The Earthquake Machine: This machine was a machine that was thought to be able to generate earthquakes.

#### **Reference Links**

#### 1: https://youtu.be/iEJNJ0rFSe8

2: http://theconversation.com/nikola-tesla-the-extraordinary-life-of-a-modern-prometheus-89479

3: https://www.smithsonianmag.com/history/the-rise-and-fall-of-nikola-tesla-and-his-tower-11074324/ **HOW DOES A BABY DEVELOP?** 

**Thomas Harvey 7NOX** 



#### An egg in a woman's ovary.....



....is fertilised by a man's sperm......



...it then implants itself into the uterus......



The baby develops in the mother's uterus for 9 months, divided into 3 periods..... FIRST TRIMESTER





#### THIRD TRIMESTER

# **Third Trimester: Stages of Fetal Development**



#### **SEXTUPLETS**

Sextuplets mean that six babies have developed together in the same uterus at the same time! Graham and Jan Walton had Hannah, Luci, Ruth, Sarah, Kate and Jennie on November 18 1983





# ALL ABOUT REPRODUCTION

Cosima Bagnall 7WRB





1



# You have questions? We have answers!

Human reproduction



Human reproduction is any form of sexual reproduction resulting in human fertilization. It typically involves sexualintercourse between a man and a woman. During sexualintercourse, the interaction between the male and femalereproductive systems results in fertilization of the woman's ovum by the man's sperm.



Sperm cell

Fun facts!

Human reproduction is when an egg cell from a woman and a sperm cell from a man unite and develop in the womb to form a baby. A number of **organs** and structures womb to form a baby. A number of **organs** and structures which produce most of the fluid that man organs and genitals.

The <u>reproductive system</u> is a collection of internal organs and external genitalia that work together to generate new life. The female reproductive system is made up of a number of different parts, most notably the vagina, uterus and egg-producing ovaries. The male reproductive system consists of the penis, scrotum and testicles, as well as various internal accessory organs, which produce most of the fluid that makes up the

### Gestation period



Gestation is the period of development during the carrying of an embryo or fetus inside viviparous animals. ... The time interval of agestation is called the gestation period. In human obstetrics,gestational age refers to the embryonic or fetal age plus two weeks.

Overview. A typical pregnancy lasts 40 weeks from the first day of your last menstrual period (LMP) to the birth of the baby. It is divided into three stages, called trimesters: first itrimester, second trimester, and third trimester. The fetus undergoes many changes throughout maturation. Germinal Embryonic Fetal

The first trimester begins on the first day of your last period and lasts until the end of week 12. This means that by the time you know for sure you're pregnant, you might already be five or six weeks pregnant! A lot happens during these first three months.

The second trimester of your pregnancy is from week 13 to week 28 roughly months four, five and six. As well as feeling and looking more pregnant during these weeks, you may also have more energy than you did in the first trimester.

#### What are sextuplets?

A sextuplet is six babys that are born at the same moment.

But conceiving sextuplets without the use of fertility treatments is extremely rare. In fact, the odds of giving birth to sextuplets spontaneously are one in 4.7 billion. ... Twins are the most common form of multiple birth and can occur naturally once in every 90 births.



he odds of having sextuplets is estimated at one in 4.7 billion, per the hospital. Now compare that to the chances of getting struck by lightning at some point in your life, which is about 1 in 3,000, according to National Geographic. 1) Delivery of one little one is tough enough.



# **PLASTIC POLLUTION – IT REALLY IS EVERYWHERE!**



It has long been recognised that the disposal of plastic items, particularly those 'single-use' items, is creating a serious problem in the environment. In general plastics breakdown extremely slowly so will persist for decades, perhaps even centuries.

More recently an issue has come to light regarding **MICROPLASTICS**. These are defined as all forms of plastic with an overall dimension less than 5mm. When large plastic items eventually breakdown they can release small, microplastic fragments - these are known as **secondary microplastics**. What is even more alarming is the presence of **primary microplastics** in the environment – these include microscopic plastic beads used in personal care products and *microfibers* from clothes and pre-production pellets.

Now the results of a new study published in the journal NATURE GEOSCIENCE\* make disturbing news:

#### **MICROPLASTICS ARE BLOWING IN THE WIND!**

Researchers from EcoLab in Castanet-Tolosan (France) set out to investigate possible atmospheric pollution by microplastics, choosing a location, the Bernadouze weather station, high in the Pyrenees between France and Spain. Using special containers they collected microplastics falling out of the atmosphere over a 5 month period. Each month they took out all the particles that had been collected for identification and then totalled up all the results at the end. They found plenty!

Here is an extract from the summary of their report:

We analysed samples, taken over five months, that represent atmospheric wet and dry deposition and identified fibres up to ~750  $\mu$ m long and fragments  $\leq$ 300  $\mu$ m as microplastics. We document relative daily counts of 249 fragments, 73 films and 44 fibres per square metre that deposited on the catchment. An air mass trajectory analysis shows microplastic transport through the atmosphere over a distance of up to 95 km. We suggest that microplastics can reach and affect remote, sparsely inhabited areas through atmospheric transport.

This report suggests that it is not just our populated land areas and our oceans that we are polluting with microplastics, but our atmosphere as well!

\* Atmospheric transport and deposition of microplastics in a remote mountain catchment Steve Allen *et al. Nature Geoscience* 12, 339–344 (2019) "The fact is that no species has ever had such wholesale control over everything on earth, living or dead, as we now have. That lays upon us, whether we like it or not, an awesome responsibility. In our hands now lies not only our own future, but that of all other living creatures with whom we share the earth." David Attenborough, Life on Earth



Well, not quite all! As this will be the last edition ever from the LSC (when we start the new school year in September we shall all be together on the Upper Site) the Editorial Team would like to say a big thank you to all the authors who have contributed these last 3 years. Thanks also to all our readers.

Don't worry, though, this is certainly not the end for the Journal of Science as we have every intention of continuing at the USC, so have good summer break and we'll see you again in the autumn term.