

The Journal of the Students of Spalding Grammar School



THE SPALDONIAN



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WELCOME TO THE SPALDONIAN

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Priory Road
Spalding
Lincolnshire
PE11 2XH
www.spaldinggrammar.lincs.sch.uk
enquiries@spaldinggrammar.lincs.sch.uk
01775 765800

INSPIRE

CHALLENGE

ENRICH

EDITORIAL

Welcome to the very first issue of the Spaldonian, a journal that represents the diverse array of academic work of the students of Spalding Grammar School. These articles contain course content included in exam specifications, but also the application of this knowledge in real world contexts and current global debates, which make for captivating reads.

There are several articles from the natural sciences. Anya Strickland outlines why shark conservation is important, Alexander Simpson explains how chemical weapons agents have been used over time, and Joshua Brooks illustrates how sapienic acid can be extracted from plant seeds.

In the social sciences, Max Baker examines the effects of deforestation in the Amazon on the carbon and water cycles, Chloe Wright explains the psychological causes of phobias, and I use economics to argue the extent to which the company *Amazon* is considered a monopoly.

Essays from the arts and humanities include a polemic by Matthew Southwell questioning whether minimalism should be treated as art, the various arguments to viewing euthanasia as murder instead of peaceful death by Sayang De Ste Croix, and an explanation as to why foreign languages are difficult to learn by Silvia Richards. Toby Walters also outlines important influences and changes in music over the years.

You will also find a number of poems throughout this volume. The unique companionship between humans and animals is something which has been explored throughout literature, evident in Homer's 'The Odyssey' (500-400BC) and explored in the poems written by Isaac

Woolley. But despite the comfort animals bring, they also provoke an innate fear within us, when we associate them with violence and danger. This contrasting perspective of the relationship between animals and humans is explored within the poems by Beon Malieckal.

There are also articles from PE, in which Alfie Thomas explains the impacts of discrimination in cricket; German, where Emily Hemsworth comments on the repression of art and culture in Nazi Germany; Engineering, where the benefits, limitations and applications of Nanoscale 3D printing are discussed by Martin Stuart; and Maths, as Joshua Brooks proves the quadratic formula.

Throughout you will also find art pieces that make the fabric of Spalding Grammar School a more colourful and thoughtful place. Much of what you'll find in this issue is postmodern, but our students are just as capable in the classics.

The school's core purpose is to inspire, challenge, and enrich. Working on this journal and seeing the great work done by the students of Spalding Grammar School has certainly been inspirational. Of course, being the very first issue - and perhaps in time an important part of the school's history - it has also been challenging! But ultimately, we hope that this journal celebrates what our students achieve and how it reflects the spirit of enrichment at our school.

Daisy Darley, Editor-in-Chief

On behalf of the Sixth Form Editorial Board



ANYA STRICKLAND (BIOLOGY)

SHARK CONSERVATION

Why is the conservation of sharks important to marine ecosystems?

Sharks are often considered iconic, ruthless predators roaming the world's oceans. It is far less common to consider the role all species of sharks play in marine ecosystems as they maintain a balance within the marine food chain. Sharks are notoriously the most efficient predator in the world's oceans and can survive in all environments.

Sharks have dominated the oceanic depths for over 100 million years, presenting almost the same characteristics today as they did 100 million years ago. This is because sharks have been such successful predators throughout history that there is no requirement for them to adapt. Sharks can inhabit almost every marine ecosystem on earth, ranging from bottom-dwelling species present in coastal regions to larger sharks roaming the open ocean. Because of this, they undertake a vital role of regulating the productivity of fish, crustaceans, coral reefs, and other types of marine organisms in these different environments.

It could be argued that the conservation of sharks is not important to marine ecosystems because of their potential replacement by other predatory species such as killer whales, barracuda, and blue marlin. Furthermore, some may argue that marine herbivores would allow coral reefs to prosper to a similar extent as is possible in the presence of predatory sharks. It could also be suggested that the human uses of sharks as medicine and in medical operations is far more important than their relative importance to marine communities. And lastly, it is

possible to argue that large sharks are relatively unimportant to marine ecosystems as they inhabit environments so far from coastal reefs and communities and so conservation efforts towards protecting such species are unnecessary.



Tiger shark by Albert Kok CC BY-SA 3.0

However, a far more convincing argument would suggest that all types of species of sharks are extremely important to marine ecosystems and because of this they do require conservation efforts in order to protect them. It is evident that coral reefs are far more productive in the presence of reef sharks which feed on browser organisms to prevent the destruction of the reef. This was highlighted through the examples detailed by the Scripps Institution of Oceanography at the University of California. The argument that vulnerable sharks should definitely be conserved is further supported because of the incentives for humans. Large sharks are the top predator in the marine food web. Fishermen benefit hugely from shark presence near fisheries because they remove

predators that would restrict the abundance of smaller fish. Without the presence of the large shark as the apex predator, the balance of the food chain becomes unequal – resulting in an increase in the number of large fish. This would create an abundance of larger fish such as mackerel and tuna that predate on small fish to such an extent that those populations would decline exponentially. Furthermore, humans would benefit from a sustainable supply of shark oils to use for medicinal purposes, like controlling cholesterol levels, which is a major cause of cardiovascular disease in humans. A specific species of shark named the Spiny Dogfish (*Squalus Acanthias*) produces liver oils containing 10 times the amount of Vitamin A than that of Cod liver oils. This is obviously an incredible incentive for supporting conservation projects aimed at protecting sharks.

The argument that sharks are unimportant to marine ecosystems is critically flawed. The assumption that other marine predators, showing similar diet patterns to sharks, have the capabilities to replace them as the ‘top’ predator is simply an assumption, and the evidence collected from scientists across the world suggests that the absence of sharks leads to a major imbalance of the food chain within a marine community.

It is clear that sharks are an incredibly important asset to marine ecosystems in all oceanic environments, and because of this, it is essential that humans implement conservation projects in order to help protect and save them.



Horse

They've served their time,
Fighting for us to stay alive,
Treated as tools of war,
The noblest warrior's humans could ever ask for.

Today it's different,
They're pacifists now,
Free to graze and breed,
Released from the shackles of human greed.

Isaac Woolley

CHLOE WRIGHT (PSYCHOLOGY)

PHOBIAS: FEAR AND DANGER

Psychological causes of phobias: from spiders to heights!

Phobias are irrational beliefs about an object or situation and can be categorised by excessive fear or anxiety. Currently, there are three main recognised phobia categories:

- Specific phobias are phobias of a specific object or situation, e.g., fear of dogs (Cynophobia)
- Social anxiety or phobia which involves fear of social situations such as public speaking.
- Agoraphobia is the phobia of being outside or in public spaces.

Those who suffer from any of these may experience symptoms, including panic, avoidance of the stimuli, anxiety, and cognitive symptoms such as irrational beliefs and selective attention to the phobic stimuli.

To explain phobias and how they arise, the behavioural approach of psychology is taken, which explains behaviours in terms of learning. Mowrer (1960) proposed the two-process model in order to help explain the causation of phobias. This model explains that they are first acquired and learned through classical conditioning and then simply maintained through operant conditioning. Classical conditioning involves the association of a neutral stimulus with something that triggers fear (unconditioned stimulus producing an unconditioned

response). The association of these creates the conditioned stimulus, which gives a conditioned response, so we know the original neutral stimulus is associated with fear. An example of this is shown through feeding a dog. The food is the unconditioned stimulus, providing an unconditioned response of pleasure once eaten, and if a bell is introduced and rung before feeding (a neutral stimulus), eventually the noise of the bell will be linked to the response of eating the food which is positive, and so when the dog hears the bell it will expect food. This can then be generalised to similar objects, so the bell may be generalised to a similar loud noise, such as a doorbell.



Spider by Lucarelli CC BY-SA 3.0

Maintenance of this newly created phobia is achieved through operant conditioning. This works by reinforcing behaviours through reward or punishment as consequences of the situation, and so reinforcement increases the frequency of the behaviour. Positive reinforcement is when the behaviour results in rewards, and so the behaviour is

continued. However negative reinforcement is when the behaviour continues in order to avoid an unpleasant situation. An example of negative reinforcement in context is how people who have cynophobia may show avoidance to dogs due to the fear, and as a result of avoiding them, they do not experience the fear and anxiety of seeing one and so are avoiding the negative situation, meaning this avoidance is repeated and enforced. Both lead to desirable consequences, and so the behaviours are repeated.

Phobias vary from person to person and here are some of the most common ones worldwide:

- Arachnophobia: intense fear of spiders and other arachnids
- Ophidiophobia: intense fear of snakes
- Acrophobia: intense fear of heights
- Trypanophobia: intense fear of injections
- Mysophobia: intense fear of germs, dirt and other contaminants

The most common fear in the world is thought to be arachnophobia, which is believed to be because during childhood, many either experience the anxieties of a parent about spiders, or by having a traumatic experience with a spider (which is frequent due to their common nature). However not everyone has a phobia, and it is estimated that only 12.5% of the U.S population has or has had a phobia in their lifetime. Phobias are treatable with methods such as flooding and desensitisation, although these methods may not be 100% effective.

References

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MAX BAKER (GEOGRAPHY)

DEFORESTATION IN THE AMAZON

How does mass deforestation of tropical rainforests affect the water cycle?

The Amazon rainforest is home to 10% of all known living species on Earth and covers an area of more than 6 million km². However, this vast and dynamic ecosystem is under threat due to human activities like farming and logging, which can have extensive impacts on the water and carbon cycles. The water and carbon cycles are fundamental to Earth's life support systems and crucial to the survival of all living things on Earth. They are also economically and politically important to humans. Carbon regulates the Earth's temperature, comprises the food that sustains us, and is a major source of energy that fuels the global economy. Similarly, water also regulates weather patterns, moves nutrients and sediment around aquatic ecosystems, and is necessary for every household around the world.

Deforestation is therefore concerning when these cycles are disrupted. Recent Amazonian deforestation has caused episodes of flooding in the Porto Velho region of the Madeira River, the largest tributary of the Amazon River. In 2014, 60 people died from floods that were caused by deforestation. The removal of the trees impacts the ability of the soil to absorb water. During the process of deforestation, the top layer of the soil can become dislodged (known as soil erosion) which can decrease its ability to absorb and retain water. This, along with compaction of the soil from vehicles and machinery, can cause higher levels of surface runoff, thereby increasing the risk of flooding downslope. Deforestation

also increases the risk of flooding as trees have a significant role in absorbing water from the soil through the roots. This means that without trees, the water that would have been absorbed by the roots will then run off the surface of the newly dislodged soil.

Farming also leads to problems. A significant amount of deforested land in the Brazilian Amazon is used for cattle ranching, which has a notable impact on the amount of carbon emitted by the Amazon Rainforest. Cattle produce large amounts of methane, and since trees (which absorb methane and other greenhouse gases) are constantly being removed, the Amazon as a carbon sink is being quickly depleted. Farming also creates high demand for deforestation practices, providing incentives for more areas of the precious forest to be cut down. Much of this occurs through slash and burn techniques, where forest fires are intentionally started in order to create space for cattle ranching and soy bean farming. The forest fires caused by this technique emit huge amounts of carbon dioxide, and since the biomass of the area is rapidly depleting, there are not enough plants in the area to offset the carbon being produced, meaning more will escape into the atmosphere, exacerbating the effects of global warming.

The carbon and water cycles are intrinsically linked. As biomass is reduced, rates of transpiration and evaporation become lower and slower, which has serious repercussions on the rest of the system, such as reducing humidity, affecting cloud formation and precipitation. These problems are further exacerbated by the lack of vegetation on the forest floor, which would usually be able to intercept the falling precipitation, but are unable to, causing increased runoff.

Deforestation and farming therefore significantly affect the water and carbon cycles of the Amazon Rainforest, causing extreme episodes of flooding, greater soil erosion and increased runoff, and a transfer of carbon from the biosphere to the atmosphere. The need to deforest is only increasing through higher demand for agricultural space as a result of a growing global population and rising wealth. It's time to act.



GEORGE WAKEHAM (HISTORY)

THE NORTH ATLANTIC TREATY ORGANISATION

The origins and relevance of NATO

NATO (or the North Atlantic Treaty Organisation) was founded at the beginning of the Cold War era between the USA and the USSR, its main goal being to preserve peace in Europe and protect Europe from Russian aggression. As events continue to unfold in Ukraine, it is useful to examine the key factors surrounding the reasons for Russian aggression, and how the West can subsequently respond to such aggression without a major escalation taking place, as well as protect its own integrity on the international stage.

NATO was originally signed into effect on the 4th April 1949 in Washington, built off the prior Brussels Treaty for the Western Union, an agreement between France, the UK, and the Benelux countries. The treaty originally encompassed only 12 countries, from North America, Western Europe and Northern Europe, but has since come to cover the majority of Europe, with 30 countries now being members. NATO at its heart is a defensive organisation meant to safeguard its members from any form of aggression, mainly from Russia and the former USSR, alongside encouraging prosperity and trade between members. The treaty is governed by 14 articles with the main three articles being: Article 1 – Members will resolve issues among themselves diplomatically; Article 3 – Each member must spend 2% of their GDP on defence spending; and Article 5 – An attack on one is an attack on all.

The principles have helped to guide NATO policy to safeguard peace in Europe with every non-belligerent country being allowed to join if they so wish, and though restrictions apply to this matter, as a whole NATO has helped to stabilise Europe, though the organisation's presence alone can be seen to be an antagonising factor to nations such as Russia.

Today NATO is the largest defensive organisation in the world, though it can be seen to be internally weak as only 8 countries make the 2% of GDP defence budget requirements with some members, such as Iceland, lacking any form of standing army. Alongside this many of the countries are polarised on their commitment to Article 5, with some such as Germany only having 42% of their population willing to act if this protocol occurs. However, the Russian invasion of Ukraine has had the opposite effect to what the Kremlin intended with the need for a defensive treaty being more agreed upon than ever. Alongside this, other countries such as Sweden and Finland, who have currently remained neutral, are considering applications, despite Russian threats, in order to safeguard their own integrity and sovereignty. Those falling behind on their 2% promises are also stepping up investment, with Germany and France pledging an increase to begin to meet this quota in the face of the Russian-Ukraine invasion.

As of now, though the situation remains tense, it is vital to remember that through organisations like NATO, the West can stand up to aggression from authoritarian states.





Harry Mycock

ANDERSON MACCORMICK (LATIN)

THE VALUE OF LATIN

Why 'dead languages' matter

In a world seemingly driven by STEM-related jobs, the prospect of studying a 'dead' language might seem like a waste of time. However, there is good reason to give Latin a chance.

Studying Latin has been shown to improve cognitive development in young minds. A study conducted by Oxford researchers found that studying Latin in primary schools had a positive impact on literacy, but especially on English reading and writing proficiency. The same might be found for learning any language, but the nature of the Latin language also hones problem-solving skills. Learning Latin exercises your problem-solving abilities because of its unique grammar unlike most languages taught in this country. For example, the three Modern Foreign Languages most taught in UK schools (French, Spanish, and German) all adhere to a basic word order of 'Subject-Verb-Object' e.g., "Maria drinks water", as English does also.

However, Latin usually utilises a 'Subject-Object-Verb' word order e.g., "Maria aquam bibit" literally translating to "Maria water drinks". This simple Latin rule teaches students to treat Latin as more of a puzzle, reading the whole sentence and re-ordering the words to align with English grammar, rather than foreign words that are converted into their English equivalent. Latin also has noun cases (word endings for nouns that dictate their role in the sentence) and verb conjugations (verb endings that show the person, number and tense of the subject of an action).



The Pantheon by David Castor CC0

This might not seem linguistically ground-breaking, as there are systems that many languages share with Latin; however, once Latin grammar is considered at advanced levels, we begin to understand its problem-solving quality as it increases in difficulty. Latin nouns have 3 grammatical genders with 5 declensions (basically a 'category' for different words that give them a list of different endings), which provide different endings for 6 noun cases in both singular and plural forms, with many of these sharing similar or the same endings, and so you must remember or be able to identify how to interpret the word based on a combination of rules and contexts. And that's just nouns. But we have word order to help us determine in which case a noun is. Word order can be changed or even completely ignored in Latin poetry and literature because each noun has a specific ending that tells you exactly what it means, so there's no reason to get lost in all these rules.

Speaking of literature, it's about time we address another, perhaps more interesting, reason for studying Latin: literature. If you have a taste for

reading, especially epic tales of mighty heroes, formidable foes, decades-long journeys, gods and monsters, love and loss, fate and trickery, power and morality, Latin literature has the real classics that will keep you turning those pages. Writers such as Virgil and Ovid brought stories of both historical and international acclaim and recognition that truly founded what we know as the Western world's literature. And don't be mistaken in thinking that the Romans only wrote stories; Latin texts on the most profound and meticulous topics can be noted as the seed of the Humanities. History, philosophy, law, politics, and countless other academic fields have an era of progress and development that will enrich your knowledge of the world, life, and the human experience as we know it. With the Latin language, Roman society, culture, and consequently its everlasting legacy are at your fingertips. And I assure you, a whole other level of understanding and authenticity is accessed by taking in the text in its purest original form.

Latin's impression on the English language is as demonstrable as its wider global impact. Direct loanwords or loaned expressions from Latin are present in English's nuanced history of borrowing words from other languages. Expressions such as *verbatim*, *carpe diem*, *quid pro quo*, the infamous *et cetera*, are all borrowed from Latin. Latin terminological borrowings and namesakes are very common in legal or medical vocabulary (e.g. *in locum parentis*, *ad hoc*, *caveat emptor* etc.; *abdomen*, *dementia*, the majority of scientific names for animals etc.). Learning the intricacies behind these phrases will not only broaden your vocabulary but also provide a substantial understanding of sophisticated and intellectual areas of study without having to learn these labyrinthine fields of study. And yes, to shoehorn in the beloved cliché argument for learning Latin, knowing the language will also help you to manoeuvre these massive subjects without having to worry about memorising a lot of weird little words and a paragraph that details their definitions and nuances. Call it a little extra *pro bono* knowledge.

So, there are many reasons why Latin deserves a bit more popularity. It's quirky, fun, and actually even a little bit cool. Give it a go.



SAYANG DE STE CROIX (RE)

AN ETHICAL DILEMMA: EUTHANASIA

Murder or peaceful death?

In 2005, a British man called Tony Nicklinson had a stroke which caused locked-in syndrome (paralyzed except for the muscles in the eye, causing him to be conscious but unable to move or speak in his body). For many years, this caused him to want to end his own life, as his suffering was “dull, miserable, demeaning, undignified and intolerable” to live with. Tony repeatedly asked the UK High Court if it was lawful for a doctor to help him end his suffering with euthanasia; however, he was told not every time, which he said was incompatible with his human rights as he wanted to die with dignity. Ultimately, by refusing food and water, he was able to pass away with pneumonia, supported by his family.

Euthanasia is the deliberate ending of a patient’s life, to relieve suffering, such as an incurable disease or a permanent coma. As you are probably aware, this controversial practice is illegal in the UK, however, it is still legal in Switzerland, New Zealand, Canada and a few other countries around the world, so it is not a common medical practice. The questions are, what are the issues with euthanasia, and why is it considered murder in the UK?

Firstly, there are two forms of euthanasia: passive and active. Passive euthanasia is involuntary, which is without consent for the patient due

to them being on life support, which could be in form of withdrawing medication or disconnecting a feeding tube. It may be used in cases where the patient is not showing any signs of improvement after a long period, or the person/family has consented before their condition to the ending of their life. Active euthanasia is a more voluntary, consenting method to passing away, due to the person being in chronic, unbearable pain, so they have a doctor use a fatal dose of a drug to die peacefully, with the doctor also consenting to performing the operation as well.



Holding hands by Mercurywoodrose CC 4.0

Euthanasia can be considered good for the patient, as overall, it will prevent prolonged suffering. Suffering is arguably one of the worst things a human can experience, so it can be seen as an act of kindness to help a person who has no will to live to put a stop to suffering that has no foreseeable end besides death. Some may also consider it a

human right, like Tony, as it enables one to preserve the dignity of the person whilst also enabling them the liberty of a life with less suffering than dying a slow, painful death. In the UK, 84% support a change in law for assisted dying for the terminally ill, although with strict precautions to avoid unlawful death.

Therefore, why is euthanasia still not legal in the UK if it is the most freeing option? This controversial topic has religious views disagreeing due to it questioning the sanctity of life, especially for Christians (where a large percent of Britain is Christian). Sanctity of life is the idea that all life is sacred with intrinsic value (in itself), so allowing people to die as they please is either suicide or murder, if someone has helped them. Religious people may consider suffering as having an ultimate purpose in soul-making, where it will help God judge a person's soul depending how they react to their suffering.

This in turn will also devalue the life of those in suffering, as it can cause an internal debate for the patient if it is easily accessible, as it can be seen as giving up with living. Furthermore, there is a chance of euthanasia being abused, as there may be coercion by the family or friends of a patient to pressure them into dying without trying other options. Further complexities arise if the patient possibly has underlying mental health issues, as there have been previous cases of patients with anorexia or depression using it without getting help in the form of therapy.

Overall, euthanasia can be considered murder or peaceful death depending on your own opinions and beliefs, however it should not overshadow the true suffering many of us can't imagine that people go through every day. Personally, I think that euthanasia should be able to be accessed legally, but it needs to have strict precautions and for the patient to be able to fully consent after trying every other option available to improve their quality of life. This would for me be able to allow freedom and dignity in death, as well as ensuring the patient is doing the most moral action.



JOSHUA BROOKS (PE)

RUCKING IN RUGBY

Strength, skill, or tactic?

Rucking involves getting over the top of a tackled player who is lying on the ground with the ball in his hands, playing defensively or offensively. The best technique for a defensive ruck is to get your shoulder low to the ground and, depending on the position of the opposing player, place your feet shoulder width apart – one foot further forward ready for an opposing player to push against you in a move to counter ruck. In a counter ruck, when your team does not have the ball, the best technique is to get even lower than the defending player and drive them upwards to destabilise their position, throwing them off-balance. You can continue to drive them so that a teammate can come behind and take possession of the ball but, failing that, you should get balanced so you can use your feet to jackal the ball backwards out of the ruck so another teammate can pick up the ball.

If instead a teammate is in the ruck, you should bind onto their waist, putting your shoulder in and driving. However, you must be careful not to push them if they are already set as it can cause them to lose balance and place a hand on the floor, falling off their feet, giving the opposing team a foul.

Rucking is important to a rugby forward as their primary role is to take the ball into contact or to follow another teammate into contact and ruck over them, ensuring that the opposition cannot get over them first and win the ball. Alternatively, when their team does not have possession of the ball, they should be aiming to force the opposition to lose their man advantage. They can do this through committing more men to a ruck, preventing a counter ruck, and losing the ball or outright winning possession of the ball for their team.

Having strong levels of muscle mass in your legs helps to give you additional power, especially in the gastrocnemii and quadriceps. This extra power plays a vital role in rucking, helping drive opponents back or resist their drives when they are counter-rucking. This makes it more likely to keep or gain possession of the ball effectively.

It is easy to become over-zealous when going into a ruck: becoming too aggressive, losing balance, and give away a foul. On the contrary, if not aggressive enough, you're unable to drive back the opposition hard enough.

Paying attention to the smaller aspects of the game has wider benefits. Good teamwork relies on players trusting one another in a one-on-one or even a two-on-one situation. It also means that teams can aspire to having possession of the ball more often as the ball is won by driving through rucks and jackaling the ball, giving more opportunities to score. Furthermore, a team's confidence in one-on-one capabilities means that they can prevent any openings in defence should one fail to succeed in possessing the ball because they do not have to commit multiple players to have a chance of winning it. This prevents (5) overloads and shuts down any attempt by the opposition to score. It also means that the opposing team must commit more men to a ruck to retain possession of the ball, ensuring that they cannot play balls down the line because if they do, this will result in a two-on-one scenario in which one person could tackle them resulting in the second player grabbing the ball before the enemy player has any chance to ruck over it.

Rucking is one of the most important elements of the game, and to be good at rucking you need to be strong, skilful, and use it as a tactic.

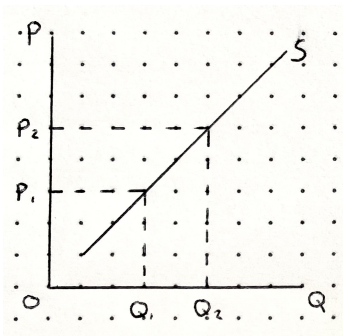


DAISY DARLEY (BUSINESS STUDIES)

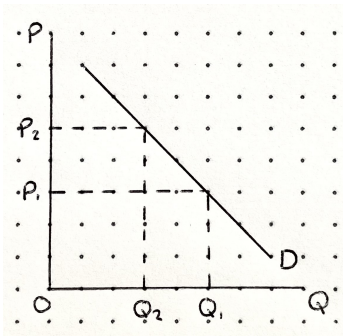
SUPPLY AND DEMAND

The effects of the COVID-19 pandemic

Supply is the amount of goods and services in the market that are available to buy. Demand is the amount of goods and services that consumers want to buy. Together, they form the economic law of supply and demand, which determines the price at which goods and services are sold.

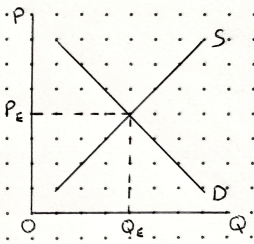


The law of supply states that as prices rise, companies view the possibility of more profit potential, therefore increasing their supply of goods and services (as long as the revenue generated by each additional unit produced is greater than the additional cost to produce it). Due to this, there is a positive relationship between pricing and supply, which is shown by the diagram left.



On the other hand, the law of demand states that as prices rise, consumers buy less therefore demand drops. The diagram left demonstrates this negative relationship between pricing and demand.

When put together, the supply and demand curves intersect at the point which determines the equilibrium price (where



P&Q meet). At this price point, supply is completely equal to demand meaning there is no excess supply or excess demand (shown left). This point is called the market clearing price as sellers have sold all they want to sell, and buyers have bought everything they want to buy. Everyone in the market is satisfied.

To stay competitive, businesses need to accurately determine how much of a product to manufacture and at what price to sell. Too much stock (referred to as a product surplus) at a high price can result in a business acquiring a large amount of deadstock that will significantly increase their costs. Alternatively, too little stock (referred to as a product shortage) at low prices can drive away customers due to long waiting times while waiting for backorders or customers associating low price with low quality.

Supply and demand fluctuate, meaning the equilibrium (market clearing) price varies over time. This can be due to a variety of external factors and changes in the economic climate, and in the past few years, this was especially the case with the COVID-19 pandemic.

The COVID-19 pandemic had a huge influence on all businesses and economies across the world. Problems with sourcing raw materials and supply chain disruptions due to lockdowns and worker shortages reduced the supply of goods and services available to purchase. Once this news made the headlines, demand rose exponentially. According to psychologist Robert Cialdini (1984), "a product becomes more attractive when their perceived availability is limited". This creates a psychological need for the product in the mind of consumers which is what led to 'panic buying', meaning the lack of supply was unable to keep up with rapidly rising demand. This links with the concept of herd behaviour. Some people started buying more than what they normally would, so items sold out faster than normal and were replenished slower than usual. This meant that others felt the need to do the same out of fear of products going out of stock before they could buy them. Clearly, this made the situation worse and turned into a vicious cycle where consumers were constantly left unsatisfied with the lack of goods

available. This was not rectifiable, especially when the supply chain disruptions meant that companies could not produce more to keep up with demand.

Although the price of raw materials began to rise and some businesses were shut down due to the lockdown measures, other businesses profited greatly. An example of this is the hand sanitiser and toilet paper industries. While supply was little, demand was high, so this gave certain businesses the ability to exploit this newfound inelasticity (demand was highly unresponsive to changes in price) and charge higher prices for these goods. In turn, this benefitted businesses by increasing their profit margins (assuming costs were not also increased), whilst consumers were negatively affected by being forced to pay higher prices.

Regardless of the government intervention put in place in an attempt to maintain the normal price of commodities, the scarcity of the goods resulted in an increase in price. The equilibrium price for most goods has increased as a result and has led to cost push inflation (overall price increases due to increases in the cost of wages and raw materials). This has arguably contributed to the UK's cost of living crisis, where the price of essential goods is rising faster than income, causing a spiral of poverty. There is not telling when this situation might ease.

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ALEXANDER SIMPSON (CHEMISTRY)

CHEMICAL WARFARE

The effects of chemical weapons agents



Canadian soldier with mustard gas burns, Library and Archives Canada, C-080027

There is renewed concern about the use of chemical weapons. With the war in Ukraine continuing apace and Russia's track record of the use of chemical weapons (the Second Russo-Chechen war, 1999-2009, and Russian involvement in the Syrian Civil war, 2015) may well be grounds

for predicting an escalation into chemical warfare. This article explores the four main types of Chemical Weapons Agent (CWA).

Blood Agents

Examples include cyanogen chloride, hydrogen cyanide and arsine and are chemicals designed to be inhaled. Their toxicity derives from the fact that they are non-competitive inhibitors to proteins involved in oxygen transport in the blood and respiration inside body cells. In the case of cyanide molecules, they form a stable complex with the enzyme involved in cellular respiration, cytochrome oxidase. As a result, the process that synthesises Adenosine Triphosphate (ATP) as the energy currency used throughout the body, is inhibited, and thus cannot be carried out at the enzyme's typical V_{max} . Thus, organisms that are exposed to such chemicals asphyxiate, and cannot carry out active processes, such as inhalation, causing them to suffocate and die. Typical treatment for blood agent exposure includes blood transfusion and haemodialysis (artificial filtering of blood). Both of which are not available in a battlefield setting, hence the effectiveness of these during wartime.

Choking/Pulmonary Agents

Examples include phosgene, chlorine, chloropicrin, and diphosgene and are chemicals designed to be inhaled. Their toxicity derives from their disruption to normal breathing. They can function in liquid, gaseous, or aerosolised states. As a gas, choking agents work by irritating the respiratory systems, including mucous membranes involved in protection against dust and microorganisms. Inhalation of these gases induces swelling in the lungs, nasal passages, and throat. This inflammation can itself cause suffocation and death.

Notably used during the First World War, chlorine is a poisonous, green gas at room temperature. A diatomic molecule of chlorine is relatively insoluble in water, but once breathed in, water vapour in the lungs oxidises the gas to produce hypochlorous acid (HClO). This chemical is then able to infiltrate cells, reacting with proteins and degrading intracellular structures. This causes mass pulmonary cell death, and gas exchange can no longer occur into the blood stream, in turn causing death. There are no known antidotes for choking agents, therefore they

are also highly fatal in any circumstance. Typical treatment is only for reducing the effects of the toxin, and to prolong life.

Blister Agents/ Vesicants

Examples include nitrogen mustard, sulphur mustard and lewisite, and are chemicals that enter the body primarily by inhalation or skin contact. Blister agents are called such since symptoms include burns and blisters on the skin, mucous membranes, and eyes (known as chemosis). Exposure in gaseous form causes first and second degree chemical burns, which, in the case of inhalation, may compromise the internal respiratory membranes' abilities to exchange gases or protect against particulates entering the lungs. Exposure in liquid form causes second and third degree chemical burns, but only to skin and eyes. In extreme cases of ocular burns, the victim's eyes may suffer irreversible damage, resulting in a loss of vision.

Sulphur mustard is an alkylating agent, commonly inducing changes in the DNA or RNA of cells. When reacting with biological molecules such as proteins and DNA, the intermediate in the reaction has 2 chemically active regions, which can cause cross-linking between strands and eventual necrosis. If pulmonary tissue is amongst those affected, the victim's lungs then die, suffocating them. The antidote for lewisite is British Anti-Lewisite, also called dimercaprol, and is administered by an injection. It does not counteract symptoms but does eliminate the threat from the toxin. Mustard compounds do not have antidotes. Typical treatment for mustard compound exposure is symptom-specific and does not act to reverse the toxin itself.

Nerve Agents

Examples include sarin, tabun, soman and Venomous Agent X (VX) and are chemicals that affect the nervous system. Most notably, the interaction at neural synapses and junctions by which electrical information is transferred to another cell via a chemical messenger called a neurotransmitter. Nerve agents used in chemical warfare are all artificial and are presented in gaseous or liquid form.

Most nerve agents impede typical functioning or degradation of chemicals such as acetylcholine. As a result, nerve cells either do not transmit the signal, transmit at wrong times and intensities, or transmit repeatedly, causing overstimulation of muscular tissue. Their toxicity derives from their non-competitive inhibition of acetylcholinesterase (AChE) at the neuromuscular junction. AChE is responsible for the breakdown of acetylcholine (ACh), a neurotransmitter used in motor signalling. If it is inhibited, then the ACh accumulates in the junction, and the muscle cell will never stop contracting. This is lethal since muscles used to inhale must relax to exhale. Without the ability to expel carbon dioxide, the organism will die of carbon dioxide poisoning (when oxygen that would otherwise bind to haemoglobin is displaced by the excess carbon dioxide). Typical treatment for nerve agents is comprised of two antidotes taken together. Pralidoxime chloride acts to separate the nerve agent from the AChE and restores its full capabilities. Atropine has anticholinergic properties and reduces the overabundance of ACh.

It is understandable that many endeavours have been made to abolish the use of such deadly weapons in warfare. Despite this, countries like Germany and the UK in WW1, Japan in WW2 and more recently, Russia, Iran, and the USA, have still decided to violate conventions put in place to do so. With the development of the world's technology, it is becoming increasingly more important that people are educated in the prior use and effects of chemical warfare to prevent future usage.



TOBY WALTERS (MUSIC)

MOTOWN

The development and impact of the infamous soul record label

Motown Record Label is an African-American music record label, founded by Berry Gordy Jr in 1959, in Detroit, Michigan, USA. Its name was derived from Detroit being coined 'Motor City' at the time, due to its thriving car manufacturing industry. Its success is credited to the number of hits it gained and gave its name to the hugely popular style of soul music that it created. It became one of the most successful black-owned businesses and one of the most influential independent record labels in American history.

Berry Gordy was one of thousands of African Americans who was part of the massive migration from the South, during and after World War 1. He later went on to have a significant influence on the development of the music industry in America, bringing in new styles and unique hits that proved popular not only among Americans, but also overseas in the UK, especially during the 1960s when the Beatles were popular.

Motown Records was based on Soul music, originating in the African-American communities in the USA. Soul was influenced by many African-American styles of music like Jazz, Rhythm and Blues, and Gospel, using similar musical and stylistic features. It largely focused on vocalists, integrated religious themes, and was designed to achieve commercial success. It is characterised by the use of catchy vocal hooks, improvisation in tightly controlled solos, blue notes, and pentatonic scales along with an upbeat which provided a jazzier feel, and a fast, danceable tempo with a 3-minute simple structure.

This structure was popular because its producers and engineers firmly believed in KISS (Keep It Simple, Stupid), so generally avoided complex arrangements. This is important as Motown included unique features on top of the soul style, characterised by melodic bass lines, a backbeat emphasis (emphasis on beat 2 and 4 of the bar), and a call and response singing style. Much like soul music, it used horn section riffs (with trumpets, saxophones, and trombones) that were tightly rehearsed, along with string sections to augment and develop the sound of the ensembles of instruments.



The Temptations in 1968

Motown came around in the 1960s, and was a big contributor to soul music, in addition to its lighter, more pop-oriented style. It played a crucial role in the racial integration of pop music and became more influenced by rock 'n' roll and blues which were popular during this decade. At the time, the Motown label followed the idea of a 'hit factory'

approach, where studios were running most hours of most days, and the founder Berry Gordy had a strict handle on quality control, ensuring only the best songs were released. This ensured that Motown records were always top of the charts. Therefore, these songs and Motown artists became known worldwide due to their significant success across the whole record-buying public, and have inspired so much of pop and soul music to this day.

Some of the most noticeable artists and groups include Martha and the Vandellas, Smokey Robinson and the Miracles, The Temptations, The Four Tops, Diana Ross and the Supremes, Gladys Knight and the Pips, The Jackson 5, Stevie Wonder and Marvin Gaye, who still have a significant influence today. The Miracles produced, wrote, and sang several of Motown's most memorable hits – including the label's first smash song, "Shop Around" in 1960. A year later, "Please Mr. Postman," by The Marvelettes, was the label's first No. 1 hit, but it would not be the last.

Motown music would not be forgotten and went on to influence other music labels like Stax, which was based in Memphis and produced soul music with a grittier sound. This quickly became known as 'Memphis Soul' and featured ethnically integrated bands and staff, which was unprecedented during the time of racial tension in Memphis. Another style was Philadelphia Soul, which came about in the 1970s, with direct influence from Motown. It included extravagant arrangements, focusing on the horns and strings, with more expressive vocal lines. It had a smoother and more refined style, which formed a key influence on the early origins of Disco in the 1970s and showed the success of ethnic minorities at the time, leading to the integration of these communities and helping to address the racial tensions that were apparent in the USA during this time.





Harry Nuttall

SILVIA RICHARDS (MFL)

LEARNING A LANGUAGE

Why are modern foreign languages so difficult to learn?

We all know that learning another language is difficult. Essentially, languages are just popularised versions of gibberish, all made up, yet they have strict rules to follow to make them comprehensible, and with individual dialects within languages, it just gets even more difficult. There are so many languages and dialects that we cannot even coin an exact number for how many exist. It is estimated that there are between four and five thousand different languages spread across the globe, spoken by 7.9 billion people. A single country can have various languages representing it; for example, Papua New Guinea, which has the most languages in the world, is host to over eight hundred languages.

So, what actually makes learning foreign languages so difficult? Even a person with the best active recall and memory can struggle with learning all the rules and orders associated with a certain language. If you use the wrong word order, the meaning of the entire sentence is changed; spell something wrong, the meaning of the word is changed; even something as small as an accent can change meanings. What is the point in learning a language if you cannot accurately convey the message you are trying to put across? The idea of simply learning the rules, spellings, word endings and accents may help, but it will not give you perfectly accurate speaking, because they need to be applied in practice.

This then leads to the next dilemma of learning a new language: intonation and accent. The way you speak the language and pronounce the words can also wildly affect your own and other peoples understanding of the language. English is a good example. Across the UK there are different dialects, accents, and pronunciations common to specific areas, the most generalised and popular being the Queen's English. We notice these differences and acknowledge that other variations of English can sometimes be difficult to understand, because it is not what we are used to as creatures of habit. In language learning, this then raises the question: which version of the language should I learn? This added complication once again prolongs the journey of learning a new language.

Learning a second language will always be difficult because for your entire life you have spoken a single language and never deviated. You have become proficient at the language, almost mastered it (not fully, but it is natural to you); you don't consciously think about rules or pronunciation because you have had them subconsciously memorised since you were a child. To then add a whole new set of rules, pronunciations and spellings into your memory is demanding. Achieving fluency in any language is extremely difficult. But this doesn't mean that you shouldn't try. Learning another language is rewarding, emancipatory, joyous.



MATTHEW SOUTHWELL (ART)

MINIMALISM

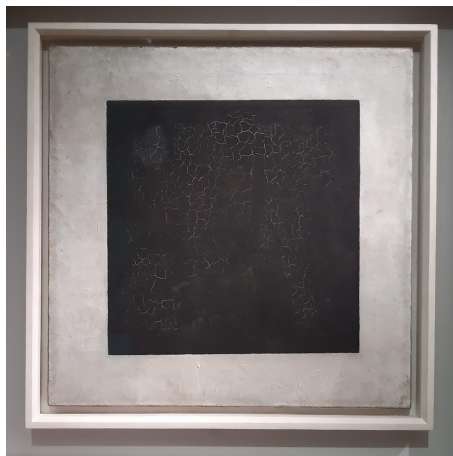
To what extent is minimalism a form of art?

Minimalism is an art movement that emerged in the 1960s and is characterised by a focus on simplicity and the use of minimal elements in the creation of artworks. Minimalist artists often use geometric shapes, monochromatic colours, and repetition to create their pieces. While some people may argue that minimalism is not art because it lacks the complexity and emotion of other art forms, others believe that minimalism can be just as powerful and meaningful as other art movements. Minimalism is often associated with the idea of "less is more." By stripping away unnecessary elements, minimalist artists are able to create works that are pure and focused. This simplicity can be incredibly powerful as it allows the viewer to focus on the essential elements of the artwork. Minimalist works can be incredibly beautiful, with their clean lines and simple shapes creating a sense of harmony and balance. Some of the most famous minimalist artists include Donald Judd, Dan Flavin, Carl Andre, Sol LeWitt, Agnes Martin, and Robert Morris. These artists were known for their use of simplicity and geometry in their artworks, staying true to the minimalist criteria. They helped to define the minimalist movement in the 1960s and 1970s and continue to be influential today.

One of the most famous minimalist art pieces is "Untitled" by Donald Judd. This work is a series of identical, industrial-looking, galvanised metal boxes arranged in a grid pattern up a wall. The boxes are made of brushed aluminium and have a simple, geometric shape. While the individual boxes are identical, the way they are arranged creates a sense of movement and variation with the way the colours glow against the wall, yet it all seems so serene and still. "Untitled" is a classic example of minimalist art, as it uses simple shapes and repetition to create a work

that is both beautiful and thought-provoking; even the piece's name is minimalist as it is simply called 'Untitled', suggesting that the work does not connote any deeper meaning and is purely there as a simple spectacle.

The way minimalistic art has evolved over the years has been simultaneously subtle yet clear, maintaining its simplistic nature throughout the decades, and being applied to a wider range of media such as digital software, sculptures, and collages rather than them all being painted. An older minimalist art piece is "Black Square" by Kazimir Malevich, created in 1915. This work is a simple black square painted on a white canvas. It is considered one of the first examples of geometric abstraction, and it was a radical departure from the representational art of the time. "Black Square" is a classic example of minimalism, as it uses a single shape and colour to create a work that is



"Black Square" (Kazimir Malevich) by shakko01 CC BY-SA 4.0



"Untitled" (Donald Judd) by Rob Corder CC BY-NC 2.0

both simple and powerful. The piece itself takes a new approach to suprematism, a movement that focuses on the supremacy of colour and shape in painting rather than representing a landscape or a person, and I feel like this makes the piece visually appealing as it is an relentless expanse of the darkest colour that evokes the purity of darkness in the nothingness of the white that surrounds it.

A more recent minimalist art piece is "Untitled (Stack)" by Felix

Gonzalez-Torres, which was created in 1991. This work is a pile of individually wrapped sweets that viewers are invited to take and eat. The sweets are arranged in a simple, geometric shape, and the pile is replenished each day. "Untitled (Stack)" is a minimalist work that is both interactive and playful. It challenges traditional notions of art by inviting the viewer to participate in the creation and destruction of the work, but it does beg the question of whether wrappers in a pile can be considered art. Considering both sides of the debate, those who do not see it as art are definitely entitled to that opinion as the simple act of collecting wrappers and piling them up in the corner of an art exhibition can be done by anyone, and not just a skilled artist. On the contrary, this work could be seen as art since it could reflect a deeper meaning. The real purpose of this piece is to symbolise the late partner of the artist who tragically died of AIDS in an era where it was deemed incurable, and the total mass of the wrappers equates to 175 pounds (his partner's weight at the time of his death), so while it is a very simple yet questionable piece of art, it was executed in this way to convey a deeper meaning, and this is typical of minimalist artists. By reducing an artwork to its most basic elements, minimalist artists are able to explore fundamental concepts such as space, time, and form. Minimalist works can be incredibly thought-provoking, as they challenge the viewer to consider the relationship between the artwork and the space around it.

In conclusion, I believe that minimalism can be considered art. While some people may argue that minimalism lacks the complexity and emotion of other art forms, I believe that minimalist works can be just as powerful and meaningful as any other art movement. By focusing on simplicity and the use of minimal elements, minimalist artists are able to create works that are pure, focused, and thought-provoking. Of course, not all minimalist works are created equal. Some minimalist pieces can seem cold and sterile, lacking the emotional depth of other art forms. However, I believe that this is not a flaw of minimalism itself, but rather a limitation of the artist. A skilled minimalist artist can create works that are just as emotional and expressive as any other art form.



ALFIE THOMAS (PE)

DISCRIMINATION IN SPORT

Impacts and responses in cricket

In 2020, Azeem Rafiq revealed that he had been subject to racism whilst playing for the Yorkshire county team. Rafiq also stated that the abuse nearly led to him taking his own life. This resulted in a long inquiry by the Yorkshire cricket club, concluding in 2021 with no action taken against the accused. The English Cricket Board (ECB) did not intervene, for which they received heavy backlash from social media.

Historically, cricket has long been seen as one of the more exclusive sports. In its early days during the 17th and 18th centuries, there were two main distinctions: the gentlemen and the players. The gentlemen were upper class and played as amateurs; they could afford to play for no wages. The players were typically working-class men who earned money as they could not afford to miss any work. The gentlemen looked down on the players and at Lords - the "home of cricket" - there were two separate entrances for them to enter based on their socio-economic status. It was not until 1962 where the distinction was abolished. The sport also spread all over the British Empire and quickly became popular among non-white people. However, as cricket grew more popular so did the English sense of ownership over the game. Cricket became a symbol of "Englishness", which became quite negative in a sense as people started to believe that cricket is an English game for English people only. The British empire is long gone; however, it could be argued that the colonial mindset remains.

This is quite evident when major cricket magazine Wisden published an article in 1995 titled "Is it in the blood?" when questioning the commitment of black English players. Also, in 2004 the Marylebone Cricket Club (MCC), one of the oldest and most influential clubs in the game published a poetry anthology where one of the poems had verses stating "Cricket is an English game/It is not suited to hot blooded races/ although we export it to other places." When such large and reputable institutions/individuals get away with these statements with minimal repercussions then the culture of the sport must be questioned. The impacts of discrimination are pernicious, and participation is reduced amongst minority groups, leading to a widening divide between communities.

So, what is being done to combat discrimination? In 2022, the ECB ordered a full review into the dressing room culture in all men's and women's professional teams. They have also launched talent support programmes for cricketers that come from underprivileged backgrounds. Also, every senior executive in the ECB will have personal Equality, Diversity, and Inclusion targets as part of their annual performance targets. The ECB is also working with the "Kick It Out" organisation, which is the leading anti-discrimination organisation in football. This is to identify areas where they can offer expertise into developing plans to include a more inclusive cricketing environment.

Overall, it is evident that discrimination has been a reoccurring problem within cricket and has been an obstacle that many player has had to deal with in order to play the game they love. However, steps are being taken to try and eliminate discrimination, led by major organisations such as the ECB. This helps to spread awareness of the problem and educate people on how to recognise if discrimination is taking place and the actions they can take in response.



EMILY HEMSWORTH (GERMAN)

THE REPRESSION OF ART AND CULTURE IN NAZI GERMANY

Propaganda and totalitarianism

The 1920's was perhaps Germany's zenith of culture and creativity. The Weimar Republic had just begun and in order to distract from the tragedy that had just occurred in the form of World War One, the German government did what they could to promote cultural freedom and diversity. Bertolt Brecht, a native Bavarian, was known for his political works of art, and artists such as Otto Dix depicted the graphic and tragic horrors of WW1 in his paintings. Other notable German culture of the period included the establishment of the Bauhaus (founded by Walter Gropius), a German art school that encouraged its students to combine crafts and fine arts in their work. Furthermore, the Berliner Ensemble, established by Bertolt Brecht and his wife Helene Weigel, produced (somewhat controversial) political plays. There was much cultural diversity within the country at the time, with topics of all kinds being covered through different art forms. In the Weimar period, Germany, especially Berlin, thrived under the influence of these great artists, actors, writers and architects.

However, in 1933, Hitler became chancellor of Germany as the Nazi Party had successfully risen to power (Machtergreifung). He was now

the supreme dictator of Germany, a position gained through the terrorism of voters and the influence of the SS propaganda. Under Hitler's power, Germany was transformed from a country known for its astounding art and culture into a country of repression and extreme turmoil. In 1934, after the death of President Hindenburg, Hitler became supreme leader of Germany (Führer). Shortly after this, he began to make drastic changes to the art scene that had previously been renowned worldwide. Germany was completely transformed.

Following Hitler's machtergrieffung, the art and culture scene changed drastically. Joseph Goebbels, the minister for propaganda for the Nazi Party, introduced the Reich chamber of culture, established on 22 September 1933, where any German artist, writer, actor or director was forced to consult with Nazi officials before publishing any work, in order to achieve the standardisation of all institutions (gleichschaltung). The primary aim of this regime was to eliminate any culture seen by the Nazi Party to be "degenerate". In other words, anything seen as non-German (Undeutsch) was either destroyed or sold abroad for large sums of money. They wanted all political and social work to be in line with Nazi ideology. They even escalated as far as to raid the homes of artists so that they would not secretly hide any degenerate art in their houses. More than 16,000 works of art were prohibited under this strict regime. Many which were not sold were burned.

In June 1939, the Nazis arranged for an auction to take place in Switzerland so that they could sell all the banned artwork (Entartete Kunst). Jewish artists in particular were strictly banned in order to "purify" the art of the Nazi period. Work from Vincent Van Gogh, Pablo Picasso and Henri Matisse were sold for large amounts of money, which were said to have funded German museums, and they promised that it would not be used to wage war. They even installed an exhibition of the banned artwork, featuring artists such as Wassily Kandinsky and Paul Klee (two of the most prominent artists of the golden era of Germany) in a bid to showcase the type of art that was not accepted. This art was demonised and criticised heavily by the Nazis.

The Reich chamber of culture was divided into seven different sectors. There was the Reichsfilmkammer, managed by Carl Froelich, which

ensured that all films shown in cinemas were propaganda films. They were sometimes satirical, sometimes serious, but always portrayed the Nazi Party in a good light. The Reichsmusikkammer, headed by Richard Strauss, banned music influenced by American styles such as jazz and blues; banned English lyrics; and above all, Jewish composers were strictly banned from creating music. The Reichstheaterkammer prohibited all previous theatre styles, including work from Bertolt Brecht, as they were seen to be too controversial. The Reichskammer der bildenden künste simply reinforced the idea that degenerate art was not allowed and only German styles were appreciated. The Reichschrifttumskammer controlled all literature and only allowed accepted writers to write about the glorification of war, Hitler, the Aryan race, and so on. The Reichspressekammer was the global newspaper, and these were tightly controlled as many members of the public read them, so it was important for the Nazis to only publish what they wanted people to know. In this way, it became very easy to suppress the truth and manipulate the public into believing that what they were doing was morally justified. The Reichrundfunkkammer, the radio stations, also focused on promoting Nazi propaganda and glorifying Hitler, by telling people that they were indebted to him for giving them radio. All seven of the Reich chambers of culture were beneficial to the Third Reich and its domination.

Historian George Mosse described the Nazi regimes as attempting to create a “total culture”, where everything revolved around shared ideologies pushed onto the German public. Hitler’s leadership style combined both public fear and domination, along with manipulation and winning over his people through propaganda. His initial success in World War Two happened because he manipulated the German population into believing his party were enforcing beneficial changes for Germany when, in fact, Hitler was actually plotting what turned out to be one of the biggest worldwide tragedies ever recorded in history.

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MARTIN STUART (ENGINEERING)

NANOSCALE 3D PRINTING

Benefits, limitations, and applications

Nanoscale printing is a revolutionary technique that has become increasingly popular in recent years due to its ability to create highly detailed and complex structures at the nanoscale level. This technology is important because it enables the creation of structures that were previously impossible to fabricate using traditional manufacturing methods. This article provides an overview of nanoscale printing, including its benefits, limitations, and applications.

One of the most significant benefits is the ability to create highly complex structures with sub-micron precision. This is achieved by using a combination of high-resolution imaging techniques, computer-aided design (CAD) software, and advanced printing techniques such as electron-beam lithography and focused-ion beam (FIB) milling. These techniques allow for the creation of structures with feature sizes as small as a few nanometres.

Another advantage of nanoscale printing is its versatility. Unlike traditional manufacturing methods that are limited to specific materials and geometries, nanoscale printing can create structures from a wide range of materials, including metals, ceramics, polymers, and composites. This versatility makes it ideal for a variety of applications, from electronics and photonics to biomedicine and energy storage.

Despite its many benefits, nanoscale printing also has several limitations that must be addressed. One of the main challenges is the cost and

complexity of required equipment. Nanoscale printers are expensive and require lots of training to operate, making them inaccessible to many researchers and companies. Another limitation is the slow and low throughput of the technology. Nanoscale printing can take hours or even days to create a single structure, depending on its complexity and size. This slow printing speed makes it unsuitable for large scale production, which limits its potential commercial applications.

Despite its limitations, nanoscale 3D printing has a wide range of potential applications in various fields. In electronics, nanoscale 3D printing can be used to fabricate complex structures such as interconnects, transistors, and sensors with high precision. In photonics, nanoscale 3D printing can be used to create advanced optical components such as waveguides, micro-lenses, and photonic crystals. These structures have potential applications in telecommunications, data storage, and imaging.

In biomedicine, nanoscale 3D printing has the potential to revolutionise the field of tissue engineering. Researchers are using this technology to create scaffolds for cell growth and to fabricate complex tissue structures. In energy storage, nanoscale 3D printing can be used to fabricate electrodes and other components for batteries and supercapacitors.

Nanoscale 3D printing is a powerful technology with a wide range of potential applications. Its ability to create complex structures with sub-micron precision has made it an essential tool for researchers and engineers in various fields. Despite its limitations, advancements in this technology are likely to expand its future applications. As such nanoscale printing is poised to play a critical role in advancing various fields and transforming industries.



The King of the Jungle

Tawny fur cut with midnight stripes,

Insensitive,

Fearful fire blazing through its eyes,

Ever longing the taste of metallic blood,

Running rampant through the moon-lit night.

Beon Maliecka

EMILY HEMSWORTH (SOCIOLOGY)

WOMEN IN THE MEDIA

Gender roles and subjectification

The media is everywhere. TV, newspapers, books, and social media have become ubiquitous in our daily lives, and in the 21st Century is more influential than ever before. It reinforces societal norms and values and is an agent of socialisation. For decades, women have been misrepresented and / or underrepresented in the media, and subsequently stereotypical gender roles are perpetually reinforced. Although many of the stereotypes associated with gender have decreased dramatically in recent years, major differences between men's and women's gender roles still exist.

My first argument in this essay is that women are still primarily shown to be passive and obedient, and this behaviour is specifically encouraged through TV shows and films. Many feminists argue that women are represented with the characteristics that men want them to have, as society is patriarchal and structured to benefit men. The term 'male gaze' was coined by scholar and filmmaker Laura Mulvey (1975) and refers to the idea that women are portrayed in the media in a way that pleases men (usually including sexual objectification). She found that only 31% of film directors in the UK were female, meaning that female characters are primarily constructed by men. Feminists argue that this limits women to being objects for men's desires and takes away their sense of identity and individuality. Another clear indicator of women's lack of representation in the media is the Bechdel Test. This is a test created by Alison Bechdel in 1985 created a test to see if a film has two named women talking to each other about something other than a man.

If so, it then passes the test. This may seem like a basic standard for films, but according to The Bechdel Test website, only 40% of films pass this test. This statistic further supports the idea that women serve as props for men, and that their lives focus solely on men. In terms of casting and opportunities, men have a 75% chance of getting leading roles in TV shows and films, whereas women have only a 25% chance. Moreover, women are 80% less likely to get speaking parts in movies than men, as they are often cast as background characters such as maids, waitresses etc. who fulfil the jobs women are 'expected' to do.

Not only are women sexually objectified in the media, but gender roles are reinforced at a young age through media aimed at children. For example, Disney movies regularly feature females acting as damsels in distress, who need to be 'saved' by male heroes. The storylines of Snow White, Cinderella and Sleeping Beauty all revolve around women living poor lives, then eventually marrying a handsome man. Whilst these movies are entertaining to watch, the morals learned from them can be exemplary to young children as they internalise these gender roles. They socialise young girls into doing domestic jobs and then settling down with a husband as a final goal in life, whilst young boys are taught to be chivalrous and brave and work for their wives.

There are, of course, many Disney films that show women to be strong and independent, such as Brave, Mulan and Pocahontas. Another notable example of a female lead who defies stereotypical gender norms is Katniss Everdeen, the lead character in The Hunger Games. She is portrayed as strong, fearless and determined, characteristics that would usually be given to a man. There has also been an increase in male leads represented in more feminine ways, such as Call Me By Your Name, a film that shows a homosexual couple and feminine traits among men.

Whilst gender norms in the media are progressing, the fact remains that the majority of children's TV reinforces stereotypical gender roles. Childhood is the most impressionable age, and children take these values into their adult life and pass them down through the next generations. Gender socialisation makes it difficult to deviate from

gender roles and allow children to behave however they want, without societal disapproval.

Social media is, undoubtedly, the platform that puts the most pressure on women. With over 57 million social media users in the UK, it has become extremely prevalent in British society, and it can be difficult to avoid its influence. As we live in the postmodern age, life is fluid, fragmented and ever changing. Social media adapts and people can communicate so quickly that we are now living in a world where people can't live without it. The issue with this is that everyone is now impacted by what happens online, and many people feel pressured to conform to social standards. Women are greatly affected by this due to the unrealistic beauty standards most feel they must live up to. Studies have shown that 88% of women compare their bodies to those they see online, and it can lead to negative mental health effects. Due to advancing technology, photos and videos can be easily edited, and prolific celebrities such as the Kardashian family edit their posts and create standards with their seemingly "perfect" bodies. Even before social media, the issue of female models and women's body image have been correlated for decades due to unrealistic portrayal of women in magazines and advertisements. Women feel forced to try and replicate the perfect body and appearance, which is extremely difficult when beauty standards are constantly changing.

In conclusion, although there is a progressive level of change occurring within the media regarding the perception of women, there is still a long way to go before it can be said that men and women are represented equally. It could take decades, or even centuries for this level of change to be realised.

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JAMES WILSON (PHYSICS)

THE UNIVERSE

Its creation and its destruction

The Universe is unfathomably enormous, reaching about 93 billion light-years in diameter, which is the equivalent of 5.879×10^{12} miles. It should be noted that this is also only the estimated diameter of the known observable universe. It could be even larger. With such an enormous size, it may confuse some as to how the Universe came into existence as it is today. This article addresses this question and ponders the end of the Universe.

The Big Bang Theory

The theory most accepted about the creation and expansion of the Universe is known as the Big Bang. This states that in the beginning, there was nothing but an incredibly dense and hot mass. Suddenly, (about 13.8 billion years ago) this 'singularity' exploded, leading to a state of rapid expansion and cooling. This continued to expand and still does to this day. However, this is not the only theory which has been accepted for the creation of the Universe.

Other Theories and Evidence for The Big Bang Theory

The main alternative to the Big Bang theory is the Steady State theory. This was first proposed in 1948 and suggests that the Universe has always existed, but is still expanding as new matter is created. The theories are both supported by evidence, some the same, although some evidence only supports the Big Bang. One example is red shift. Red light has the highest wavelength of the visible light spectrum, so when light wavelengths are increased, it is described as 'red shift.' The phenomenon, in this context, means that the further away a planet is, the more red-shifted the light is, as the wavelength of their light increases. This means that the further away the galaxies are, the faster

they are travelling. Just like in an explosion, the parts moving the fastest are the furthest from the centre of the explosion. This supports the idea that the Universe is expanding, providing evidence for both theories. However, the main piece of evidence which gives the Big Bang theory more weight than the Steady State theory is the presence of Cosmic Microwave Background Radiation (CMBR). It was discovered in 1965 by Robert W. Wilson and Arno A. Penzias in New Jersey, for which they received a Nobel Prize in Physics in 1978. This is radiation which began as gamma waves, but as the Universe expanded, the wavelengths were stretched out, causing the radiation to become microwave radiation. It has been detected coming from all directions in space and has a temperature of -270°C . This is highly likely to be the remains of the thermal energy caused by the Big Bang, spread thinly across the Universe. Steady State theory has no way of explaining CMBR, but it provides a lot of evidence for the Big Bang theory, meaning the latter is the scientifically accepted theory for the creation of the Universe.

The End of the World as We Know It

It is highly unlikely that anyone will see the end of the Universe. In fact, no living organism will be around to witness it. Probably. Whilst we cannot know exactly what will happen in the future, we can hypothesise and calculate the most likely event, and I am afraid it is not exactly a 'happy ending.' Much like the creation of the Universe, its ending has two possible outcomes: the Big Crunch and the Big Freeze, the latter being the more viable of the two hypotheses. It all comes down to which force is greater: gravity or the force created by the Big Bang. If gravity overcomes the force of the Big Bang, the Big Crunch will start. If the opposite happens, the Big Freeze will take place instead. Scientists have not yet been able to calculate the force created by the Big Bang, so for now we are uncertain what will happen. The Big Crunch states that should the force of gravity (caused by the size of the Universe) overcome the force of the Big Bang, then the expansion of the Universe will be reversed, and it will collapse in on itself. It will reduce the cosmic scale factor to 0 before creating an even bigger bang yet again for the process to repeat.

Alternatively, the Big Freeze states that the Universe will undergo a 'heat death.' In this scenario, the Universe runs out of free heat energy,

meaning it cannot sustain processes which increase entropy (a concept and measurable physical property associated with a state of randomness or uncertainty). Heat death does not suggest a particular temperature at which the Universe will 'freeze,' but simply that temperature changes and other processes can no longer do any work, meaning nothing can happen. This is known as thermodynamic equilibrium. The main piece of evidence that increases support for this theory over the alternative is the Accelerated Expansion of the Universe. Two experiments were undertaken in 1998 by the Supernova Cosmology Project and the High-Z Supernova Search Team. The idea was that Type Ia supernovae have the same brightness, and since objects further away appear dimmer, the brightness can be used to calculate the distance the body is away from us. When compared with the red shift reading, it was found that objects in the Universe were moving away from each other at an accelerated rate. These were not the results these teams were expecting, as they had predicted it would be decelerating, due to the gravitational attraction of the matter in the Universe. This supports the theory that the force from the Big Bang is greater than the force of gravity, which would lead to the Big Freeze taking place. Three scientists from these teams were awarded Nobel Prizes in Physics for their work on this. These were Saul Perlmutter (from the SCP) alongside Adam Riess and Brian P. Schmidt (from the High-Z Team).

Some closing thoughts

The end of the Universe is not exactly a cheery topic to talk about, write about or even think about. However, we have no need to worry. An arguably comforting thought is that humanity will certainly not be around to see the end of existence as we have come to comprehend it. We are unlikely to see the end of the Solar System, but we may see the end of Earth if some of the generations in billions of years are 'lucky' enough to live that long (and if humanity doesn't kill itself first). Looking into topics such as the end of the world can certainly be depressing; however, it has a lesson to teach us. No matter what, there is an end to life - it is inevitable. It tells us that we need to enjoy what we have now, and every second of it. There is no point in focusing on our destination; we must enjoy the journey there in the time we have.



CHLOE WRIGHT (PSYCHOLOGY)

DEPRESSION

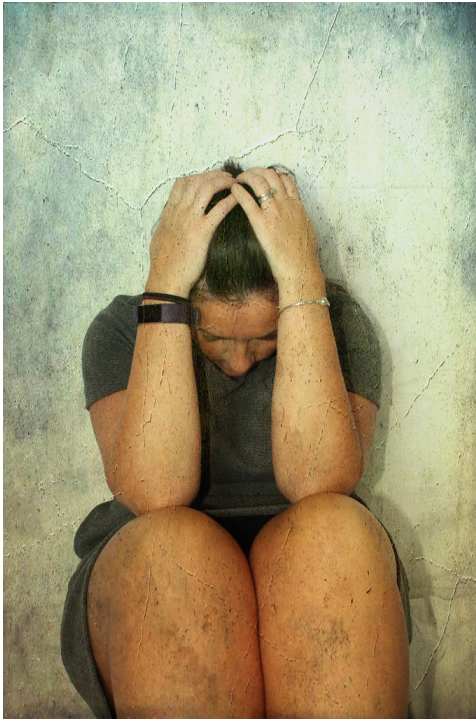
The causes of mental illness

Cognitive approaches use experimental research methods to study internal mental processes such as attention, perception, memory and decision-making. Depression is a statistically common mental illness which often causes lowered mood, changes to eating and sleeping habits, anger and aggression, absolutist thinking and much more. Despite perhaps being looked at as common by some people due to its familiar nature, it is significant and plays a controlling role in many people's lives, and so it is important to be able to understand why it may occur and what to look for.

One explanation for depression was theorised by Aaron Beck (1967) who proposed that there were three kinds of negative thinking which contributed to the mental illness, known as the negative triad. These negative views led a person to interrupt their experiences daily and increases their vulnerability to depression. The three aspects that create a dysfunctional view are:

- A negative view of the world
- A negative view of the future
- A negative view of self

The negative triad enhances the feeling of a lack of hope and lowers self-esteem through faulty information processing and negative self schemas. Faulty information processing is when negative aspects are attended to, yet the positives are ignored. This can be referred to as 'black and white thinking' or absolutist thinking. A schema acts as mental framework for interpretation of sensory information, and so



negative self-schemas make us believe all information related to ourselves is negative.

This suspected cause of depression can be combatted by Beck's CBT (Cognitive Behavioural Therapy) though, which aims to identify and challenge the negative triad through hypothesis testing, where the truth of these self-beliefs is evaluated, often conducted through homework set by the therapist.

Another cognitive explanation to depression was created by Albert Ellis (1962), named Ellis' ABC model which explains that good mental health is a result of rational thinking in ways that

allow people to be happy and free from any pain. Therefore, this means irrational thoughts affect our behaviour and emotional state. The ABC model is an acronym to help explain this theory...

A - Activating events

Depression follows negative events/experiences which trigger irrational beliefs, meaning after an unpleasant thing happens, these damaging thoughts appear.

B - Beliefs

These irrational thoughts lead to illogical beliefs. An example of an extreme belief leading to depression is "musturbation", where unrealistic demands are set to always succeed/achieve perfection when it is not always reachable.

C - Consequences

The consequences of an activating event trigger irrational beliefs, leading to the development of depression.

The ABC model shows a clear explanation of the buildup and process to what may trigger depression. Ellis also conceived of the ABCDE model to help remember his Rational Emotive Behavioural Therapy (REBT) to maintain and treat this mental disorder.

D - Dispute

The aim is to identify rational thoughts and dispute them through vigorous arguments to break the link between activating thoughts and depression.

E - Effect

Globally, it is estimated that 5% of adults suffer from depression and the major concern is that over 700,000 people die due to suicide every year. Suicide is the fourth leading cause of death in 15-29-year-olds, illustrating the importance of educating society about depression: how it occurs, to build empathy to those suffering, and how to support and notice those potentially struggling.

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ANDERSON MACCORMICK (ENGLISH)

LOANWORDS IN ENGLISH

Filling that sense of “Je ne sais quoi”!

Words of foreign origin are practically inescapable in our daily life. When you get home after a long day, does the car get parked in a *garage*? Then after getting into your *pyjamas*, do you sit on the sofa and watch a *comedy* or *drama*, sipping a warm beverage like *tea*, *coffee*, or hot *chocolate*? All these everyday words have been brought into our language in some capacity to form the language we know as ‘English’.

It is estimated that almost 80% of our language’s vocabulary has been borrowed from other languages. The most influential have been French, Latin, German and Greek. However, loanwords experience different treatment based on when they were loaned, how common the word is, and where the word comes from. Words may also age to be more or less relevant in society, as people nowadays are better acquainted with loanwords like *latte* or *cappuccino* (Italian coffees), as opposed to loanwords like *deluge* (a severe flood – Old French) or *grimoire* (a book of magic spells and invocations – Old French) which have unfortunately faded away over the years.

But why do we treat borrowed words in a certain way? Can a loanword ever truly become an ‘English word’? And do they deserve a place in English at all? To answer our first question, a brief bit of history can help to guide us. Whenever you think about loanwords in the English language, the first examples that jump to mind may be of French origin, and usually words that are associated with etiquette, extravagance, and elegance. Or, for that matter, any other fancy words we can use to

describe something posh, mostly likely on the topics like food, fashion, or hospitality. These are fields where France has been particularly innovative and influential, and so the English upper class, with the opportunity to travel and communicate with different cultures, would historically have indulged in these foreign French fineries and presented their new-found luxuries to their companions back home, bringing along the exotic and peculiar words that describe them. And over time, some have remained a feature of high society, such as *hors d'oeuvre* (a small savoury dish, typically served as an appetizer) or *haute couture* (expensive, fashionable clothes produced by leading fashion houses), whereas some practises and terms have been integrated into everyday language, such as *hotel* or *scarf*. This is just one example of how history affects our perceptions of language, but generally there's no single answer: it's just a society thing.

But do we consider loanwords to be 'English'? Well, ultimately yes. A large portion of loaned vocabulary in English has undergone some extent of Anglicisation, where the word has been adapted to be more 'English' in spelling and pronunciation. These are words that most people would naturally consider a part of the English language. Yet, loanwords that have retained their original spellings and quirks still count; if it is a word in the English Dictionary, then it's an English word. That's the rule.

But should English have these loanwords anyway? This is a topic that occasionally strikes up a debate between linguists. Though the general consensus on this matter is that loanwords are a natural part of language development as different cultures interact and share resources, ideas, and mindsets. But there will always be those who think against the grain.

A modern-day initiative to rid our language of foreign influence is underway: the invention of English. English is described as "linguistic purism applied to English". Some believe this is a superior form of our language, and those people are in the process of producing a dictionary (named the "English Wordbook", to dodge the blunder of using a French loan) that will eventually contain all words in the current English language but expressed in a strictly English way.

However, I would challenge this way of thinking as I believe foreign influence is fascinating and has a well-deserving place in our language. One reason for this is that some words that English has taken on embody profound and obscure ideas that could not be so well easily expressed without such foreign influence. Some of my favourite examples are: *schadenfreude*, the German word which describes the enjoyment one receives from another's misfortune. *Saudade* is the Portuguese word which can be most accurately translated as a feeling of melancholic or nostalgic longing for absent love.

Though I believe foreign influence enriches our language with new concepts that challenge how we think or simply with fun-sounding expressions, I find English to be an interesting thought experiment. What if English never received all this external influence? And the English Wordbook has produced some great examples, such as the word 'wortcraft', which would be a substitute for 'gardening'. Charming, isn't it?

Anyway, I shall open the discussion to you: how do you feel about loanwords? Do you feel that the English language should embrace its original quality and return to its Anglic roots? Or does English need that little bit of *chutzpah* (extreme self-confidence or audacity – Yiddish) that foreign influence brings to the linguistic table?



JOSHUA BROOKS (MATHEMATICS)

ALGEBRAIC PROOF OF THE QUADRATIC FORMULA

Applications in Mathematics

Quadratic equations are an essential part of mathematics and are used constantly in our everyday lives. They are necessary to calculate speed, profit and area and as such they are taught throughout school from Key Stage 3 to Key Stage 5. Thus, the quadratic formula is essential so that precise calculations can be made to ensure everything in our world functions properly. The most exciting thing that this is key to achieve is space exploration, as space is a vacuum, acceleration in space is constant, this allows quadratic expressions using time to be calculated allowing scientists to figure out exactly how long it will take for exploratory space craft to reach their destinations and make amazing new discoveries.

Due to this many of us can quote the formula: when $ax^2 + bx + c = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

We have all learnt it but have we ever questioned how we know this to be true or how mathematicians came up with this formula in the first place? So how do we prove this formula works well first we must complete the square using a , b and c .

Starting with $ax^2 + bx + c = 0$

$$x^2 + \frac{b}{a}x + \frac{c}{a} = 0$$

First we divide through by a:

Move c/a to the RHS :

$$x^2 + \frac{b}{a}x = -\frac{c}{a}$$

And complete the square moving the product to the RHS:

$$\left(x + \frac{b}{2a}\right)^2 = \frac{b^2}{4a^2} - \frac{c}{a}$$

Multiply $-c/a$ by $4a$ so the RHS is all over a singular denominator:

$$\left(x + \frac{b}{2a}\right)^2 = \frac{b^2 - 4ac}{4a^2}$$

Square root both sides and keep both positive and negative solutions:

$$x + \frac{b}{2a} = \frac{\pm\sqrt{b^2 - 4ac}}{2a}$$

Move $b/2a$ to the RHS:

$$x = -\frac{b}{2a} \pm \frac{\sqrt{b^2 - 4ac}}{2a}$$

As both fractions have the same denominator they can be written as a single fraction so:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Thus we can prove the quadratic formula works to find both solutions of x in a quadratic equation, and we can all breathe a big sigh of relief that the maths used to calculate how strong the roof needs to be so we don't all die is correct, whilst being hopeful for the future with the exciting possibilities that it provides for space exploration!



Bronte Noble

CAMERON TONER (GEOGRAPHY)

THE CLIMATE EMERGENCY

Are some countries more responsible for climate change than others?

Climate change is a large-scale, long-term shift in the planet's weather patterns and average temperatures, and right now is a decisive issue for our planet. Determining responsibility helps to contextualise potential solutions for mitigation and adaptation, but it is also a complex argument. Temporality and spatiality are key to understanding contemporary and historical greenhouse gas emissions.

Most people might immediately suggest that China is the most responsible country for climate change, as it has emitted 12,060,000 thousand tonnes of carbon in 2020 alone. However, if we were to look at this temporally, it may not seem so straightforward. Up until the 1970s, the country's economy was overwhelmingly rural and largely dependent on biofuels (timber, animal waste etc.). In 1978, China's leaders moved from a strict command economy to embracing free market principles and industrialisation resulted. From here, emissions began to rise as China became increasingly more of a global export nation, responsible for 12% of the world's exports. In addition to this, China has become a manufacturing economy in which most of the work done in the country is a result of post-industrial nations, such as the USA or UK, outsourcing for cheaper labour. It could be argued that as a result, post-industrial nations are offsetting their carbon emissions by exporting them outside of their own borders. Does this make China more responsible?

Another common argument would be that post-industrial countries of the West are more responsible for climate change. These were the first to undergo industrial revolutions, with the UK starting around 1760. This period of time when manufacturing boomed to an extraordinary level produced huge amounts of carbon while countries in Asia and Africa remained pre-industrial. It is only recently that emerging countries and lower income countries have started to contribute to global greenhouse gas emissions. In contrast, the US and EU countries have emitted 47% of total carbon emissions since 1751. So, while currently industrialising nations are the largest net annual emitters, post-industrial nations have already emitted nearly half of anthropogenic historical greenhouse gases. The USA for example, has contributed 25% of total emissions since 1751, which is around 400 billion tonnes.



Drax Power Station by Chris Allen CC BY-SA 2.0

The USA is still a major emitter in present day too. A reason that the USA contributes so significantly to both the past and present is due to its

large population, which is currently around 332,000,000, so the USA ranks 16th in carbon emissions per capita at 15.52 tonnes per person. Electricity production in the USA contributes to 25% of the country's emissions, and 60% of this electricity is generated by the burning of fossil fuels. This percentage is likely to increase as the population continues to grow, further amplifying USA's contributions to climate change.

In the context of responsibility for climate change, low-income nations are nowhere to be seen, contributing the least to global emissions historically and in the present day. Economically, many of the Sub-Saharan nations rely on primary sector work, with agriculture, fishing and forestry making up much GDP. Carbon emissions are low because they have yet to industrialise and rely on the combustion of fossil fuels. For example, Sierra Leon emitted 0.11 metric tonnes of carbon in 2019. For these reasons, pre-industrial nations have perhaps contributed the least to carbon change, but in a cruel irony, experience the worst effects of it, such as the increase in extreme weather events and sea level rise.

To conclude, some countries are more responsible for climate change than others, but it is not as straightforward as it may first appear. I would put the responsibility mostly on the wealthy, post-industrial West for both the past and the present day. Carbon outsourcing is the major factor for present day emissions, and it is an ever-growing issue. Even though most are moving toward a more sustainable and renewable future, the damage has already been done.



RUBY WARREN (ENGLISH)

WHY ARE WE DRAWN TO TRAGEDY?

“Behind every exquisite thing that existed, there was something tragic” - Oscar Wilde

Tragedy as a genre is vital to the study of English Literature. Shakespeare's Macbeth and King Lear are considered some of the greatest tragedies, along with other recognisable works like Hamlet and Othello. Is there a reason why tragedies are so appealing? Maybe at the most basic level it's due to how well we can write about it, or is it about innate intrigue?

Some might suggest the sadness and loss embedded and crucial to tragedies make us feel thankful for our own relationships. In the case of Macbeth, we may feel grateful to be cherished and loved by a partner, instead of being manipulated and lied to: “Be innocent of the knowledge, dearest chuck”. In King Lear, when Lear is betrayed by both of his daughters and is left with no family, we may remember how strong our own familial ties are, how we've never been betrayed or abandoned: “I prithee daughter, do not make me mad”.

The prospect of tragedy being experienced by oneself is instinctively fear inducing and worrisome, so when we watch or read of tragic events being experienced by someone else, why don't we stop? Why don't we put the book down or turn the film off? There must be something we

can gain from tragedy, something we enjoy: we crave the emotion, the catharsis.

Catharsis

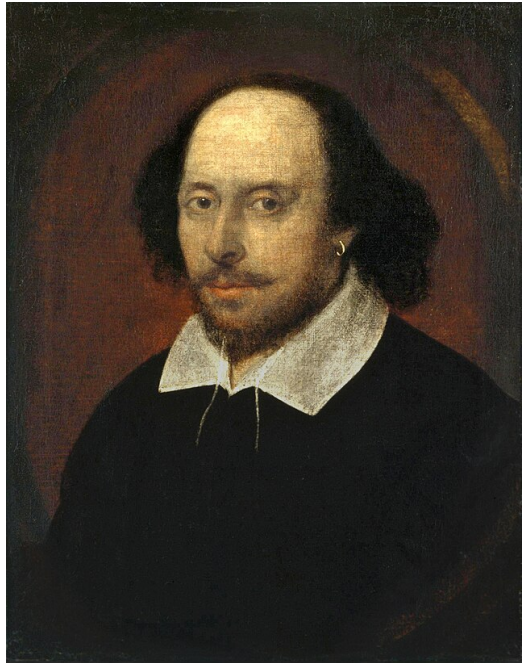
As Aristotle put it, "catharsis is the purging of emotions of pity and fear that are aroused in the viewer of a tragedy". We can feel drawn to tragedy because it helps purge us of our own anxieties, our own fears or even worries of experiencing tragedy ourselves. In relishing in someone else's loss, we can cope with our own. Catharsis is one of the last stages of Greek Aristotelian tragedy, therefore when we come away from a tragedy the last thing we remember is this insane release.

The close connection Shakespeare builds between character and audience enhances this feeling. We may feel catharsis when Macbeth is slain, we feel the same relief noble warriors such as Malcom and Macduff do when the tragic hero meets his inevitable tragic end. To discuss catharsis in King Lear would be more complex; it's arguable whether or not any sense of catharsis is actually achieved, making it a tragic play which somewhat defies the rules of tragedy itself- but we still read it. In King Lear, Shakespeare tortures the audience to an extent incomparable with other plays, the psychological and physical violence is so prevalent we question whether or not any moral lesson can actually be learnt. However, this doesn't stop us from engaging so closely with the play and all of its torment. This is not to say we feel a sense of happiness when we're met with death and corruption in such tragedies, but instead we feel happy when good eventually conquers evil. Suddenly, the amount of violence we as the audience have endured seems somehow worth it. In both Macbeth and King Lear we get to see a kingdom restored by noble leaders, even though some may argue both the good and the evil die, we can see some of these deaths as noble; we can call some characters martyrs.

Survival instinct

Maybe it's our fear of tragedy which makes us unable to look away. As paradoxical as this may seem, there is some truth to it. When we watch a horror film, we can't look away, but this doesn't mean we're not afraid. We force ourselves to experience second-hand tragedy in order to feel safety; when we watch tragic events unfold, we can be sure of the

safety that is restored at the end of the event. For example, when reading Gloucester get his eyes ruthlessly plucked out in King Lear, we don't skip the scene, we read with anticipation to be sure of the extent of the harm done to him, we need to know that he doesn't die, and in Macbeth, when Macduff and Macbeth are fighting, we keep our eyes locked on the page or the stage to see who the victor is and to ensure that good conquers evil. When our brains recognise we're in a dangerous situation, our survival instinct is activated.



William Shakespeare

In the case of Shakespearian tragedy, we're obviously not personally facing this danger, but the bond Shakespeare creates between audience and character is strong enough that we can believe we are facing the situation ourselves.

Schadenfreude

'Schadenfreude' is a German word referring to the experience of pleasure, joy, or self-satisfaction that comes from learning of or witnessing the troubles, failures, or humiliation of another. Schadenfreude can be relevant to the question of why we are drawn to tragedy as justice-based schadenfreude suggests we feel pleasure in seeing immoral behaviour punished. This goes back to the point that the attraction we have towards tragedy may not be the tragedy itself but its consequences. We see characters inflict tragic events upon one another, but in the end its expected that justice is always served. Maybe we want to read and watch tragic events unfold so that when our faith

in humanity is crushed to awfully low levels, we get to experience it being repaired again. To take a more pessimistic view, we may delight in tragedy in order to feel a growth in self-worth and importance (rivalry-based schadenfreude). This take is perhaps more relatable to the time of Shakespearean England, a feudalistic society which oppressed the poor. To relate this to plays such as King Lear and Macbeth, we see corrupt rulers punished and the aristocracy crumble; lower class audiences may celebrate such events. Audiences may have also found pleasure in the tragic downfall of many female characters in Shakespeare tragedies. The villainisation of women in literature began with the Bible and is continued by Shakespearean tragedies through characters like Lady Macbeth (Macbeth), Reagan (King Lear), Gonerill (King Lear), Desmonda (Othello) and Ophelia (Hamlet). It's significant that at the end of these tragedies, although justice is restored for men and kingdoms, women are left as being victims of (usually) their male counterparts.

Sympathy

Through our exploration of tragic texts, we learn how to sympathise on greater levels than we've ever considered before. In English literature, questions are often posed like 'Is this character a victim or a criminal?'. A popular example is Lady Macbeth; we witness her scheme on Machiavellian levels with her husband but then meets a tragic end, leaving us to contemplate whether she's an antagonist ('baddie') or a victim of her husband and society. We get to sympathise with characters who have committed horrible sins, questioning human morality as a whole. In saying this, it's obvious that we don't forgive, normalise or accept the misdeeds of characters in these plays, but we do get to explore why they committed such acts and why these acts constitute such tragedy.

We are drawn to tragedy because it explores human morality and human relationships on a deeper level that other genres can encompass, there's a certain truth and lesson behind tragic stories, despite their fantastical and maybe unrealistic plots, which make us want to read them, we want to learn more about the human condition and the extent we can dissect it through the art of literature.





Anna White

AMIE YOUNG (LAW)

TORT LAW

How does Tort Law dictate whether a claim for negligence is viable?

The law in the UK is divided into two fields; Civil Law and Criminal Law. Criminal law focuses on punishing the defendant through methods such as imprisonment, community service and other means, whereas civil law aims to put the claimant (victim) back into the position they were in before the breach of civil law was committed, by awarding damages.

Damages in civil law are categorised into pecuniary and non-pecuniary losses. Pecuniary loss regards a value that can be calculated in terms of financial loss, for example, due to negligent health and safety precautions, a claimant fell down a pot hole at work causing a broken leg which prevented them from going on their £5000 holiday (in this case damages of up £5000 could be claimed). Non-pecuniary losses are slightly more complex in that they are not based solely on financial loss and concentrate more heavily around pain and suffering caused. However, the purpose of civil law is not to put the claimant into the position they would have been in were it not for the negligence; it only aims to put them back into the position they were in. This refers to terms of the actual loss suffered rather than potential loss which could have been suffered. Furthermore, law in the UK encompasses statute law (established when an act of Parliament is passed) and common law (judge-made law created when a decision is held by a judge within a trial).

Tort law is a division of civil law which revolves around a civil wrong committed by a 'tortfeasor', which arbitrarily ensues loss or harm to another. The word 'tort' in French means wrong; the Latin for this is

'tortum'. Prior to the English Industrial Revolution, some fractions of loss or damage occurred between parties that had no contract between them, and therefore contractual grounds for one party to sue another were absent. This resulted in the introduction of Tort law around the eighteenth century. Although this article pivots around the Tort of negligence, it is critical to acknowledge that Tort law encases various civil wrongs and that negligence is only one branch of Tort law.

The law of Tort has largely been founded in common law in which, multiple principles and criteria have arisen in order to prove that a tort occurred. A duty of care set out by the law of Tort in the realm of negligence is a principle which dictates whether there is a sufficient obligation (and eventually failure of that obligation) owed by the defendant to the claimant in order to bring a civil action.

Civil law decides whether a duty of care is owed in terms of negligence through a series of principles. The first is the Neighbour Principle, as introduced by Lord Atkin during the case of *Donoghue v Stevenson* (1932). The Neighbour Principle states "... you must take reasonable care to avoid acts or omissions which you can reasonably foresee would be likely to injure your neighbour". Who, then, in law is my neighbour? The answer seems to be "persons who are so closely and directly affected by an act that one ought reasonably to have them in contemplation as being so affected when directing one's mind to the acts or omissions which are called in question". Therefore, a neighbour is anyone who fits this description. If it is decided that the claimant and defendant are classified as neighbours, the three-stage *Caparo* Test must be applied to the case as set out by *Caparo Industries PLC v Dickman* (1990). The first stage depicts that the injury/damage must be foreseeable as a result of the defendant's conduct. This criterion was also reinforced in the case of *Kent v Griffiths* (2000). Next, it must be proven that there was sufficient proximity between the defendant and the claimant in terms of time and space; this principle was confirmed by *McLoughlin v O'Brien* (1984) and *Bourhill v Young* (1943). The final criterion established that it is fair, just and reasonable to impose a duty of care upon the defendant, as also enforced by *Hill v Chief Constable of West Yorkshire Police* and *Swinney v Commissioner of Northumbria Police*. During the case of *Hill v Chief Constable of West Yorkshire Police*, it was

found that a duty of care being imposed was not fair, just, nor reasonable as Jacqueline Hill (a victim of the Yorkshire Ripper, Peter Sutcliffe) was an unknown member of the public. Therefore, Peter Sutcliffe could have picked out any female in the area at that time as a victim, as Hill was unknown to Sutcliffe and as any female could have been his victim, West Yorkshire Police was found to be under no duty of care to protect Jacqueline Hill from the Yorkshire Ripper because it was found to be

unforeseeable that she would become his victim. On the contrary, in the case of Swinney, it was held to be fair, just and reasonable to impose a duty of care upon the Commissioner of Northumbria Police as Swinney was known to the police as a witness of fact

therefore, decided to be a known member of the public. Following all

three criteria of the Caparo Test are successfully satisfied, the civil court are likely to dictate that a claim for negligence in the law of Tort is viable.



Tort law by Nick Youngson CC BY-SA 3.0

However, in established duty situations the three-stage Caparo Test does not apply and only one part of the test must be met. Established duty situations delineate where a duty of care is already established, for example, doctor patient relationships, car driver other road user relationships etc. In these situations, it must only be decided to be fair, just and reasonable to impose a duty of care.



JAMES WILSON (CLASSICAL CIVILISATIONS)

ANCIENT GREEK HEROES

Was Odysseus too selfish and deceitful to be a hero?

In Ancient Greece, a hero was someone who was incredibly intelligent, very handsome, a powerful warrior, and had strong *kleos* (fame), along with being a force of good rather than evil. Throughout *The Odyssey*, Odysseus proves himself to fit these criteria amazingly well. However, it must be recognised that multiple times throughout the poem, he is deceitful and selfish. Despite this, it does not significantly impact his image as a hero, because not only is it not a criterion for being a hero, but he also often does this for good reasons.

The first example of Odysseus being deceitful is at the start of Book 6, when he must convince Nausicaa to help him. He lies to her, telling her that she reminded him of a perfect tree he saw on his travels to the Temple of Apollo, even though he had not been there. However, despite this, the deceit is simply meant to convince her to care for him (otherwise she would not believe him) and causes no harm to anyone, and it works. So overall, this example of Odysseus' deceit does not support the argument that Odysseus is too deceitful to be a real hero. Odysseus is also deceitful in Book 9, where he originally tells Polyphemus that his name is 'Nobody'. Then, when Polyphemus is blinded by Odysseus and is crying out, the other Cyclopes ask who blinded Polyphemus, to which he replies, 'Nobody' blinded him, and so no suspicion is raised. This shows Odysseus being deceitful, though it is

again for a good reason, as blinding Polyphemus allows him and his men to escape Polyphemus' cave.



Odysseus by Egisto Sani CC BY-NC-SA 2.0

Odysseus is first seen as being selfish in Book 9. In the episode with the Cicones, he is seen to be very fair, splitting the plunder from Ismarus equally among his men. Despite this, Odysseus also shows his selfishness multiple times in the encounter with Polyphemus. Firstly, when they first arrive on the island, Odysseus and his men land on a different island from the Cyclops, which is uninhabited and has everything they would need to survive. However, Odysseus sees signs of civilisation on the island and so takes a ship over there anyway, despite it being unnecessary. After arriving on the Cyclopes' Isle, he takes his twelve best men to a nearby cave, which has a farm outside. Again, Odysseus, instead of leaving once they had taken some goats and sheep from the farm, decides to stay despite his men's begging. This is because he is wanting *xenia* (hospitality), an expected behaviour at this time when a host was expected to look after and give gifts to visitors. This shows Odysseus' greed. He does not need any *xenia* from this homeowner, yet he wants it anyway and stays, which leads to six of his twelve men being killed. As the ship sails away from the Cyclopes' Isle, Odysseus tells Polyphemus that he is Odysseus, Son of Laertes, and that he should tell people that is who blinded him. Here, Odysseus is wanting *kleos*. One of the main aspects of being an Ancient Greek

hero is that everyone knew who you were, and this is what *kleos* was. This puts Odysseus and his men in a lot of danger, as Polyphemus throws a boulder at the ship, which nearly hits it and pushes it back to shore. So, Odysseus and his men must row away, and despite what just happened, Odysseus continues to taunt Polyphemus. This clearly shows Odysseus being incredibly selfish. However, a Greek hero can only be a hero if they have a lot of *kleos*. Odysseus trying to gain *kleos* as seen here by the criteria, makes him a great hero by Ancient Greek standards.

Although not directly caused by Odysseus being selfish, his men's mistrust of him (caused by his known selfishness) leads to them opening the bag of winds that Aeolus has given him to allow a safe journey home. Alongside, in Book 10, Odysseus shows his selfishness when encountering the Laestrygonians. When they arrive at the harbour at Telepylus, Odysseus keeps his ship outside the harbour, because he suspects that something is not right, but he still lets his other eleven ships go into the harbour not caring for his men. As a result, all those ships and the men on board them are massacred by the Laestrygonians, while Odysseus, his ship, and the men on it get away unscathed. This shows that Odysseus is incredibly selfish and only cares about his own safety. Yet, it can be argued that this is because a Greek hero was expected to prioritise their own lives over their men's. Therefore, this selfishness does not completely support the idea that Odysseus is too selfish or deceitful to be a hero. As well as this, later in Book 10, Odysseus is seen as being selfish yet again because he ends up keeping his men on Aeaëa for a year, completely unnecessarily, and even must be reminded that they need to return to Ithaca. Odysseus is being shown as selfish here; however, as Circe is a witch, even though Hermes gave him *moly* (a magical herb) to counter her magic originally, that doesn't mean he was completely resistant to the magic and may have been bewitched by her to stay on Aeaëa, which if we knew would help determine if he was being selfish in this situation. However, overall, it has a small impact on viewing him as a hero.

Odysseus is selfish and deceitful in Book 12 too. Firstly, he tells his men that he needs to listen to the Sirens as they go past, though, this is not true; it is optional, yet he is lying to them so he can and no-one else can.

This is Odysseus being selfish and deceitful at the same time, although luckily this has no negative effect on them. He does tell them about the Wandering Rocks and about Charybdis; however, he decides not to tell them about Scylla, as this would discourage them from being on the deck of the ship and rowing past Scylla, making it impossible for them to get past. Although he is being deceitful in this moment, overall, it has a positive effect because otherwise, if they had learned about Scylla, the men would not have gone further, and they would have died at sea. Therefore, it can be argued that Odysseus lying in this situation makes him a better hero than if he had told the truth.

In Books 16 and 17, Odysseus appears to everyone (besides Telemachus, whom he reveals himself to) as an old, poor beggar. He manages to go through the town and into his own home without anyone recognising him (besides his dog Argus). This is deceit on another level (although admittedly, he had not been seen by anyone there for 20 years). However, this trickery is very cunning and well-justified, as if he appeared just as himself, the suitors would kill him, and it allows him to assess the situation and figure out the best solution to the problem. This also shows that Odysseus being deceitful can sometimes reinforce his appearance as a hero.

In summary, Odysseus is very deceitful and selfish throughout the whole poem. His selfishness (aside from the encounter with the Laestrygonians and his desire for *xenia* from Polyphemus) has no negative effect on him or anyone around him and sometimes actually reinforces his image as a hero (e.g., telling Polyphemus his name for *kleos*). Odysseus' deceit is often done for a good reason (e.g., not showing himself at his home allows him to assess the suitor situation without instantly being killed), does not heavily impact people most of the time, and is just part of his cunning and intelligence. In conclusion, I would argue that Odysseus is not too selfish or deceitful to be a hero, as by the criteria for being an Ancient Greek hero, he fits in almost perfectly, and sometimes these parts of his character make him a stronger hero.



DAISY DARLEY (ECONOMICS)

COMPETITION, MONOPOLY, AND AMAZON

Is *Amazon* a monopoly?

A monopoly is a market structure where a single seller or producer assumes a dominant position in an industry. A pure monopoly is said to exist when a single seller of a product has 100% of the market share in a specific sector. Whereas in the UK, a firm that has more than 25% of the market share has monopoly power. Monopolies are discouraged from occurring in free market economies as they reduce the level of competition in a market, limiting the availability of substitutes for consumers. This can lead to unfair consumer practices as monopolies may have no incentive to innovate their products, leaving dissatisfied customers. Monopolies also have the ability to charge high prices exploiting consumers due to the lack of other available options. In instances like this, government regulation and price capping may be necessary to prevent market failure. The defining characteristics of a monopoly are as follows:

Price makers

Monopolies have controlling market power which means they have the ability to set the prices of the goods and services, unlike firms in perfectly competitive markets who are price takers. As a result of this, they often charge higher prices.

High barriers to entry and exit

A barrier to entry consists of when existing firms set their prices sufficiently lower to deter entry into the market. This is possible due to their lower marginal costs as a result of economies of scale. Once the threat of a new entrant subsides, prices will usually be raised again. Alongside this, an example of an exit barrier may be sunk costs, or irrecoverable costs.

Economies of scale

Larger producers have a scaled advantage against new entrants due to their lower marginal costs per unit from economies of scale. Especially with natural monopolies, the firm may be a supplier's only customer giving them negotiating power to attain cheaper raw materials.

Monopoly power

When supernormal profit is increased due to lower marginal costs, firms can increase investment in working practices to become dynamically efficient.

Based on all of this context, there are various arguments that suggest *Amazon* can be considered a monopoly but also opposing views that suggest the term 'monopoly' isn't the best fit to describe *Amazon*. In the UK, *Amazon* currently has over 30% of the market share in the e-commerce industry. As this figure is above 25%, *Amazon* clearly has a high level of monopoly power, regardless of whether it is actually classed as a monopoly in the UK.

An argument suggesting that *Amazon* is a monopoly is that it prevents fair competition. *Amazon's* large size allows it to edge out competition and dominate over all smaller firms in the industry. *Amazon* itself offers more than 12 million different products and this figure is without the items listed by third party sellers. Alongside this, not only does *Amazon* provide a wide variety of goods, they also sell them at incredibly low prices. This makes it impossible for new firms of a smaller size to be able to price compete, as they are not at a capacity large enough to exploit economies of scale in the same way that *Amazon* can. This can

be classified as a barrier to entry which is a key characteristic of a monopoly.



Alabama Amazon workers by **Joe Piette** CC BY-SA 2.0

On the other hand, this directly contradicts another defining characteristic; monopolies are price makers and therefore generally charge higher prices. *Amazon* has built their brand on being affordable, which can be reflected through their incredibly low profit margins. The average profit margin for each product is 1-2% yet *Amazon* still manages to turnover hundreds of billions in profit. This is because of their large customer base. Whilst they may not make much profit on each item, their incredulous sales numbers turn these small figures into billions. Although many people use *Amazon* for its convenience, if prices were raised, customers would have less of an incentive to buy their products and may instead find cheaper alternatives from rival companies. For this reason, in order for *Amazon* to maintain their monopoly power and a market share above the baseline 25%, prices must be kept to a minimum. From this perspective, prices are an irrelevant factor in determining *Amazon's* monopolistic qualities.

An oligopoly is an industry dominated by a few large firms. Some argue that this term can be better used to describe *Amazon*. The three main characteristics of an oligopoly are the interdependence of firms, barriers to entry, and differentiated products.

Interdependence means that the firms in the market must take into account the likely reactions of their rivals to any change in price, output, or forms of non-price competition. In order to keep up with these changing consumer trends, businesses must also evolve to cater to these needs. This means that if *eBay* diversifies to offer products in a different market, *Amazon* is likely to follow in their footsteps and also expand into the new market to prevent losing customers to rival businesses. The same applies to pricing: if *eBay* dramatically lowers their prices, *Amazon* may have to do the same to prevent sales drops, even if this means that profits may take a dip. Every action from one business has a chain effect on all other firms in the market for oligopolies, and *Amazon* follows this trend.

The market in which *Amazon* operates has barriers to entry which allows *Amazon* to be classified into the category of either a monopoly or oligopoly. As for differentiated products, this is a non-price factor that focuses more on the quality of the product, the advertising, and branding used to make products stand out from others in the market. In some ways, *Amazon* does this as a result of their large product range and well known brand image; however, due to their cheap prices, quality is often low and packaging unappealing.

In conclusion, whilst *Amazon* has a high level of monopoly power, I would suggest *Amazon* is more of an oligopoly. I argue that the the market in which *Amazon* operates has high barriers to entry, economies of scale and monopoly power. Therefore, if it weren't for the 100% market share requirement, *Amazon* would have all the defining characteristics of a monopoly.



Huskey

Always there for you,
Natures perfect learners,
A best friend for life.

Isaac Woolley

TOBY WALTERS (MUSIC)

SYMPHONIC CHANGES

The changing use of string and percussion instruments in symphonic music: 1750-1910

The use of strings and percussion throughout symphonic music has changed significantly since the development of new instruments and techniques altered the way composers used them. During the Mannheim orchestra era, Johann Stamitz was a key composer who used strings as the foundation of his pieces since they were versatile and flexible with their playing. String quartets were common, as violins were melody instruments supported by the lower cello which at the time had a bridge with a larger angle and a slightly different bow. This meant that the cello back in the Mannheim era was not used as frequently and did not have the same range as a cello today. Therefore, it usually played low pedal notes to accompany the violin melodies. The harpsichord was also an important instrument at this time, but it fell out of use once the piano was invented and proved more popular in classical symphonies. Stamitz's symphony in D major used many 'Mannheim' techniques in the violins, like arpeggio 'Mannheim rockets' and 'Mannheim sighs' that focused on string melody.

Later on, instruments like the clarinet were invented, so they were experimented with and used as the melody instead of the violin. This is seen in woodwind trios featured in symphonies such as the 1st Movement of Haydn's 104, which uses moments of woodwind interest taking over from the violin. This can also be seen in Mozart's symphony 40, where strings were still a main part, but other instruments featured,

including the timpani, which commonly played the tonic and dominant notes to punctuate chords. This is also where celli developed different bridges, so started to be used in diverse ways by experimenting with the higher register. (Brass also invented valving later which allowed them to take some melodies/fanfare parts, forcing violins to accompany with sustained notes).

In Haydn's clock symphony, violins were used to symbolise the 'ticking' clock, so techniques like pizzicato became popular and they could simulate specific themes like rocking quavers. In Mendelssohn's Italian Symphony, strings were still important to be used as the melody line (since they were representing Mendelssohn's trip to Italy, and the glorious sights he expresses in the symphony). Timpani also features a lot, using rolls and varying rhythms to add a syncopated percussive effect.

In the Romantic era, strings still represented a big part of the orchestra, but other instruments became more popular as the orchestra enlarged and new instruments like horns and trumpets were added. In Berlioz's Symphony Fantastique, we witness programme music intended to portray a specific theme or image (a young artist continually confronted by images of his perfect woman), and violins still portray this in an effective way due to their extended range and the timbre created by accompanying lower strings. Also, the facility to play them allows for more virtuosic music with fast and jumping melodies.

Finally, in Les Preludes by Liszt, these two instruments feature in an impressive symphonic poem style (programmatic style) that features in a long symphony joined into one movement. Strings are once again used in a variety of concepts, alternating between melody and accompaniment, exploring a range of dynamics due to their versatility whilst the percussion punctuates passages more frequently using newly developed techniques like varying the pitch (timpani could be tuned differently) and whereabouts on the skin you hit the drum.

Overall, since 1750, the strings and percussion have not just changed their style of playing, but also their uses in the symphony as they work

together will all the other instruments and change their ability to present different musical motifs and themes.



Theodore Simpson

JOSHUA BROOKS (CHEMISTRY)

UNIQUELY HUMAN: SAPIENIC ACID

Extracting sapienic acid from plant seeds

Sapienic acid is a fatty acid that is believed to be unique to humans, found within a substance called sebum secreted by a gland in the human body (even the name *sapienic* derives from the term *Sapien*, the species name for humans). This is important as a deficiency in the production of sapienic acid in particular has been linked with the development of a type of eczema, causing cracked skin that becomes swollen and itchy, as well as having antibacterial properties. This makes the research into the development of a method to produce more sapienic acid an important and potentially profitable endeavour, as health and beauty companies would be able to incorporate the chemical into moisturisers to both clean the skin and prevent the development of conditions like eczema. It is thought that some plants may contain significant levels of sapienic acid within their seeds, which, if efficiently extracted, could become a primary source for obtaining the acid. But how can this theory be tested?

First in the process is the cultivation of the plant desired; then the plant must be harvested and dried to approximately 12% water. It is now important to both reduce the size of the plant by crushing it up into a fine dust and also making the plant denser to increase the efficiency of the process. This is achieved through the process of milling and pelleting the plant. In milling, the plant leaves are placed in a mill where the gaps that the particles can leave the machine through are set at a small size to reduce the particle size drastically. Once these particles are like a fine powder, they are then pelleted, when heavy rollers force

the powder into a mould with small gaps to form pellets that are much denser than the original dust, thus making the process more efficient as there are more of the desired particles in a space at any given time. These pellets must be milled once again before moving onto the next step of primary extraction.

Primary extraction of these plant particles will remove the plant oil within them that contains the sapienic acid. This process is achieved via the use of supercritical carbon dioxide. This is carbon dioxide at a temperature above 310°C and a pressure greater than 74 bars. At this temperature and pressure, carbon dioxide doesn't function like a gas or a liquid but as a combination of both states, this makes it a perfect solvent for the plant oil. First, the oil is dissolved into the carbon dioxide in an extraction chamber packed with the dense plant particles, before moving to a collection chamber at a much lower pressure and temperature. This causes the oil to be deposited for collection and allows the carbon dioxide to be re-used. After dissolving as much of the oil as possible, the extraction enters a second, slower phase in which the supercritical carbon dioxide diffuses through the plant particles, extracting any oil that remains and once again carrying it to the collection chamber. Once this process has been completed, the oil is ready to be processed, but it must have any impurities removed from it before it is able to be processed.

These impurities are, for the most part, very simple to remove, merely requiring the layers of pure oil containing the sapienic acid, fats and water to separate. This can be done in a separating funnel as the layers gradually separate; however, this process would be extremely time-consuming, so certification is used instead. A centrifuge is essentially a device that spins very very fast, for the purposes of separating the oil, 6000 rotations per minute for 10 minutes will suffice. Tubes of the oil must be evenly weighted on opposite sides of the centrifuge, and after 10 minutes, there is a clear distinction between the oil layer at the top, a solid fatty layer in the middle and a water layer at the bottom. The oil is extracted from these tubes and kept in an airtight container to prevent as much oxidation as possible while the fatty and water layers are put back into a separating funnel. Then with the encouragement of some heptane (another solvent for the oil) and hydrochloric acid to break

down the fat, the layers separate again with a top oil layer, a bottom water/heptane layer, and a middle fatty layer which can once again be centrifuged to extract even more oil. This process is repeated for the fatty and water layers until no more oil is present after centrifugation. But this still leaves some of the heptane solvent in the oil which can be removed via the use of a still. By heating the oil, the heptane solvent, which has a much lower boiling point than the pure oil, can be vaporised into a gas and then cooled and collected into a separate flask to be re-used in different tests. This finally leaves you with a pure sample of oil containing sapienic acid.

This now allows the sapienic acid to finally be released from the oil in a pure state so that it can be used by manufacturers. This is accomplished by a process called saponification. Saponification is a method in which soap is made. This is accomplished by adding sodium hydroxide to the oil and then stirring the mixture at a high temperature (above 50°C) for approximately 18 hours. This will result in a thick white paste with about the same texture as cottage cheese. The sapienic acid is now a free acid within this paste but in order to isolate and extract the acid, the paste must be broken down and separated once more, similar to the purification of the oil, once again using hydrochloric acid to break down the mixture. However, in this situation, rather than a simple still being sufficient to remove the sapienic acid from its solvent, a molecular still must be used.

All chemicals in the mixture in which the sapienic acid is contained have relatively high boiling points. This would mean that in a conventional still, to separate the mixture, incredibly high temperatures would be necessary, which would be very expensive to operate and maintain. As such a molecular still is required. A molecular still uses the properties of a vacuum to reduce the boiling points of chemicals. In the molecular still the pressure is reduced to less than 0.01 millibars. At this pressure, there are no particles holding the substance in its liquid state, and as such, it requires much less energy to evaporate chemicals. This vacuum finally allows the sapienic acid to be separated as a pure fraction, ready for use by manufacturers.

Throughout the process, the substance is constantly tested via GCMS (gas chromatography mass spectrum) for the presence of sapienic acid. A gas solvent is able to separate the different chemicals in the mixture and display the abundance of all chemicals present in the tested sample. Then it can also identify, using a mass spectrum, the molecular mass of each of these chemicals. From this, the identity of the chemical can be deduced. This constant analysis can help a chemist calculate the efficiency of the process based on how abundant the sapienic acid is in the primary stages and, as such, how efficient the process is. This can help them decide which is the best way to extract the sapienic acid and whether obtaining the acid from plants will be a profitable and worthwhile process.



CAMERON TONER (GEOGRAPHY)

OIL AND GAS IN THE ARCTIC TUNDRA

Impacts on the carbon and water cycles

The Arctic Tundra occupies 8 million km² in Northern Canada, Alaska and Siberia. In the Alaskan Tundra, oil and gas was discovered in Prudhoe Bay in 1968. Since then, the extraction of these resources has caused significant impacts on the carbon and water cycles. The carbon cycle refers to the transfer of carbon from the biosphere, atmosphere, and oceans etc. and is important to humans as it regulates the Earth's temperature, makes up the food that sustains us, and provides energy. The water cycle refers to the transfer of water across Earth and is equally important for humans. Both the carbon and water cycles can be thought of as Earth's life support systems, and both are under threat from human activity.

Permafrost underlies much of the tundra and is an important feature in both of the life support systems. It is a major store of both carbon and water. In many areas, the oil and gas industry has caused significant melting of the permafrost, and as a result has led to the emission of significant amounts of greenhouse gases (decomposing organic matter releases carbon, and there is much of this locked away in the permafrost). This is due to the building and heating of workers houses, raising ground temperatures by 2.2°C, and the removal of the insulation layer of vegetation etc. It is estimated that around 7-40 million tonnes per year of CO² is being emitted. This large scale emission has, without

doubt, affected the slow carbon cycle, with most of the emissions transferring from the cryosphere (the frozen parts of our planet) to the atmosphere. This offset of a balanced cycle has resulted in the enhancing of the greenhouse effect, which contributes even further to global warming. A positive feedback loop has therefore been created, as the higher temperatures mean there is more seasonal variation and so more melting of the permafrost occurs.



Alaskan tundra by Maisotti CC BY 3.0

However, the melting of permafrost is not only affecting the carbon cycle, but also the water cycle. This is due to increased surface runoff and river discharge, meaning there is more likelihood of flooding in areas with bodies of water. As well as this, the increased surface runoff causes wetlands, ponds and lakes to be

more extensive, meaning more evaporation occurs in summer months. The action of the oil and gas industry has therefore caused irreversible damage to the carbon and water cycles as a result of the melting of permafrost.

The removal of the insulating layer of vegetation above the permafrost layer also means that in the localised short-term carbon cycle, there is less photosynthesis occurring and so the uptake of CO_2 from the atmosphere decreases. Furthermore, the thawing of the soil increases microbial activity with more decomposition taking place resulting in greater emissions of CO_2 . The slow-growing nature of tundra vegetation means that regeneration and recovery from damage takes decades.

Overall, the oil and gas industry has caused significant impacts on the water and carbon cycles in the Arctic Tundra, with some changes being irreversible. It's an ever-growing issue and there are no signs that it's slowing down.



JAMES WILSON (HISTORY)

FRANCIS DRAKE

Successes for the English Crown: 1558-1588

For an achievement to be the most significant for a person, it must be something that is very important and also something for which they are remembered. An evaluation of Drake's most significant achievement between the years 1558-88 must include his raid on Cadiz, his circumnavigation of the globe, and his involvement in the Spanish Armada.



Francis Drake

Drake's raid on Cadiz had a substantial impact on the Anglo-Spanish tensions during the time. In the raid, English ships sailed into Cadiz and attacked the major Spanish port. They sank Spanish ships and destroyed the vast majority of their barrels for provisions storage. This raid delayed the Spanish Armada by a year, and further impacted the Armada when it eventually set sail in 1588, because the Spanish had not been able to replace all the destroyed barrels with barrels of the same quality, so

many contained inferior wood that was not suited for a war at sea. This meant that much food would go rotten. Therefore, Drake's raid on Cadiz was a significant achievement, although not his most significant achievement during the time frame perhaps.

Drake also had a major role in the Spanish Armada itself, when it was finally launched in 1588. In 1588, Drake was known as England's 'celebrity' privateer and had successfully made a real name for himself. When Drake heard about the oncoming approach of the Spanish

Armada, he was encompassed in a game with friends. In a movie-like sequence, Drake finished his game and then headed to help command the Armada. Drake was an amazing captain and naval technician, and he utilised his newer galleons (which whilst being more lightly armoured were able to manoeuvre more successfully and were faster than the more heavily armoured Spanish ships of the time) and the rest of his ships effectively at the Battle of the Isle of Wight. He also used an astonishing but effective tactic at the Battle of Gravelines in which he set a pair of his ships on fire, before sending them towards the Spanish fleet. These fireships induced terrible fear for the Spanish fleet, splitting the fleet up. Making smaller fleets that were easier to chase down and sink. Therefore, we can see that Drake's involvement in the Spanish Armada was one of his most significant achievements, however, again it is hard to label as Drake's most significant achievement.

Drake's circumnavigation of the Globe can only be described as his most significant achievement in the years 1558-88, and possibly his life. Drake set off with the intention of raiding Spanish colonies in the New World (Americas and surrounding countries). He set off with five ships, his flagship being the Golden Hind. He raided Spanish colonies on the coast of Florida and Mexico and then moved further south to Brazil and Argentina, before going round the southern tip of Chile and back North along the Chilean and Peruvian coasts, before going to modern day California. Here, he landed in a small bay, now with only one ship, the Golden Hind. He was greeted by Native Americans who were very friendly and accepting, seeing Drake as someone to worship. Drake claimed the land for England and called it New Albion, announcing Queen Elizabeth I as its ruler, before heading across the Pacific and Indian Oceans, around the South and West of Africa, then back to England. This was completely unintentional but was the safest way to get back to England. When Drake arrived in England in 1580, after 3 years, Elizabeth came to see him as he returned into the port. He had brought back tens of thousands of pounds worth of gold as well as spices and other precious materials. Elizabeth knighted Drake on the deck of the Golden Hind. Therefore, Drake's circumnavigation of the globe, despite being accidental, was his most significant achievement.



BENJAMIN BAKER (BUSINESS STUDIES)

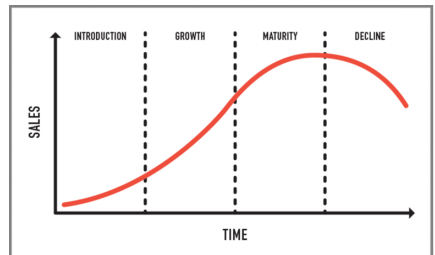
THE PRODUCT LIFE CYCLE

Sustaining growth for Spotify

The product life cycle outlines the stages a product goes through from when the idea is first considered to when it exits the market. However, not all products reach the final stage and get removed from the market. Those that do may continue to grow or remain in constant demand. The basic product life cycle is used to predict the shape of sales growth for a product but inevitably, there are times when a product doesn't follow the classic shape.

The five stages are as follows:

1. Research and development
2. Introduction
3. Growth
4. Maturity
5. Decline



The product life cycle by Tres West CC
BY-SA 4.0

A company often incurs high research and development as well as marketing costs when introducing a product but experiences higher sales as product adoption grows. Sales stabilise and peak when the product's adoption matures. However, when competition enters the market, product popularity declines, or the product becomes obsolete, the product enters the decline stage. The product life cycle helps to inform business decision making regarding price, promotion and distribution.

There are various strategies used by businesses to extend the life cycle of a product to prevent it entering the decline stage

- Product differentiation → Innovating a product to make it stand out from competing products
- Price reduction → When a product reaches maturity, premium prices may cause the product to enter decline so the price is often reduced.
- Rebranding → New packaging and revamping a product can attract new customers to try the product
- Repositioning → Involves exploring new markets which the product can be sold in
- Increasing market activity → Running sales promotions (e.g. chance to win a holiday, buy one get one free, 20% off etc.) can encourage customers to try the product

Spotify

Spotify is aiming to extend the product life cycle of its music streaming business. Spotify could either focus on marketing strategies in existing markets, such as Europe and the USA, or expand into emerging markets, such as those in Asia. Both of these options present advantages and disadvantages in extending the product life cycle.

If Spotify focuses on existing markets - such as Europe - to extend their maturity phase and delay the decline stage, they then have a solid foundation knowledge of the dynamic market. This means that they are aware of consumer tastes and cultures, as well as the products being offered by competitors such as Apple music. As a result, they are able to innovate on their existing services and create new services to meet consumer needs. This leads to Spotify gaining a competitive advantage against competing firms, allowing them to charge a more premium price which in turn results in increased sales revenue and potentially more profits. However, focusing on the existing market and limiting their customer base may cause Spotify to operate at a loss. Apple can afford to operate at a loss due to their various other products acting as cash cows (a business, investment, or product that provides a steady income or profit). This allows Apple to charge lower prices and

therefore gain controlling market share. With a decrease of sales, Spotify could be driven out of the market and into collapse.

Alternatively, an advantage of operating in Asian markets is that competition is weaker as one of the three biggest music streaming services ceased trading in 2016. Therefore, they will be able to attract more customers due to the increased demand which will increase Spotify's sales revenue and potentially increase profit. On the other hand, the Asian market is unknown so the costs associated with advertising and the entry into a new market would prove quite expensive. Spotify may also not understand Asian culture without extensive market research therefore they risk the chance of not being attractive to their target demographic. If sales revenue is low and set up costs are high, Spotify has the potential to make a large loss if this proves to be a risky investment.

The Asian market for music streaming is growing; however, the consumer base in Asia may not be willing to pay high prices, making it difficult to recover the initial investment costs. Instead, Spotify should compete against Apple music in the Europe market by signing exclusive and popular artists. This allows them to charge a premium price due to their well established reputation in Europe - something that wouldn't yet be possible in Asia. The market Spotify operates in is dynamic so changes need to be made quickly to prevent falling behind competitors which is harder when Spotify would have overseas operations to manage too. The service provided by Spotify is a subscription so customer loyalty is key, therefore Spotify need to attract more customers in the existing market.



The Cheetahs

They extend their legs to leap through their battlefield,
Launching into the air with every step,
Their speed increases in line with their insatiable greed,
Their guilt reflected by the tear stains which cut up their face.

Their chestnut eyes focus on the prey,
In their peripheral stands a gazelle,
Prancing around,
Oblivious to the dangers ahead.

The killers dart in the direction of the gazelle,
Racing against the harsh winds,
Eventually taking the final leap.

Beon Maliackal

GEORGE SKIPPER (RE)

DOES GOD EXIST?

The problem of evil and suffering

The problem of evil and suffering may count as evidence against the existence of God, but several arguments throughout history have been created to tackle the problem of evil and the oldest and most important is the free will defence.

The free will defence is the idea that due to God being omni benevolent, he had to allow humans to have free will and due to giving them free will, Adam & Eve consumed the forbidden fruit cursing all of humanity with the original sin. Therefore, humans commit evil due to the free will they have, explaining all moral evils. Although God could stop humans from committing moral evils he chooses not to as free will is more important. However, this argument fails to recognise natural evil, as free will cannot explain deaths caused by tsunamis or earthquakes for example. However, the free will defence has been developed further into two different theodicies: Augustinian and Irenaeanus.

The Augustinian also believes evil came about from the misuse of free will. St Augustine of Hippo (354-430) created an argument for the existence of moral evil claiming that God originally created the world in perfect harmony and that only due to moral evils being committed was the world thrown "off course" and the harmony destroyed, allowing for natural evils to occur. Augustine also defends God's omnipotence by defining evil as not its own entity but a lack of good, in the same way darkness is a lack of light. He also claims that Jesus Christ's death was to atone for all of mankind's sins and that at the end of time the good (those who followed Jesus' teachings) shall be rewarded and the evil shall be punished. However, Augustinian theodicy has weaknesses, such as how a perfect world would surely not go wrong; creatures

within it would not rebel and therefore evil would be God's fault and humans would now be paying for God's mistakes, and if God was all-loving he would not make humans pay for his mistakes.



War in the Congo has resulted in thousands of displaced people. MONUSCO CC BY-SA 2.0

Irenaeus' Theodicy is quite unique. Irenaeus states that God made us in an immature moral state with the potential of greatness; however, suffering is needed to attain greatness and perfection. Irenaeus believed that pain and suffering is useful as a means of knowledge and allow us to be empathetic, it also allows for character building as we grow from challenging experiences, and therefore if everything was good then nothing would be good. Finally he claims that the world runs on a set of natural laws and that natural evil came into existence to keep these laws upheld and that the people who experience the suffering deserve it or need it. Irenaeus believes that only through pain and suffering can we achieve the moral perfection needed to gain access to heaven. However, Irenaeus theodicy is limited. It denies the 'fall' and it simplifies Jesus' role to a simple moral example going against major Christian beliefs. David Hume asks, could the world not be a little more

hospitable and still teach us what we need to know? Hume argues that the amount of suffering some experience is unfair and how can it be argued that it is teaching us anything? If a child is killed by an earthquake, what moral perfection has the child truly been able to achieve? What about a newborn that has not even lived its life yet? These deaths and tragedies simply cannot be explained with this argument.

Finally, process theology developed by A.N Whitehead believes that God cannot control but only persuade what we become and how we affect others, believing that God cannot be controlling as he would then become dictatorial. He argues that God is also personally involved with humans and whilst he also feels their joy and happiness, he also experiences evil and suffering the same way humans do, with process theology deeming him 'the fellow sufferer'. However, this view changes the entire nature of God from classical theism and is therefore not accepted by most religious believers. It never even acknowledges the existence of an afterlife and has no evidence or argument to justify its beliefs, being easily dismissed as 'just a theory'.

In conclusion, the problem of evil and suffering successfully critiques the concept of the classical monotheistic God. However, if religious believers are willing to alter their view of God, or believe that omnipotence is subjective, then it does not work. Furthermore, many believe that humans cannot understand God's reasoning or divine plan, and therefore what we see as evil may not truly be evil in the universe but simply evil to humans. Consequently, it is impossible to determine if evil and suffering are truly 'evil' as we are not all-knowing like God and never shall be.



AMIE YOUNG (LAW)

NEGLIGENT MISSTATEMENT AND VICARIOUS LIABILITY

Introduction

Negligent misstatement is a tort which exists surrounding a misrepresentation of fact or a misleading statement made from one party to another. Vicarious liability is another tort which imposes strict liability on employers for the tortious acts of their employees. Below is a hypothetical situation that helps elucidate these torts.

Leroy owned an antique table. He asked Movers, a local firm of auctioneers, to value the table. Movers sent Nickie to visit Leroy. Nickie worked part-time for Movers, and they often asked her to visit customers who needed advice on antique furniture. A paragraph in Nickie's contract with Movers stated that she should only advise customers on furniture.

While Nickie was at Leroy's house, Leroy asked her to value a diamond necklace. Nickie stated that the necklace was a fake and had no value. Leroy gave the necklace to a local charity shop. Leroy later discovered that the necklace was genuine and that its value was £50 000.

Consider the rights and remedies of Leroy against Nickie and of Leroy against Movers in relation to his loss.

With regard to Leroy's losses, it is necessary to examine the relevant issues concerning the recovery of damages for economic loss. The courts exercise a generally restrictive approach to the law regarding the allowance of claims for economic loss in the tort of negligence. There are two types of economic loss. Firstly, pure economic loss, which delineates financial loss, which is not directly consequent of any damage to himself or property and is generally unrecoverable in the tort of negligence (*Weller v Foot and Mouth Disease Research Institute*). Secondly, consequential economic loss, which is directly consequential of personal injury or property damage caused in negligence and is typically recoverable (*The Fortunity*). One of the main exceptions to pure economic loss being unrecoverable relates to pure economic loss arising from a negligent misstatement. With regard to the scenario, we are discussing pure economic loss as a result of a negligent misstatement because Nickie advised Leroy negligently. For Leroy to bring an action of negligent misstatement successfully, the existence of a 'special relationship' (*Hedley Byrne*) or 'relationship of proximity' (*Caparo v Dickman*) must be proven between Nickie (the defendant) and Leroy (the claimant). This will decide whether Nickie owes a duty of care to Leroy in relation to her provision of advice under these principles. For a duty of care to be proven, all five features of the relationship must be demonstrated. The first element to be argued is that Nickie possesses a special skill or expertise (*Mutual Life and Citizens' Assurance Co v Evatt 1971*). Nickie satisfies this criterion because she has the requisite knowledge and skill required by Leroy (*Esso Petroleum v Mardon 1976*) as she offers services in valuing property and Leroy required a valuation of an antique table and a necklace. Nickie is employed by a company of auctioneers and so is in the business of giving the type of advice sought by Leroy; Nickie does possess a special skill or expertise.

The second criterion to discuss refers to Nickie's voluntary assumption of responsibility for her statements (*Hedley Byrne*). This regards whether Nickie is prepared to take accountability for her valuation. Within Nickie's contract with Movers the statement that 'she should only

advise on furniture' could qualify as a disclaimer; preventing the voluntarily assumption of responsibility for her statements. However, Nickie portrayed a disregard of this statement and chose not to highlight the disclaimer to Leroy which could render any claim of the statement clause operating as a disclaimer unsuccessful. Due to this, Nickie voluntarily assumed responsibility for her statement of the necklace being worthless.

The third feature of the relationship to establish relates to the user of the statement being known (*Yianni v Edwin Evans and Sons*). Nickie and Leroy interacted in an in-person meeting at his house. This suggests that the user of Nickie's advice was known to her (*De La Bere v Pearson*). Similarly, it must be found that the purpose of Nickie's valuation was known (*Reeman v Department of Transport*). This component will only be met if Nickie knows or should know when making the statement for what purpose her advice will be used. The scenario is absent of any indication that Nickie expressly knew the purpose of her valuation of the necklace, however she should know as a qualified and experienced auctioneer that typically people request a valuation of their possessions in order to sell them. Through this, it can be assumed that as a competent auctioneer, Nickie did know or should have known the purpose for which her advice would be utilised for (*Smith v Eric S Bush*).

The final factor to be evaluated is reasonable reliance (*James McNaughten Paper Group Ltd v Hicks Anderson and Co*). It is clear that Leroy relied on Nickie's valuation and acted in accordance with what the valuation entailed by giving the necklace away to a charity shop for free as he believed it to be of no value. Additionally, it can be argued that if Leroy was unaware of Nickie's disclaimer in her contract with Movers, it was particularly reasonable to have relied on her statements as Leroy was under the impression that Nickie was competent in valuing jewellery, due to her acting upon his requests to value the necklace without protesting her capability of jewellery valuation. These facts outline that Leroy acted on Nickie's advice and did so reasonably, under what he believed to be the advice of a proficient advisor (*Yianni v Edwin Evans and Sons*).

Regarding the tort of negligent misstatement, provided that the scenario facts and the court align with this argument, a special relationship does exist between the claimant and defendant which indicates the owing of a duty of care from Nickie to Leroy. To further prove negligent misstatement has occurred, standard of care must be examined. Nickie is expected to avoid giving Leroy incorrect and negligent advice when valuing his possessions, in order to prevent Leroy suffering 'damage to the wallet'. This is the standard of care required by the defendant. Nickie did not display the care, skill or expertise that would have been displayed by a reasonably competent auctioneer, as she valued the necklace incorrectly, branding it fake and of no value when in fact it was worth £50,000. Furthermore, Nickie operated unprofessionally when she valued a good that her contract forbids her to. These two factors make it extremely unlikely that Nickie will be found to have met the standard of care expected.

Causation must also be shown on the balance of probabilities by implementation of the 'but for' test (Barnett). But for Nickie's negligent misstatement of Leroy's necklace, Leroy would not have given the piece away to a charity shop and would not have suffered pure economic loss of £50 000. As Nickie's negligent misstatement has been proven to be the cause of Leroy's loss, he could recover pecuniary losses of up to £50 000 because pure economic loss arising from negligent misstatement is one of the few instances when damages can be recovered for non-consequential financial loss.



JAMES WILSON (PHYSICS)

DISCOVERING THE NUCLEUS

A how-to guide for aspiring physicists

An atom's nucleus was discovered by Ernst Rutherford and a team of scientists in 1911. The experiment was set up to test J.J. Thompson's model of the atom (known as the 'plum pudding' model), which presented the atom as a positive mass with negative charges dotted around inside it, like the currants in a plum pudding.

Proving the Nucleus Exists

1. First, you'll need to set up your equipment as seen in the diagram below (safety is of course advised at all times when handling sources of alpha radiation!). Be extra careful with the gold foil, it is easy to tear!

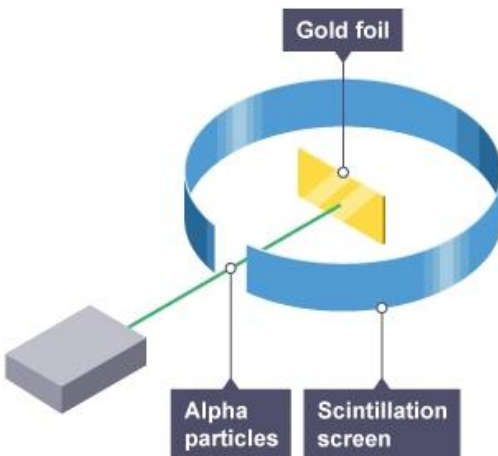


Image taken from <https://www.bbc.co.uk/bitesize/guides/zgc2y4j/revision/2>

2. Beam the alpha particles towards the gold foil. These will then pass through and collide with a zinc sulphide screen. This collision will cause a scintillation, or flash of light.
3. Next, spend a painstaking number of hours counting every time you see a flash and the angle it collides with the screen from the gold foil.
4. Then, realise (or get told by another scientist) that you've been measuring from the wrong side of the foil, and switch round.
5. Be surprised when you see flashes around the sides of the gold foil, and even some that show the particles were completely reflected by the foil and bounced back towards you (here's your chance to make an iconic comment, something along the lines of, "It was so surprising. As if you'd fired a 15-inch shell at a sheet of paper and it had bounced back and hit you").
6. Consider why some particles collided with the sheet at a different angle to the normal through the gold foil and why some are totally reflected backwards.
7. Conclude that the atom must have an incredibly small centre, which is incredibly dense because it contains almost the entire mass of the atom, and must be positively charged, as it reflected the alpha particles, which, being an equivalent to a helium nucleus (2 protons and 2 neutrons), also has a positive charge, just like those two magnets you tried to push together with both North ends facing each other as a kid.



KIEREN BAKER (POLITICS)

POLITICAL IDEOLOGIES

From left to right

In the social sciences, there are perhaps four main political ideologies, or *modes of production*: socialism, conservatism, anarchism, and liberalism. This article provides a brief outline of these. They are some of the most influential and widely studied in modern political discourse.

Socialism is an ideology that seeks to create a society where wealth and resources are owned and distributed by the community, rather than by individuals or private corporations. In a socialist system, the government typically plays a large role in the economy, providing basic goods and services to all citizens and ensuring that everyone has equal access to education, healthcare, and other essential services. The idea behind socialism is to create a more equitable and just society, where everyone has a fair chance to succeed regardless of their background.

Conservatism on the other hand, is an ideology that emphasises traditional values and institutions, and seeks to preserve the existing social and economic order. Conservatism generally favours limited government intervention in the economy and upholds that individuals should be free to make their own choices and pursue their own interests without interference from the state. Conservative ideas are often associated with religious or cultural values and are sometimes criticised for being too resistant to change.

Anarchism is an ideology that advocates for the abolition of all forms of government and authority, including the state, corporations, and other

institutions. Anarchists believe that individuals should be free to organise themselves without the need for hierarchical structures or centralised control. The goal of anarchism is to create a society based on voluntary cooperation and mutual aid, where individuals are free to pursue their own interests without being subject to external constraints.

Finally, liberalism is an ideology that emphasises individual freedom and the importance of protecting individual rights and liberties. Liberals generally favour a limited government that is responsible for protecting individual rights and promoting social welfare. They believe in the importance of free markets and individual choice, and tend to be supportive of civil liberties and social progressivism.

Each of these four ideologies has its own unique strengths and weaknesses, and they have all played important roles in shaping the political landscape of the modern world, including that of the UK. Understanding these ideologies and their underlying values can be helpful in developing a broader perspective on political issues, and can help us make informed decisions about the kind of society in which we want to live.



RUBY WARREN (CRIMINOLOGY)

THE TRANSACTIONAL APPROACH TO DEVIANCE

Sociology and 'labelling theory'

Sociology experienced a cultural turn in the 1960s as Howard Becker, in his book 'Outsiders' (1963), developed Emile Durkheim's work 'Suicide' (1897) to provide a different account of how some social groups come to be classified as different, against the norm, or deviant. Deviance was previously understood as a feature of the individual or group, who chose to become outsiders. Becker argued the opposite and suggested that society represents groups as deviant.

To put this theory into a relatable context, we're all victims and perpetrators of labelling one another; perhaps we can recall labels that came from our parents during primary socialisation (the first and arguably most important stage of socialisation where children learn to walk and talk), 'mischievous' or 'troublemaker'. However, labels can also be positive, maybe during secondary socialisation (where we learn universal values through agents such as education and peer groups) you were labelled as 'hard-working' or 'funny'. These labels can be used in passing, without much thought or meaning put behind them, but when we look below the surface (as sociologists like Becker did), we can think more critically about labelling others.

What is the labelling theory?

Becker's key idea about labelling is deviancy "is not a quality of the act a person commits, but rather a consequence of the application by others of rules and sanctions to an 'offender'. Deviant behaviour is behaviour that people so label" (Becker, 1963: 9)

To unpick this, Becker suggests that when someone is deviant or commits an act of deviancy (underage drinking, theft, vandalism, truanting from school) the act only becomes deviant when people react to it as being such. The labelling theory focuses less on the severity of deviancy itself (which can be a criticism, the theory is often critiqued for promoting criminal victimhood and ignoring real victims of deviancy) and more on social responses and the encouragement of deviancy. Becker in particular was less focused on why people commit deviant acts and more focused on why people label behaviour as deviant and what effect the label has on individuals and society.

According to Becker (*ibid.*), the process of labelling is as follows:

1. First, a negative label is given to someone (e.g., thug, troublemaker, thief).
2. The label can then be internalised - the person receiving the label begins to believe it.
3. The label is reinforced and given multiple times, this can lead to deviance amplification, where a person's deviance is enhanced and encouraged as they believe it is now a part of their self-identity; it is who they are.
4. The label then takes a Master Status - it overrides and becomes more important than any positive labels the individual has ever received (e.g., hard-working, loving).
5. Finally, this leads to the individual developing a deviant career. This is related to Edwin Lemert's (1951) work on primary and secondary deviance. He suggests after someone carries out a deviant act (primary deviance) the reaction they get from others can encourage subsequent deviant acts (secondary deviance) which is termed a deviant career as the person is now frequently engaging in deviancy.

Social characteristics and their influence

When Becker was developing this theory, he suggested that people react differently to the same act depending on the social context and that this determines the label that is placed on the act. Homosexuality illustrates these ideas quite well. In the 1930's, European societies regarded homosexuality as deviant and therefore people reacted to it with a certain disdain. This meant that the label placed on homosexuality was one of deviance. However, Margaret Mead's research (1935), suggested otherwise in different societal structures, where in Samoa, homosexuality was regarded with a kind of openness and acceptance, and therefore was not labelled as deviant.

Within Anglo-American society, social class also plays a role in defining deviance. William Chambliss (1973) spent two years observing 14 high school students aged 16-19. He observed 14 boys from two different peer groups: six were working class 'Roughnecks' and eight were middle class 'Saints'. He found that the behaviour of the Saints was much more deviant than that of the Roughnecks, though both groups were treated very differently by teachers, police and society. The Saints were viewed as 'good students' by their teachers and were therefore given a positive label. However, the Roughnecks were viewed as delinquents and were labelled as such. The Saints could easily pay off police fines when they transgressed whereas the Roughnecks were more likely to be arrested. As Chambliss explains, because the Saints had a positive label, their behaviour was interpreted as harmless and therefore social control (e.g. by the police) was not imposed upon them and their deviancy was not encouraged. This stopped them from developing a deviant career and the Saints grew up to go to college and attain high-end jobs. In comparison to this, the Roughnecks were interpreted as deviant and social control was enforced upon them, which then led to deviancy amplification, creating further deviancy, evidenced by the fact that the Roughnecks grew up to be unemployed.

Conclusions

To conclude, it is difficult to determine how legitimate the actual effect of labelling is. Some people may be reluctant to believe that something recognised at a more harmless level as 'name calling' could really result in a 'deviant career'. However, it's interesting to speculate how deeply

reactions to our behaviour from our friends, family and teachers can determine our behaviour and self-identity.

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ASHLEIGH ROGERS (DT)

BIOMIMICRY

The crossover of technology and nature

Biomimicry, literally meaning 'life' + 'imitate', is a discipline that seeks inspiration from nature's designs, processes, and systems to solve complex human challenges. Nature has evolved and perfected its solutions through trial and error over millions of years, resulting in efficient, sustainable, and resilient designs. It harnesses this vast source of inspiration to create innovative solutions that benefit human society while minimising our impact on the environment. Biomimicry has already been optimised in the industry of transport, fashion, architecture and more.

Biomimicry draws inspiration from nature's time-tested principles and patterns to create sustainable solutions. It encompasses various disciplines such as biology, engineering, materials science, and design. By observing and understanding how organisms have adapted to their environments, scientists and engineers can replicate and incorporate these strategies into human technologies and systems. Nature's designs are abundant with innovative ideas waiting to be discovered. By studying nature's strategies, scientists can unlock novel approaches to challenges such as energy efficiency, waste reduction, and resource management.

Examples include the bullet train, designed from 3 different species of birds. The new model of bullet train significantly reduced noise and air resistance, resulting in secondary benefits of reducing energy consumption and cost savings. Engineers used their hypothesis that the shape of the kingfisher's bill is what allowed them to dive at high speed from open air into water and create minimal splash, as well as

becoming interested in the fimbria (comb-like serrations) edging of primary wing feathers. These features break down air rushing over the wing, muffling sound and allowing owls to fly silently. The underside of the train was shaped similar to that of a penguins' belly to decrease wind resistance and therefore reduce aerodynamic noise.



Shinkansen (bullet train) by Wei-Hang Chua CC BY-NC-ND 2.0

Nature excels in producing materials with exceptional properties while minimizing waste. Spider silk, for instance, is incredibly strong and lightweight, inspiring the development of advanced textiles. Researchers have also looked to lotus leaves for self-cleaning surfaces, enabling the creation of low-maintenance coatings. By imitating nature's material innovations, industries can reduce their environmental footprint and enhance product performance.

Biomimicry also offers a wealth of solutions to enhance energy efficiency and sustainability. Studying how plants convert sunlight into energy through photosynthesis has inspired the development of solar cells and artificial photosynthesis technologies. The wings of a butterfly

have inspired a new type of solar cell that can harvest light twice as efficiently as before and could one day improve our solar panels. Thin film solar cells (some just nanometres thick), have a lot of potential. These are cheaper and lighter, but because they're less efficient, we usually use them only in watches and calculators, instead of solar panels. The rose butterfly is native to Southeast Asia and is cold-blooded. It needs sunlight to fly, so its black wings have evolved to be very good at absorbing energy. Most solar panels are positioned at an angle, which means they generate lots of power for a few hours and then not much the rest of the time. Solar panels using this (Siddique's) technique could produce more power throughout the day.

While biomimicry holds tremendous potential, ethical considerations are crucial. Respecting and valuing nature's contributions is paramount, ensuring that the practice of biomimicry is sustainable, respectful, and protects biodiversity. Collaborating with local communities and indigenous knowledge can provide valuable insights and contribute to responsible biomimicry practices.

Biomimicry offers a transformative approach to innovation, drawing upon the brilliance of nature's designs, systems, and processes. By understanding and imitating nature, we can develop sustainable solutions that harmonise with the environment and enhance human well-being. From the efficiency of energy systems to the sustainability of our world, biomimicry has the power to revolutionise industries, foster sustainability, and shape a better future for our planet. As we embrace biomimicry, we unlock the potential to coexist and thrive with the natural world, bridging the gap between technological advancement and ecological harmony.



ANDREW EVANS (SGS RADIO)

THE IMPORTANCE OF RADIO

Introduction

The radio, first made in 1895, is still used widely in cars, workplaces, and at home. However, it wasn't always as renowned as it is now, and the radio's initial use was for communication overseas during the 1920's using morse code. The importance of radio transmission grew during World War One, enabling communication between units in the army, kickstarting a boom of popularity for the use of radio in the home. In Europe and the US, the KDKA was the first station ever to be licensed by the government, and the BBC (British Broadcasting Corporation) was the first introduced to Great Britain.

Broadcasts in England began in 1922 with the BBC's air in London, rapidly gaining popularity as a news source following the newspaper strike in 1926. Granted, with radio being one of, if not the most popular news source at the time, the prominence of it surged once again throughout World War Two. With the radio, news about the war could be declared to the public, but it was also used as an information rallying source between governments and armies, alongside using it to garner public support.

Before then, radios had been a source of entertainment, but stations began to broadcast more of what we commonly know them for today – music. The target audience for the radio went from families to pre-teens and adults reaching their mid-thirties, gaining more traction than ever before. This enabled more genres of music to emerge, such as punk rock. With this notoriety came pirate radio stations, (getting the name

from being broadcasted in ships off the coast,) first being introduced in 1964 with Ronan O’Rahilly’s ‘Radio Caroline’. These stations soon became a relevant part of British culture, particularly with fans of underrepresented music genres and those in the underground rave scene during the 1980s-90s.

With such relevance in the past, what purpose does the radio serve today? Statistically, it’s still one of the most trusted and used media sources in the world, and with rises of misinformation spreading over the internet like wildfire, some may prefer it as a reliable news source, even over television. The radio is affordable at any time, only often needing signals, which can make it popular at times where cutting costs is a priority. As society becomes more progressive, radio can be used as a means for voices to be heard, with more audience engagement and interest.

At Spalding Grammar, we hope to do the same – with the introduction of our radio, we hope that every voice in school can be heard; including yours! More details will be coming soon. Stay tuned.



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