



King's High School

Inspire Essay Competition 2020



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Foreword

Our fourth annual Inspire Essay Competition is a symbol of the passion, dedication and intelligence of the students of King's High. Not only are the essays gathered in this volume of a superb quality; they were also researched, written and submitted at a time when our school community was connected through remote learning. To see so many entries (over 50 once again) produced during this challenging period is a testament to the brilliance, imagination and commitment of our students. Reading through them has made us feel proud, once again, to work with such wonderful young people.

The competition brief, as ever, was simple. In Oxford, graduate students of the past have sat the legendary All Souls examination, writing in response to a single-word prompt such as 'Courage', 'Society', or 'Liberty'. Our own competition takes away the support of a prompt, asking students to research and write an essay on any topic of their choosing. We are delighted to be sharing the Highly Commended and prize-winning essays from the work we received in response. The purpose of the competition, and of our Inspire Programme for Academic Enrichment more broadly, is to cultivate creative thinking, independent ideas, and intellectual curiosity. Reading and judging essays on such a range of topics has made us feel that this aim has been achieved, and in some style.

As well as the essays gathered in this booklet, we received excellent work on topics as diverse as Marcus Rashford's political lobbying, vaccines, meat eating, the reliability of history, horse riding, animal rights, the next technological steps after 4D, cercopithecidae (I hope I've spelled that right), and several thought-provoking essays on the global pandemic. It is always very difficult not to be able to include every print-worthy essay we receive. We look forward very much to receiving future Inspire work from all of the students who entered this year.

Please continue to look out for the various opportunities for academic enrichment that we offer at King's. Our Inspire Programme of trips, dinners, lectures, clubs and competitions is designed to make our community as intellectually broad and vibrant as it can be. Regular trips to Oxford, Cambridge, London and beyond, as well as talks from world experts in their field, are a staple of our supra-curricular provision. As a school we warmly encourage all students to get involved with opportunities that might spark exciting ideas or pose new, challenging questions.

Dr P Seal

Director of Studies

Year 9 Prize Winning Entries





FIRST PRIZE
YEAR 9

Why is antibiotic resistance so difficult to control?

Niya Bains

Antibiotics were discovered in 1928 with the discovery of penicillin by Professor Alexander Fleming of Bacteriology at St. Mary's Hospital in London. Ever since then, we have used them as the primary tool to prevent and treat bacterial infections. Through the overuse of antibiotics, however, resistance has emerged as a major problem. Antibiotic Resistance occurs when bacteria and other microorganisms can survive under exposure to an antibiotic, due to a modification that gives the bacteria immunity. Once an antibiotic has been used, the remaining resistant bacteria will form a resistant colony, which can cause illness that is extremely difficult to treat, as the antibiotic previously used will have little to no effect.

Resistant infections are becoming increasingly frequent with many examples, including methicillin-resistant *Staphylococcus Aureus* (MRSA) or Fluoroquinolone-resistant *Salmonellae* (FQSS).¹ Already, antibiotic resistance is becoming a problem for treating pneumonia, tuberculosis, gonorrhoea, and salmonellosis, and it is beginning to become a problem for HIV and malaria too.² Researchers estimate that resistant bacteria cost the US around \$26 billion annually, a figure which is predicted to rise. Furthermore, it is estimated that by 2050, up to 10 million people will have died of resistant infections globally.

In this essay I will investigate three main areas that greatly contribute to the development of resistance: the agricultural sector, the medical sector and antibiotic development.

Across the world, antibiotics are used in the production of livestock for the treatment of illness but also for growth promotion. This regular use of antimicrobials has put an unnecessary selective pressure on the microbial ecosystem in farms, leading to the spread

of antibiotic resistant genes (ARGs) among bacteria in both animals and humans. In the USA, most conventionally grown poultry, pork and beef farming involves the use of antibiotics in some form.³ In 2010, around 63,000 tons of antibiotics were used in livestock and, due to factors such as population growth and increasing demand for meat, this is predicted to rise by 67% up to 106,000 tons in 2030.

However, most of this antibiotic use in farms is designed to suppress disease or for growth promotion, as opposed to treating illness. Human antibiotics are routinely used in animal feed, not just to treat illness. This kills off most bacteria, allowing antibiotic-resistant ones to thrive. These resistant bacteria can be spread to humans, through manure fertilisers or badly cooked meat, and can cause serious illness. To lower this risk of antibiotic resistance farmers should therefore stop the routine use of antibiotics; they should inject antibiotics directly into infected animals rather than adding it to the feed and should explore the use of alternatives such as ionophores or probiotics.

My second point is that, in medicine, antibiotics are our primary weapon against bacterial infection and are commonly used in hospitals globally. However, they seem to be losing potency against many diseases, resulting in increased mortality rates, longer treatments, and greater financial burdens on hospitals, and in the case of the UK, the NHS. To solve resistance, developing in livestock use of all subtherapeutic antibiotics should be terminated. However, we cannot simply do this in human medicine. Often the best treatment for a bacterial infection is a course of antibiotics. So ironically, giving the best care for patients can be against the interest of humanity.

There are superbug strains that are becoming very dangerous, emerging in hospitals across the world.

This is a result of exposure to large antimicrobial selective pressures. An example of one of these resistant bacteria is the case of *Staphylococcus Aureus* (*S.aureus*). Many antibiotics are losing potency against bacteria due to the spread of resistance. Superbugs such as MRSA or VRE are becoming difficult to treat effectively. To reduce resistance, antibiotic usage must limit prescriptions and educate the public and medical staff about antibiotic resistance.

The final reason why antibiotic-resistant bacterial infections have become such a large problem is the lack of development of new antibiotic classes to replace ineffective older ones. Between 1932 and 1960, we discovered over 20 novel classes of antibiotics. However, in the past 40 years only two new antibiotic classes have been discovered, and many new antibiotics belong to the same few classes. We must therefore increase and improve our antibiotic research, through mandatory investment in research by companies and by basing prices on the value of drugs not on the volume sold.

Recognising the issue with antimicrobial development, the UK Government released a 5-year plan to tackle antibiotic resistance earlier this year, in which they aim to reduce antibiotic use by 15% and resistant infection by 10%.⁵ The plan acknowledges that the Government's £360 million investment in antibiotic research has not been enough to increase discovery. Currently, in the UK, there are only 28 antibiotics in the late stages of development. Many of these belong to the traditional older classes of antibiotic, often having the same core structure, resulting in resistance developing very rapidly. We need to prioritise the discovery of new scaffolds to get drugs that are effective on even highly resistant antibiotics.⁶

This essay has looked at the agricultural, medical, and pharmaceutical industries, to find the best ways to counteract the effects of antibiotic resistance in relation to these sectors. The agricultural industry uses antibiotics heavily in meat production, but this reliance puts human health at risk. Restrictions must be put in place to reduce and eventually end subtherapeutic use of antibiotics of farms. In medicine, the way antibiotics are used could be improved to reduce resistance by limiting use only to patients who need the drugs. In the pharmaceutical industry, the development of new drugs needs to be improved in terms of quality and quantity. The Government can encourage companies to improve this by using the previously stated projects. The limited number of new antibiotic discoveries in the past 20 years illustrates the difficulties faced by pharmaceutical companies. As a result, rapid changes must be made to control the development of resistance, and to improve the development of antibiotics.

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³ Ibid. 955

⁴ Ibid.776

⁵ <https://www.bbc.co.uk/news/health-46973641>

⁶ Ibid. 1089



SECOND PRIZE
YEAR 9

Does being multilingual change the way you see the world?

Multilingualism and its benefits

Carla Estrada

Multilingualism is the ability of an individual speaker to communicate fluently in more than one language. 56% of the world population is bilingual and trilingual whereas only 44% is monolingual. However, it is extremely rare that bilingual or trilingual people speak all of their languages at the same level of proficiency. Studies show that children born in countries such as the UK or the US with both English speaking parents, are less likely to ever become bilingual or speak another language, besides English, fluently. This is unfortunate, as being bilingual has many advantages and as the emperor Charlemagne stated, "To have another language, is to have another soul."

I am trilingual as I speak Catalan and Spanish at home and English at school. I have always wondered what advantages I had compared to other children and how my brain worked and if it was any different to a child's who only spoke one language. I have since been researching and have found many sources stating that someone who has spoken several languages is more likely to live for longer, make more rational decisions, have a brighter future with more job opportunities and have a connection with people across the world which someone who was monolingual wouldn't understand.

It is also proven that children who are bilingual could easily become trilingual as their language abilities are much higher than an average monolingual. However, people question, 'Is it ever too late to learn a language fluently?' The answer is no. It is never too late to learn a language and you can become just as proficient at any age in a second or third tongue as you would have been when you were younger. However, it does become harder and the older you are the more likely you are to have a foreign accent to the language you are speaking.

Studies show that up until the age of around ten it is possible to attain the accent of the language you are trying to learn, however sources say that after this it is extremely rare. This is because at around this age, your brain shuts off and it becomes less possible for it to change itself in response to experiences. After reading this in many articles I posed a question to myself, 'Does your connection to the people and the culture differ or become less close if your accent is not proficient?'

The answer is yes. A connection between yourself and a foreign person speaking the same language as you, is a key way through which you connect with them. However, if their accent is unconvincing then you may not feel as close as you would. Nevertheless, speaking another language fluently, whether you have a foreign accent or not, does not change the fact that you see the world differently. It is scientifically proven that many bilingual people feel that the way they act, laugh, love, and see the world in general changes according to the language they are speaking. This opens their mind and gives them so many rewards for their later life and the experiences they will share with their languages. Neel Burton (psychiatrist from Oxford university) says that, "Every language is another way of being human, another way of being alive."

Being bilingual brings many benefits to your brain, which make you internally healthier, but people who speak multiple languages are equally as likely to get dementia, Alzheimer's and other diseases and illnesses like this. However, it is proven that multilinguals are on average more likely to live five years longer than an average person and are diagnosed with illnesses like dementia and Alzheimer's three to four years later than a monolingual, despite being of a similar background, education and occupational status. I was intrigued to find out that my

life could be longer and that this is because I have stronger connections between my brain areas involved in executive functions.

However, in my research I kept seeing the following question posed: 'is a bi/multi lingual person smarter than an average monolingual?' The answer is simply no. Even though multilingual people have a more developed brain as they have experienced different ways of thinking since they were young, this does not necessarily mean that they are smarter in school or more successfully professionally, as many bilinguals can have learning difficulties and/or dyslexia. Bilinguals can struggle just like everyone else. Because of their understanding of different cultures and the connection they have had with people all around the world since they were little, they might possibly be more aware of people in general and can "read a room" more easily than a monolingual could. They may be better at analysing their surroundings, multi-tasking, and better at problem solving. As Ann Campanella (American writer and editor) stated, "One of the benefits of being bi-cultural is simply the awareness that how YOU live is not the only way."

Being multilingual can also improve your judgement. When we are faced with an issue or a problem we tend to "waffle" and not think rationally; we just say random words and not think logically. It is proven that someone who is forced to judge a situation in their second fluent language, which isn't as proficient as their first, makes a more logic judgement. This is because their language skills are less skilled and so they only use necessary vocabulary; they are focused on getting the words right, so they also think harder about what to say. I did a survey with all of the bilingual and multilingual people I knew such as my family and friends, asking them what they most liked about having the ability to speak more than one language fluently. Here are some responses:

- "I can see the world in three different ways"
- "I can easily communicate with people all around the world"
- "I can read many authors in the original version"
- "It helps me to empathise and be more open towards different people"
- "It helps me to be less ignorant of my surroundings"
- "Language is knowledge. The more you know the more power you gain."

As Geoffrey Willans (British author and journalist) has said, "You can never fully understand one language until you understand at least two"

Since I have been young, both of my parents have spoken to me in the three languages I am proficient in today. However, this at times could become confusing and I mixed up the languages on a daily basis. Like all parents, they would worry and think that I would be behind the other children who could speak one language fluently at that age, whereas I was only 'half fluent' in all three and therefore mixed them up. Many parents get put off by the fact that their children will intermingle the languages if they are bilingual; however, experts say that intermingling languages is completely normal and should be nothing to worry about. Children themselves develop speech at different stages and bilinguals usually end up proficient in all of their languages a little later than a monolingual child trying to master a first tongue. As Frank Smith (teacher) said, "One language sets you in a corridor for life, two languages opens every door along the way."

To conclude, after having completed this research I have a great deal about languages and their benefits. I am so to my parents for spending time helping me to learn the languages I love speaking today, and to be able to make connections and friends with people all around the world. I am also so excited for all the opportunities that await me in the future. Finally, as Nelson Mandela once said, "If you talk to a man in a language he understands it goes to his head, but if you talk to him in his own language it goes to his heart."

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THIRD PRIZE
YEAR 9

What is it about masculinity that makes violent crime more common in young men?

Ema Jasper



Introduction

Violent crime is most commonly committed by young men between the ages of 16-25. Masculinity is defined as 'The characteristics that are traditionally thought to be typical or suitable for men' (Cambridge English Dictionary, 2020). Something that stands out to me is that masculinity is built around social expectation rather than scientific evidence or fact. The meaning of the word is derived from what is 'typical' or expected of men. We must separate the idea of males and masculinity in order to truly understand what it is about masculinity that makes men more prone to violent crime. Males are more likely to be masculine and we have therefore learnt to associate masculinity with males.

By the age of 31, one third of men will have a conviction for a serious crime. In women, only 1 in 13. This is a radical difference, and the question is whether maleness is the source of this difference, or masculinity.

Social Expectation

One key factor is that social expectation makes males feel they must commit violent crimes. There is an expectation that males will commit violent crime and although it is negative and something that people don't

want to happen; people can subconsciously feel the need to live up to this expectation to fit the trend. Boys can be pressured by peers to commit crime or be called a wimp or girl for not doing it.

Men are associated with certain characteristics and if they do not fit these, they can be ridiculed or criticized. It is likely that even the people pressuring someone into committing a crime know that it is wrong and that they wouldn't do it themselves, but feel they need to pretend in order to avoid being the victim of teasing. This cycle means that even if the people involved don't want to do what they know is wrong, they think they have to pretend for the sake of each other. This can be referred to as peer pressure.

Status

Males are more likely to exert authority over others. This may be down to their natural instinct, physiology, and genetics. Many men who commit violent crime do so because they have come from difficult backgrounds and have not experienced a healthy upbringing. As students, people from these difficult circumstances are less likely to be enthusiastic towards school or even have access to a good education. They are then unable to gain status in school through a positive mechanism whether it be academics, music, or something else.

During teenage and early adult years, the brain develops into the adult brain, which tends to settle at around the age of 25. During this time, people can strive for short term gratification even if this puts them in danger. Adrenaline and testosterone rushes make teenagers, particularly males, do things that they might not otherwise.

If this energy can be properly channelled into something positive such as sport, the occurrences of offending during these years could be reduced. An example of this is boxing. Excess energy can be used respectfully and safely. The problem is that many people do not have the access to this and end up offending as a result.

One outlet for excess energy is gang culture. If unable to gain status elsewhere, young people can be coerced into joining gangs, sometimes needing to exert violence to do this. In gangs, those who good at or interested in sport or academics can gain status through violence and physical strength. They may also feel a sense of belonging and feel attached to peer gang members. Of course, involvement in these gangs can lead quickly to offending behaviours. Often young males (and females) may be exploited and manipulated into offending.

Others may have been coerced into offending because they are vulnerable and may be exploited. They may have a learning disability or neurodevelopmental condition such as autism. Those on the autistic spectrum are also at risk of being the victims of crime. Interestingly, there are more males with a diagnosis of autism than females; the current ratio is 3:1. Many girls on the spectrum are likely to internalise their feelings whereas boys externalise it. Consequently, boys end up getting assessed and spotted earlier than girls. Often, boys express aggression and challenging behaviour in reaction to their condition.

Mental Health

In the UK, one in eight adolescents will have a diagnosed mental health condition. This may be another contributing factor as to why males are more likely to commit violent crime. During adolescence,

there is a range of emotions that may contribute to the decline in mental health. Peer pressure and the need to fit in can lead to low self-esteem. Other contributing factors include poverty and greater numbers living in urban areas.

Adverse Childhood Experiences (ACEs)

Many young offenders, male and female, have experienced Adverse Childhood Experiences. These include trauma, abuse, neglect, parental mental illness, domestic violence, divorce, incarceration, and substance use. These factors can mean that children are influenced negatively by their parents when they are young and could go on to display similar issues when they are older. For example, if a child grows up in an environment where his parents argue a lot and are violent towards each other, they are more likely to mimic this behaviour when they are older as they have normalized it. There is a risk that a child who has experienced trauma and neglect may have suffered a developmental delay and subsequent damage to the brain that could also lead to committing a violent crime.

To prevent this, these issues need to be identified early on so that authorities can help. Rather than allowing young people to deal with 'their own problems' without full awareness of what their future could look like. For this to happen the Government would need to invest more in youth services and preventative work.

Solving the Problem

In Japan, violent crime levels are especially low: it is considered to be the 9th safest country in the world. Why is this and how can we use similar techniques to lower violent crime rate in the UK? One reason for this may be that in Japan, all children in schools have to learn martial arts. There are a few options such as Judo, Aikido and Kendo that

Year 8 Prize Winning Entries

include the release of violence in a controlled, respectful, and safe way. By having a place like this to 'vent', perhaps children grow up feeling like they don't need to commit violent crime as they can release feelings through martial arts. This teaches children discipline as well as the importance of respecting your elders. This basic etiquette also helps young people to understand the workplace later in life. One example of this is when people bow before and after they fight. This displays respect to the other person and the chance to give thanks that you have the opportunity to improve your skill.

These martial arts are compulsory in most schools in Japan, so even the most reluctant teenager must participate. I think this is necessary for the desired effect to be possible as many teens at the age where this is most important will be peer pressured into not doing certain activities at school. This could be for a range of reasons but most stem from the fact that many people consider it not 'cool' to be enthusiastic about school. By making everyone take part, the system ensures that those who will most benefit are able to take part without being teased.

I think that these sorts of practices should be implemented in schools everywhere, to help those who really need it. Just having the opportunity is not enough to ensure that people don't end up offending as it is not guaranteed that those who need it will take part.

Conclusion

This is a complex issue with many factors to consider. The genetic and physiological aspects of masculinity certainly play a part. Whilst brain development and the associated changes may also make males more likely to commit violent offences, it is also dependant on many external or environmental factors. These factors include peer pressure, social expectation and also lack of concern or action towards this issue. After evaluation all of these, I think that one of the most prominent is social expectation and Peer pressure, which seem to go hand in hand: because of social expectation, people pressure others into doing things that they think is normal or right.

To improve this, we should look to other cultures to see what works best. This way, we can make a better world by taking inspiration from one another and changing for the better.

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FIRST PRIZE
YEAR 8

Was the Royal Navy's role most significant in the Napoleonic War, First World War or Second World War?

Rosie Brooker



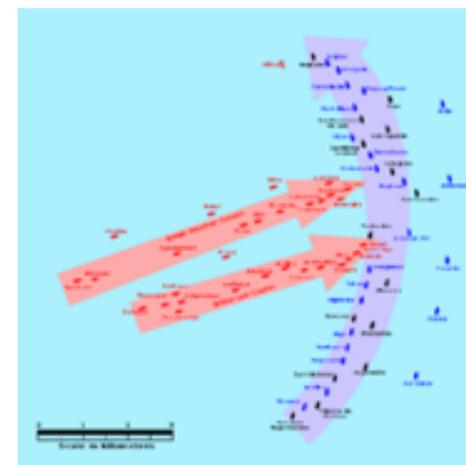
Egypt, with the eventual plan of linking up with Tipu Sultan, ruler of the Indian state of Mysore, in a grand alliance against Britain'.²

This would be a land campaign but would force the Navy to fight globally on two fronts. This was intended to weaken the Navy enough for Napoleon to make the invasion across the Channel. The British squadron, led by Lord Nelson, found the French at anchor in Aboukir Bay,

in Egypt. The French were backed against a spit of land surrounded on either side by shoals which were seemingly impenetrable, but there was a gap and enough water for ships to go around the French on the landward side, and for others to line up on the seaward side, sandwiching in the enemy fleet.

Eventually, 'the British [had] suffered about 900 casualties, the French about 10 times as many'.³ Only four French ships had escaped and Lord Nelson, despite having been injured in the battle, wrote back to the government saying: '...God blessed our Endeavours with a great Victory'.⁴

In 1805, seven years after the Battle of the Nile, a French and Spanish fleet of thirty-three ships of the line left Cadiz with the intention of ending the persistent British naval blockade and launching an invasion of Britain. Lord Nelson gave chase and the two fleets met off Cape Trafalgar. The possibility of an invasion of Britain died at that battle. It was a '[...] great and glorious victory'⁵ and 'established Britain as the world's



leading naval power for a century'.⁶ During these wars, the Navy not only prevented a global war breaking out; it also created a hopeful image of

invincibility to encourage Britain and all who were defending it. The Navy's role was central to the British victory.

Naturally, in the century between the end of the Napoleonic War to the start of WW1, there had been major naval developments. 'Ships moved from wood, broadside guns and sails to turrets, steel and steam';⁷ naval tactics changed, too.

The Dreadnought was 'a new type of battleship [which] dominated navies in the early 1900s'⁸ and HMS *Dreadnought* was 'the first all-big-gun battleship to be launched [...] also the first battleship to be powered by steam-turbine engines [...] faster than any other battleship afloat [...] was intended to act as a deterrent to any nation thinking of attacking Britain'.⁹ All the big navies were building their own dreadnought designs, but especially Germany's navy. This worried the British public, fuelling a fierce arms-race. This was a key factor in the growth of militarism, which was one of the long-term causes of the war. By now, the Royal Navy had become a part of national prestige (contributing to nationalism) and was integral in sustaining the Empire around the globe (adding to imperialism). The world's military powers were eyeing each other warily as they

waited to see who would make the first move. However, when the war did start, in one of the biggest naval engagements – the Battle of Jutland – HMS *Dreadnought* was not present and although the dreadnought ships were there, they were 'too valuable to risk losing [so] the German and British battleships only exchanged fire once',¹⁰ during the war. Germany claimed victory – 'the spell of Trafalgar has been broken'¹¹ as Kaiser Wilhelm said – but Britain maintained control of the North Sea and the German Imperial Navy spent most of the war in blockaded ports.

There were other naval engagements in WW1, such as Gallipoli, where the Allied warships 'attempted to sail through the Dardanelles and bombard Constantinople'¹² and some more unusual clashes, such as those on Lake Tanganyika, Tanzania, which lead to 'probably the strangest naval battle of WW1'.¹³ In the context of WW1, most people regard the Navy as a side-show to the 'real' fighting in Flanders. However, I would argue that the Royal Navy did have a significant part to play in this war: not, perhaps in terms of engagement on the battlefield, but in creating the atmosphere and tension that contributed to the international conditions in which war became an increasing inevitability.

The start of the WW2, merely twenty-one years later, saw three major naval developments: the submarine, the aircraft carrier and *Bismarck*. The first submarines had been developed as coastal defence vessels in WW1, but Germany 'was more daring, developing long-range, oceangoing submarines: *unterseebooten*, or U-boats'.¹⁴ These ships presented a big threat to the Royal Navy's dominance and strength. However, the next development – the aircraft carrier – was a fearsome weapon. HMS *Illustrious* was used at the Battle of Taranto where 'six Swordfish biplanes armed with torpedoes, and six more with bombs, took off from

To an extent, this question relies on the definition of 'significant'. There is no doubt that the Royal Navy has always been an integral part of British military history and national esteem but to analyse its importance in each of these wars requires a closer look at key battles, figures and turning points in history.

The Napoleonic Wars were mainly fought on land, but the naval battles were crucial in determining the outcome of these wars. The most famous naval battle is the Battle of Trafalgar, 1805, but it was not the only significant engagement as, in 1798, Lord Nelson

'completed what was arguably [the] greatest victory'.¹ Unable to compete with the Royal Navy, Napoleon proposed the 'invasion of





SECOND PRIZE
YEAR 8

To what extent does the composer's original intention matter?

Polly Rumble

Illustrious.¹⁵ The battle was a resounding success for the British and was 'the first time a fleet had been put out of action by naval air power alone.'¹⁶

The *Bismarck* was a 'formidable fighting machine' and 'from the moment she was launched, she was a serious threat the Allied naval power.'¹⁷ *Bismarck* was eventually 'defeated by a flimsy "stringbag" biplane'¹⁸, proving the importance of aircraft carriers and collaboration between navies and air forces. 'The day of the giant battleship was drawing to a close.'¹⁹

In this war-weary world, there were other situations requiring the navy to co-operate with other military forces. The D-Day landings of Operation Overlord, 1944, saw 'Allied forces ... launched a combined assault on German-occupied France'²⁰ which 'consisted of two phases: an airborne assault and a series of amphibious landings.'²¹

The Royal Navy also collaborated in the evacuation of Dunkirk, 1940. Royal Navy ships evacuated troops from Northern France, where they had been surrounded by German troops. The Royal Navy was assisted by 'nearly 700 privately-owned small boats from all over the south coast of England [which] were also pressed into service.'²² Together, the navy and the private boats helped 338,226 Allied soldiers escape. The success of the evacuation 'turned defeat for the Allies into a great propaganda coup of their own.'²³

Neither the supremacy of the Royal Navy nor its engagements in battle could be considered significant in the war. Nonetheless, the Navy was significant in that it gave Britain the propaganda material that the country and its allies needed to keep on going; it also gave extra force to combined campaigns.

The Royal Navy has adapted, changed, developed and influenced others throughout history and remains a strong part of our national identity. However, when it comes to assessing its significance in these three wars, it becomes apparent that it was significant in each for different reasons and in different ways. Each war required the Navy to take on a different role to help the country and its people, and it has done that throughout history to support our freedom, independence and power on the global stage with unflinching resilience and determination. And that pride, trust and faith in the military force and those who serve in them can be summarised in the immortal words of Lord Nelson: 'England expects that every man will do his duty.'²⁴

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- The Royal Navy Officer's Pocket-Book compiled and edited by Brian Lavery

I recently wrote a poem titled 'the music that inspires us'.¹ The line 'Guided by the secrets of somebody else's mind' made me consider whether the composer's meaning was an important part of their composition, or whether music stands by itself as a work of art. In this essay, I will explore whether the composer's original intention matters from the perspective of the composer, performer and listener. In doing so, I will explore the theory of 'The Death of the Author' and its relevance to music.²

There are many theories surrounding the meaning of music and its relationship with the listener. For some, music is the most abstract of arts and its meaning highly personal. For others, music criticism is as important as its actual creation. However, it is generally recognised that music does have meaning, and in this context, it is interesting to consider the work of Michel Foucault and Roland Barthes on authorship.³

Foucault argued that there was too much interest in the 'author function' as the source of meaning, claiming we should instead look at a work's wider context. Similarly, Barthes argued that a work is never self-contained. Meaning is not about an author's 'truth', but the different interpretations people take from it – there can never be one single meaning.

Although Barthes focused on literature, he also addressed music criticism for focusing on rigour, brilliance, respect for the score and authenticity. He argued music is a pattern which creates effects and emotions and described listening as emerging from the composer's or performer's unconscious and addressing the listener's. In this way he dismisses the idea that the composer is brought to life within their work. Instead 'It is language itself which speaks, not the author'. Through this we progress from the death of the author/composer to the birth of the listener.

Composer

The composer is the creator of a piece through which something is communicated to the audience. However, does knowing who the composer is, why he wrote the piece and what he intended change the musical experience? It is widely held that for an artist to create, they must have intention. Wimsatt and Beardsley describe this concept as: 'to judge the poet's performance, we must know what he intended.... the way he felt, and what made him write'⁴. However, they warn against focusing on this arguing that 'If the poet succeeded in doing it, then the poem itself shows what he was trying to do'. This implies the meaning is found within the work itself, not through focus on the author. However, this idea still suggests that there is a single meaning within a work. I disagree, as a composer is not present within a score or performance, so it is not possible to look only to the composer for the meaning of music. The music itself conveys meaning and intention, regardless of composer, and this is different to each performer or listener.

In my opinion the performance is a platform for ideas contained within the music. Music guides the listener, rather than imposing a 'right' feeling or reaction. Wimsatt and Beardsley describe art as the 'peculiar possession of the public'. A work becomes the property of the public and is separated from the composer. The listener or performer interprets it in this public sphere.

The premier of Stravinsky's ballet 'The Rite of Spring' is infamous. Descriptions are contradictory; however, the crowd were shocked by Stravinsky's scoring which broke every 'rule' of music. With its wide ranging, harsh sounds, complex rhythms, and excessive dynamics, it is unsurprising it caused scandal; was this Stravinsky's intention? Whether he meant for the 'knock-kneed and long-braided Lolitas jumping up and down'⁵ to receive such reaction, surely, he knew that he was

pushing acceptance of music to the limit? Did he want to provoke, or just push boundaries?

Performer

Applied to music, Barthes' theory encompasses a new role: the performer, who bridges between composer and listener. This introduces the performer's interpretation, removing the listener further from the composer's intention. A performance is never the same twice, whether through speed, dynamics or even mistakes. The experience surrounding the performance, its environment, ambiance, the audience's reaction also greatly changes the meaning taken from the performance. The spontaneity of music is what makes it so personal.

Many classical compositions are not played on original instruments creating quite different sounds. Furthermore, a person listening to a piece centuries after its composition, may not apply the same meaning intended by the composer or portrayed at its premier. One study proves that pieces are played up to 30% faster today than 50 years ago,⁶ this changes the listener's experience and differs from the composer's original purpose.

A score or part will never convey exactly how a performer should play.⁷ It is an outline of directions, a draft for interpretation. To portray the exact intention of the composer, all staccatos, dynamics, ornaments, and cadenzas would have to be played as written. However, certain elements of the score are 'hints', not orders the musician must follow. Thus, a performer can vary their interpretation of the music whilst still reflecting the original score. Through knowledge and understanding the performer can actively embellish it and bury themselves within the moment of the music. In Meyer's words, 'the performer is an active creator, shaping and moulding the abstract scheme furnished him by the composer'.⁸

A performer is often influenced by other interpretations of a work, but no two performers are ever the same. Alison Balsom (trumpeter) was taught by Hakan Hardenberger. Listening to recordings of each performer I was surprised how differently each interpreted the same piece.⁹ Several years ago, I heard Gabriela Montero performing Shostakovich's Concerto No. 1 for piano, trumpet, and strings. It was originally written and performed in Russia in 1933. Before the

performance she talked of its personal meaning to her because of her family's experiences in Venezuela. Her performance was beautiful, emotional, and completely charged by what she brought to it beyond what Shostakovich had written. In many competitions, it is acknowledged that it is not technique that makes a performer stand out from the rest, but how they convey their interpretation of a piece to an audience. This creates the incredible diversity and unpredictability of music.

Listener

Barthes argues 'intention has no business involving itself in the text' and is irrelevant to the performer or listener.¹⁰ Sherburne too suggests music is not just a 'predictive pattern', but a subject 'provided by the listener in response to the predictive pattern'.¹¹ 'A listener is an active interpreter of a piece, who subconsciously applies his own meaningful referencing framework to the piece of music'.¹² The listener is required to apply meaning and emotion to the music and does not expect it to be given to them by the composer or performer.

The emotions felt whilst experiencing a performance can only relate to what the listener knows, understands, and feels, as well as the cultural context. Many experiences affect how someone reacts to a piece, whether that is the reason the piece was originally composed, how it has been used subsequently, or something more personal to them. Often, by the time a listener hears a piece of music, so many different interpretations have been performed that it is no longer a representation of the composer's original intentions. The listener becomes co-composer through their experience, imagination and interpretation, and not just the 'passive auditor'.¹³ Listeners with a 'trained ear' have often studied or played a score before hearing a performance, whereas an 'amateur' listener may have a different response. Any listener is able to differentiate between the emotions conveyed by major and minor keys, and the sense of celebration in pieces such as Beethoven's Ode to Joy. They do not require a precise understanding of the musical constructs. Consequently, to understand the significance of a piece, the interpretation and application of meaning by the listener could hold more importance than musical education or training.

Conclusion

In Barthes's theory, the listener is elevated to creator and the composer is disregarded in favour of the applied meaning of the listener. Between these stands the performer who conveys the composer's work to the listener, gives the music its own meaning and brings it to life. Through the death of the composer, the piece is liberated from meaning and lives as music in its own right. As Foucault said, the 'author function' then disappears: 'All discourses, whatever their status, form, value, and whatever the treatment to which they will be subjected, would then develop the anonymity of a murmur. We would no longer hear the questions that have been researched for so long: who really spoke? Is it really he and not someone else? With what authenticity or originality? And what part of his deepest self did he express in his discourse? Instead, there would be other questions like these: What are the modes of existence of this discourse? Where has it been used? How can it circulate and who can appropriate it for himself? And behind all of these questions, we would hear hardly anything, but the stirring of an indifference: 'what difference does it make who is speaking?''¹⁴

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¹ A journey of sound whispering of happiness,
Each listener's own winding road,
A meandering path to home, to the peace found within

An avenue down a private way,
A voyage through one's emotions.
The never ending trail through life,
Guided by the secrets of somebody else's mind.

An image created through the joys of melody,
The world of somewhere else.
A community of listeners each walking a different street,
The passage to a new way of life.
The pathway to escape

² Barthes, R (1967) 'Death of the Author', in Barthes (ed.) *Image-music-text*: Macmillan

³ Barthes, R *ibid.* Foucault, M 'What is an Author' published in Harari, J.V (ed) (1979) *Textual Strategies: Perspectives in Post-Structuralist Criticism* Ithaca

⁴ Wimsatt, W.K, Beardsley, M.C. (1946) 'The Intentional Fallacy' quoted in Cleary, A (2014) *Death of the Composer, An Analysis of Barthes' The Death of The Author as Applied to Musical Meaning*

⁵ Stravinsky's opinion on the dancers

⁶ <https://www.classicfm.com/music-news/classical-music-is-getting-faster/>

⁷ Even noted dynamics are open to interpretation. What is forte to one composer / performer is different to another. Some composers such as Bach are also very minimal in the dynamic direction they provide.

⁸ Meyer, L. B *Emotion and Meaning in music* quoted in Cleary, A (2014) *Death of the Composer, An Analysis of Barthes' The Death of The Author as Applied to Musical Meaning*, Article – December

⁹ Variations on a theme from Nora, Arban, J.

¹⁰ Barthes, Op Cit.

¹¹ Sherburne, D (1966) 'Meaning and music' *The Journal of Aesthetics and Art*, Vol. 24, No. 4 Quoted in Cleary, A (2014) *Death of the Composer, An Analysis of Barthes' The Death of The Author as Applied to Musical Meaning*, Article – December

¹² *Ibid*

¹³ Cleary, Op Cit.

¹⁴ Barthes, Op Cit.



THIRD PRIZE
YEAR 8

To what extent does ‘Khartoum’ accurately represent the historical events of 1884-1885?

Henrietta Jefferies



How accurate is Ralph Richardson’s representation of Gladstone?



Ralph Richardson’s characterization of Gladstone is in many ways very accurate, however there are also significant errors in the film, mostly surrounding the way in which the decision to send Gordon was made, and with the politics of the time, mistakes that have

most likely been made on purpose to create a more intriguing and impressive storyline. Therefore, it is wise to assume that they were not necessarily mistakes, but were made for dramatic impact.

In terms of attention to detail, the image of Gladstone is remarkable. During ‘Khartoum’ Ralph Richardson wore a ‘finger cap’ upon the forefinger of his left hand, this accurately represented a shooting accident of September 1842. An 1888 recording featuring the voice the Prime Minister even proves that Richardson’s voice was rather factual. More importantly, Richardson interprets Gladstone persuasively, and shows that he was intolerant of criticism. For example, when Colonel Stewart presents his report to the Cabinet, The Prime Minister replies with, ‘Well, I want it (Stewart’s opinion), by heaven, if it agrees with mine.’ This quote shows how opinionated Gladstone really was.

Gladstone is represented as a reluctant imperialist, who was against expanding the British empire, unlike Disraeli ‘I will not assume a British obligation to police the world’. For instance, one of the main reasons Gladstone won the 1880 election had been by attacking Disraeli’s expansion of the Empire (Gladstone referred to this as ‘Beaconsfieldism’), therefore, Gladstone was not going to reverse that

policy by extending British power into the Sudan. However, in reality Gladstone delegated Sudanese affairs to a Cabinet committee composed of the following: Hartington, Granville, Northbrook, Dilke and Carlingford, this however, was not shown in the film. On the other hand, Gladstone addresses Hartington with the words: ‘You and your imperialist friends want any excuse to move into central Africa.’ This quote is very truthful and fits in well with the historical evidence as it shows Gladstone’s unwillingness to commit British troops to the Sudan.

Thus, Gladstone’s reluctance concerning Gordon’s departure is portrayed very accurately, he did not believe in military interventions. Although the historical message concerning the film is accurate, in showing Gladstone’s anti-imperialism, the detail is not so convincing.

‘Khartoum’ could be misleading because one of the crucial scenes involves a fictional meeting between Gladstone and General Gordon. This scene was possibly created simply for dramatic impact. However, a railway event did take place, as Roy Jenkins writes (page 511): Gordon’s ‘send-off party’ was ‘magnificent and incongruous’, Therefore, there was a striking and somewhat quirky railway scene, which just happened not to include Gladstone ‘Gordon had no money on him...he (Wolseley) handed over his gold watch.’

However, we should not be overly critical of the film. Although the meeting did not happen, it brilliantly illuminates the characters of Gladstone and Gordon. ‘It will be the end of Gordon not Gladstone.’ This quote used by Charlton Heston accuses Gladstone of ignoring his political duties by not sending British troops to Khartoum. Likewise, the quote ‘We sent Gordon we did the best we could...’ implies that the blame concerning Gordon’s failure would not be placed upon the government but upon him which was what the government wanted.



One of the key figures that created public enthusiasm concerning Gordon’s departure was a Journalist named W.T Stead (who later died on The Titanic). These social events are not covered in the film, instead it makes viewers believe that it

was Granville, the Foreign Secretary who persuaded the Prime Minister to send Gordon. However, the film later shows demonstrations in London demanding Gladstone to send a relief column into the Sudan.

One of the main questions surrounding this event is: Were the British government sending Gordon knowing that he would fail?

Lawrence Olivier’s portrayal of The Mahdi

‘Just about everyone involved in this 1966 epic about Britain’s imperialist adventure in the Sudan deserves to have sand kicked in their faces.’ – The Guardian

Many critics have been sceptical over the casting of Olivier as The Mahdi, so much so that Alex Von Tunzelmann goes as far to suggest that: ‘Olivier looks as though he has escaped from a racist pantomime.’ Tunzelmann writes: “So, we need a Sudanese Nubian ... how about Laurence Olivier?”. Tunzelmann writes far too critically about a black character being played by a white man. One can challenge her views by stating the following: ‘In the 2019 film ‘David Copperfield’ Dev Patel, an English actor of Asian descent performs in the title role, and there have been no critical uprisings concerning this issue.’ Olivier is arguably one of the best and most celebrated actors in Hollywood, and in many ways his characterization of Muhammad Ahmad is rather sensitive and shows his religious conviction. He truly believed that he was ‘the expected one’.

Muhammad Ahmad, a mysterious man of the Nile, convinced that he was ‘Allah’s instrument on earth’, rose in the 1880s to spread the Islamic religion first over Egypt and then the world, he cried out for holy war. The film illustrates the dramatic hold The Mahdi had over the loyalty of the Sudanese warlike tribesmen, Olivier shows the way in which Muhammad Ahmad was enthusiastic over the use violence to achieve his religious aims: ‘men have died, more must die’, and that blood-shed was a good thing. ‘Khartoum’ also shows The Mahdi addressing a great number of mass gatherings, which shows his inspirational hold over his people.

However, Tunzelmann writes amusingly when concerning Olivier’s accent: ‘His stab at a Sudanese accent sounds like Sebastian, the singing Caribbean crab from Disney’s *The Little Mermaid*, pretending to be a Russian spy.’ This may be true, however we simply do not know what the true Mahdi sounded like as there are no recordings, therefore, we should not be too harsh on our judgement of Olivier.

The Mahdi’s relationship with General Gordon is most interesting. Here Olivier’s interpretation of the role is pleasingly accurate, although it is particularly unfortunate when the film, inaccurately, has him meet Gordon in the Sudan. However, evidence does suggest that The Mahdi and Gordon communicated over politely written letters, and it does appear that there was genuine respect between them.



After the death of General Gordon, the Mahdi is said to have been displeased when the head of Gordon was presented to him on a stick. Whoever was responsible for killing Gordon risked the retribution of The Mahdi, who before the

attack ordered General Gordon to be spared. The film’s claim to historical accuracy was also not helped by the way in which it was marketed. With the Mahdi posing with two of his victims for a ‘cosy family portrait’.

Charlton Heston has played many great historical characters such as Moses (*The Ten Commandments* 1957), *El Cid* (*El Cid* 1961), *Judah Ben-Hur* (*Ben-Hur, A Tale of the Christ* 1960), however portraying General Gordon was one of his most complex roles; this is simply because Gordon was such a complicated figure.

The film effectively highlights Gordons skills as a royal engineer as he diverted the Nile to surround the city with water. Unfortunately, ‘Khartoum’ fails to represent Gordons unstable moods and manic activity, as he remains calm and collected throughout the length of the film. For example, whilst laying the mines Gordon seems untroubled and placid.

However, the film accurately represents Gordon’s religious devotion: he was evangelical concerning Christianity and ran small working-class youth groups in London. In ‘Khartoum’ there is a scene in which Gordon and his servant have a hurried discussion concerning how best to carry out the will of Christ. Roy Jenkins writes (page 510) that ‘Gordon saw himself at the hand of God’s purpose to an extent that rivalled Gladstone.’

When arriving at Khartoum, Gordon’s enthusiastic reception seems some-what exaggerated, concerning the fact that a significant proportion of the inhabitants of the city were prepared to support the Mahdi. More accurately, the film recounts how Gordon had personally led the ever-victorious Chinese army, putting down the Tia Pang rebellion, and single handily abolished slavery in the Sudan. The film accurately

shows Gordon’s self-belief in that he was convinced that he could hold Khartoum against Mahdi troops, although hugely outnumbered.

The film’s ending follows the classic painting by Gorge William Joy (1893), which is currently placed in Leeds museum, of Gordon contemptuously looking down upon the Mahdi’s tribesmen before he is stabbed brutally with a spear. However, there is much uncertainty concerning the death of General Gordon as some eyewitnesses suggest that he did not die a Christ-like figure but as a fearless warrior fighting in the streets of Khartoum. The ending is this way for dramatic effect; therefore, one can assume that the film makers knew what they were doing and chose a dramatic and memorable ending that best fitted an epic film. A relief expedition under Wolsey arrived at the city two days later.

How accurate is the character and portrayal of Colonel Stewart?

One of ‘Khartoum’s’ focal points throughout the film is the relationship between General Gordon and Colonel Stewart. This is helpful because it highlights how headstrong and opinionated Gordon was, and his inability to follow orders. Their relationship is presented as stressful and completed, with the General even threatening to shoot his aide.

However, there is no evidence to suggest that Stewart was sent to ‘control’ Gordon and as the film implies ‘report any behaviour that could lead to the General’s physical harm.’ The film is accurate, however, when Stewart, along with Frank Power and Leon Hérbin, are sent to break the blockade, but is considerably less accurate when concerning the way that they were killed. After disembarking, they were offered safe passage by an Arab chief who was secretly in league with the Mahdi, they were ambushed and killed, unlike

how the film suggests ‘killed upon deck.’ The film, once again, shows a rather disappointing (though well-acted) fictional meeting between the General and the Mahdi in which the latter presents the head of The Times Correspondent Frank Power and the hand of Gordon’s aide Colonel Stewart. Though there was no such meeting, Tunzelmann amusingly writes that ‘Muhammad Ahmed attempted to intimidate Gordon with lucky dips full of bits of dead people.’

Although it is very difficult to know whether the film interprets Stewart’s character correctly, there is no doubt that Richard Johnson’s performance complements the film greatly, whilst adding dramatic impact.

Conclusion

In conclusion, if one were to focus too much on specific detail then it is easy to agree with the Guardian review in giving ‘Khartoum’ a C-. However, the overall message of the film and characterisation of the leading figures is impressively accurate. By targeting the detail excessively, one forgets what a great and powerful film ‘Khartoum’ really is about the challenges of late Victorian imperialism.

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Year 7 Prize Winning Entries



FIRST PRIZE
YEAR 7

The Morality of Dogs: A Man's Best Friend

Jessica Zhou

Does a dog have a sense of morality? It is a question that has been asked for decades. The *Oxford Dictionary of English* defines morality as 'principles concerning the distinction between right and wrong or good and bad behaviour', meaning the differentiation of proper actions and improper actions. We know that we as humans can differentiate between the proposed question of virtuous or unvirtuous from our millions of years on this Earth, but can dogs? And if so, why is this?

There are countless tales of dogs sacrificing themselves to protect their owners, police dogs stopping intruders from breaking into homes and fire fighter dogs saving lives from burning buildings. Others may argue against this fact, saying that dogs have been trained to behave this way, but there are many more tales of dogs plunging into deep water to save drowning children even if they are complete strangers. Any living being needs a sense of morality to make these complex decisions, though it may cause a great deal of harm to themselves.

Researchers at Japan's Kyoto University have carried out various experiments which lead them to believe that dogs do have a sense of morality, similar to our own. One of the experiments involved a dog being led into a room, followed by its owner, and a stranger who it had not seen before in its life, with each human holding three balls in their hands. As the dog watched calmly at the side of the room, its owner asked the stranger for one of their three balls. The stranger refused and the owner walked out of the room with a sad expression and slumped shoulders. A few minutes later, a second stranger entered the room, leading the owner in with them. The same process with the balls was carried out again but this time the stranger obliged and gave the owner one of their balls. The owner noticeably smiled and walked out of the room happily. All of this happened with the watchful dog at the side. A few

minutes later, both strangers came into the room once again, without the owner's presence and each offered the dog the same kind of treat. The results showed that the dog refused the treat from the selfish stranger but accepted gratefully from the obliging one.

The above experiment determines that dogs can tell whether you are acting virtuously or not. However, this poses the query, 'Do dogs solely rely on the intonations of us humans' voices and body language? Or is there a true understanding of what we say and do?'

The same researchers from Kyoto University asked exactly this. They chose to investigate the cerebrum (the area of a dog's brain where conscious decision-making happens). The dogs taking part in the experiment were instructed to lie dutifully on the floor, unmoving, waiting for their owner to come in. When the owner entered the room, they talked to the dog as normal, but sometimes said praise words with the normal intonation of happiness and mirth, whereas on other occasions, they stated praise words in a non-praising intonation.

The outcomes of this test demonstrated something fascinating. The scientists scanned the different areas of the dog's cerebrum for different responses to the words directed at them. There was hardly a difference in the sense of movement and triggers of happiness in the dog's brain when praise words were said in different ways. It cannot be proven that dogs do not think about how we state phrases, but likewise this experiment has proven that it may not be a top priority for dogs to pick up on this aspect. Some others may argue that this experiment does not indicate clearly that the dogs understood what their owners were saying. The bond between them was already so strong that the intonation needn't be picked up anymore, and since dogs' closest ancestors are wolves, their

decision-making and impulses would be thoughtless and instinctive.

A new study into these statements was conducted by the Institute for the Science of Human History, which demonstrates why dogs do not solely act on impulse. The experiment was comprised of around 50 dogs from a range of ages, who had all received basic obedience training throughout their lives. The researchers performed a test for the canines that required them to discover a prize (either a toy or some sort of food related treat) behind one of two fences (with a small hole between the two of them, slightly obscured). They let a few of the dogs view which fence the prize was hidden behind but did not let the remaining dogs see. The researchers then observed how often the dogs that were not shown the location of the prize checked the slight gap between the two fences. As predicted, many of the test subjects did exactly this and chose the fence which they had seen the reward behind. The results showed 94 percent of the canines that saw the position of the prize chose the right fence, whilst 57 percent that were not told where the prize was initially hidden accurately concluded where the reward was through the gathered information from looking through the hole.

All three of the experiments written above are all very well in describing where and when dogs use their sense of morality, but how exactly do they do this?

Conscious decision-making is mainly dominated by the cerebrum. Generally, larger creatures have larger cerebrums. The encephalization remainder (EQ) represents the relation between cerebrum and body size, with an animal with an EQ of 1, implying a creature with a normal cerebrum size for its body size. The higher the EQ, the more comprehensive the mammal and their ability to make hard decisions. We as humans have a particularly high EQ of around seven (which allows us to make extensive choices), while dogs are somewhat superior to an average mammal of its own size, with an EQ of 1.2. In any case, we can see from an MRI of a canine mind that despite the fact that it is smaller than a human brain, the structure and intricacy of the organ is remarkably similar. This is true for all regions of a dog's brain, from a large scale to a small scale. This scientific data demonstrates the fact that the dog's brain is a lot less intuitive than we give it credit for.

In my opinion, all three experiments and the structure of their brains clearly show that dogs are high intellectuals and logical thinkers, with the capability to distinguish between right, wrong, or good and bad behaviour, and do not just act on impulse and the decisions of their owners. The morality behind this is the dog's choice of making the conscientious right decision of waiting to know and explore further into what question is posed before him, basing all their decisions on previously given information. These moral decisions could not be made without the neural foundation and structure a dog's brain gives it, so maybe it is the dog's singlehanded intelligence that gives it the capability to have a sense of morality.

If dogs, in essence, do have a sense of morality, it brings me to wonder: what other complicated feelings can they experience? Even more research is continuously being done to find out information about how deep thinkers our dogs really are. However, maybe that already clarified build of our dogs reasoning explains why we establish such strong friendships with our dogs.

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Do goldfish have bad memories?

Charlotte Betts



Many people believe that goldfish have very poor memories. The popular belief based on a common saying is that a goldfish memory lasts for only three seconds. However, in truth this has largely been disproved as I shall attempt to explain below.

The main reason giving rise to the common misconception that goldfish have a poor memory, is probably due to how people perceive evolution. Following the theory of evolution, fish evolved into reptiles, which later gave rise to mammals and eventually us, humans. So, people tend to consider that animals that evolved later are smarter than their earlier evolutionary ancestors. However, it's important to remember that fish have also evolved over time and they are not the same creatures as their prehistoric ancestors. In fact, the common bony fish ancestors split into their two major groups (around 440 million years ago): the lobe-finned fish with bones in their fleshy fins, and the ray-finned fish. It's the lobe-finned fish that eventually gave rise to amphibians, reptiles, birds and mammals, whilst the ray-finned fish gave rise to the wide diversity of fish species living today.

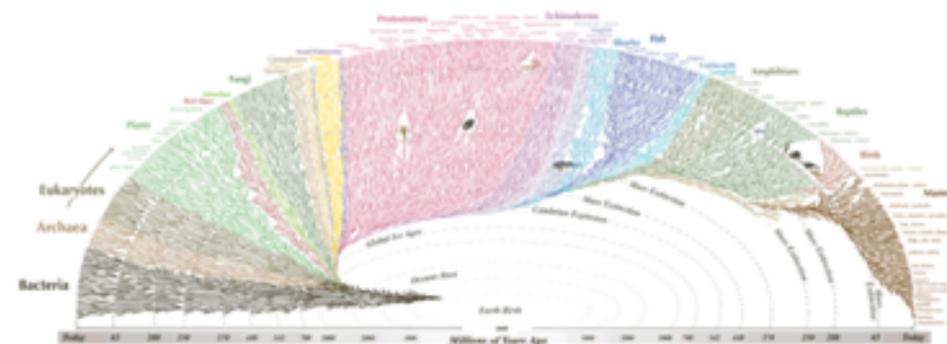
Another factor that likely contributes to the goldfish memory misconception is that goldfish have small brains, smaller than, for example, the brains of humans and other mammals. However, if brain size is measured as a percentage relative to their body size, then

goldfish have a similar brain size compared to humans. Simply, having a 'small' brain doesn't necessarily mean that a creature is not smart and incapable of learning and memory.

One of the first experiments conducted to explore the memory ability of goldfish was done in Australia by a schoolboy named Rory (aged 15) (1). Rory decided to place a red Lego brick in with his fish and feed them around it, which he did for three weeks. At first, the fish were wary of the block, but they soon came to understand and associate the block with food. The fish even anticipated being fed and would swim to the block before the food was even there. At the end of the three weeks, to test their memory further, Rory stopped using the block for the following week before placing it back in with the fish. The clever fish swam up to it in anticipation, clearly remembering its association with being fed.

Another experiment, that took this concept a bit further, was conducted by a group at the University of Plymouth.¹ They introduced a lever to the fish-tank, whereupon the goldfish soon figured out that if they nudged it, food would be dispensed. Amazingly, when the fish got hungry, they learnt to push the lever. The scientists decided to make it more difficult and made it so that the lever only worked for a one-hour time slot each day. Once again, the fish very quickly learnt how this worked, and would swim up to the lever within the exact time frame in order to push it and release the food. Some even waited at the lever in anticipation of the right time.

Other interesting experiments that have taught us about the memory abilities of goldfish are those using underwater



Evolutionary branches of life – fish lineage is shown in dark blue

mazes.² In these experiments, goldfish are encouraged to swim through a maze, once a day, for a number of consecutive days, and each time the fish got successively quicker at completing the maze, clearly remembering the route that they took the day before. Some individuals even claim to have trained goldfish to play certain sports, such as, underwater fish-basketball/football, where one fish ‘hits’ a ball into a goal or ‘hits’ a small ball through a hoop! These fish were presumably trained the same way you train a dog, by rewarding the goldfish with food. Additionally, there are some goldfish that have learnt to swim through multiple hoops stacked at varying heights. These experiments further illustrate the goldfish’s capability for learning and memory.

One particularly interesting memory experiment was conducted at a research institute in Israel.³ Over the course of one month, a group of scientists taught some cultivated fish to come to a certain place for food at the sound of a bell. At the end of the month, they released the fish into the sea. Five months later they played the same bell sound over an underwater loudspeaker and the fish returned to that same feeding spot.

Thus far, five months is the longest time period that fish memory ability has been tested, but it is now believed that fish may be able to remember for even longer periods of time, potentially even years! Unfortunately, no test has been carried out to categorically determine the memory span of a fish, or specifically goldfish.

Another intriguing idea is that goldfish can remember individual people.^{2,4} It’s thought that they are able to recognise the voice and face of the owner that regularly feeds them, for example, by swimming up to the top of its tank upon their owners approach in anticipation of being fed. Perhaps goldfish can tell that the people who feed them like them and they may even like them back? It’s also reported that the fish can recognise up to three people who regularly feed them and that they can also distinguish between them.

Other reports for how people have ‘trained’ their goldfish involve the use of coloured discs.⁵ In this experiment two different coloured discs were hung at one end of the aquarium, a red one and a green one. The goldfish were only fed at the red disc whilst no food was provided at the green disc. Very quickly, the fish learnt to ignore the green disc and swam only to the red disc. This shows us not only that they

can remember but that the fish can also distinguish between colours, perhaps useful for their survival. After a while the discs were removed, and sometime later returned to the aquarium. Once again, the experiment demonstrated that the fish ‘remembered’ to ignore the green disc and instead swam straight for the red one.

Additional reports show that goldfish may feel fear and that they can distinguish and remember which animals are predators.⁵ The example provided describes what happened when some goldfish in a pond were attacked by a heron. The behaviour of the fish was to remain at the bottom of the pond, sometimes for a couple of weeks! It is thought that they recognised the heron and headed down to the bottom for safety whilst the heron tried to raid the pond. There, the fish would wait for food to sink down to them instead of searching for food at the surface as they normally would. This defensive behaviour is similar to that observed in the large common carp.

In conclusion, the memory of goldfish is really rather good, and we still have much more to learn about these fascinating creatures. It also poses the question; how long can they actually remember for? In summary, the experiments that I have described here can only lead to one conclusion – that the memory of a goldfish is certainly longer than three seconds. We should not make the mistake in thinking that these fish are empty-headed and can’t remember anything just because they have ‘small’ brains, or because they belong to a different older evolutionary lineage. In fact, currently goldfish serve as a useful animal model for studying memory function. So, having the memory of a goldfish is not so bad after all.

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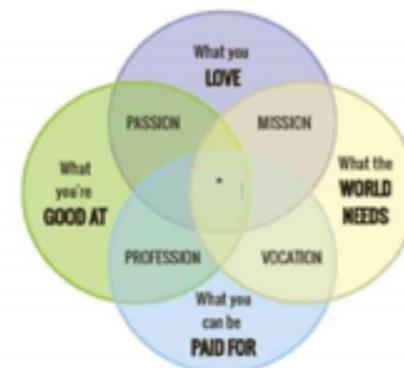
Finding Your Ikigai

Kriti Mishra

Have you heard about Okinawa? It is the fifth-largest island of Japan. It has a population of over 1.3 million. What is special about Okinawa is that it has the largest ratio of people aged over 100-years (34.7 per 100,000 people) in the world. In fact, Okinawan women live longer than any women on the planet. Despite the tough, rural and remote environment of the island and limited access to modern medicine and healthcare, Okinawans are healthier than Western society. One of the reasons for their longevity, perhaps the most important one, is that they have a strong sense of purpose in life, a driving force that the Japanese call ‘Ikigai’.

Ikigai, pronounced ‘Ik-ee-gai’ is a Japanese word meaning ‘A reason to live.’ Its origin goes back to the last period of classic Japanese history, i.e. the Heian period (794 to 1185 A.D.). The word ‘Ik’ means ‘to live’ and ‘gai’ comes from the word ‘kai’ which means ‘shell’ in Japanese. In the Heian period, shells were of value. ‘Gai’ is the key to finding your purpose in life.

Not many in the Western world are aware of Ikigai and those who are often think of it as ‘The Japanese secret to live a long, fulfilling life.’ This interpretation of Ikigai is based on the Venn diagram of Purpose created by a Spanish author Andres Zuzunaga in 2011.



Whilst this framework can be used to create a more balanced approach to life, the misconception is that this is ‘Ikigai’ and one can achieve Ikigai by meeting all four conditions. This is far from truth because if we were to show this diagram to Okinawans or to a Japanese person, they would not recognize it as Ikigai.

To the Japanese, Ikigai is a multifaceted concept. Contrary to the framework, many Japanese would not relate money to Ikigai. For them, Ikigai is also not about what the world needs from you because Ikigai lies in the realm of family, friends, community and the roles you fulfil. When you pursue it, you are not required to save the world. Ikigai is about connecting and helping people who give meaning to your life. It is about the joy of little things, being in here and now and building a happy and active life.

If we must seek a framework to help find our Ikigai, Ken Mogi’s 5-pillars of Ikigai could be a good starting point. These pillars are the foundation that will allow Ikigai to flourish.

Pillar 1: Starting small

We should start small but have open-mindedness and curiosity in abundance. Albert Einstein encouraged people to remain curious throughout their life and use constructions, concepts, and formulas as tools to comprehend what they see, feel and touch every day. For example, Steve Jobs was curious about typefaces and this led him to revolutionise digital typography through Apple computers.

Pillar 2: Releasing yourself

Releasing yourself means to let go of an illusory self in order to accept the real self and be happy.

Pillar 3: Harmony and sustainability

We need to be in harmony with our environment, with the society and with people around us. We should be mindful of the impact of our actions on society at large.



What is Failure?

Ottelia Tetley

Pillar 4: The joy of little things

We need to make a habit of having our favourite things as soon as we get up, be it tucking into tea, coffee, croissant or reading. This will release dopamine - the feel-good chemical in our brain reinforcing the action (getting up) prior to receipt of reward (morning tea, coffee or croissant).

Pillar 5: Being in the here and now

We need to live in the moment and do things that give us satisfaction, for example write a story even if no one will read it, make music even if no one will listen it. The inner joy and satisfaction that we will get from such activities will be more than enough to carry on with our life.

In September 2017, a scientific study of Japanese centenarians (i.e. people over 100-years) found that such people had a very high level of Dehydroepiandrosterone (DHE), a steroid hormone produced by the adrenal glands that may be the miracle 'longevity hormone.' The study also found that these people had one thing in common: they practiced a hobby every day. One woman spent a few hours every day carving Japanese traditional masks, another man painted, and another went fishing daily.

While the connection between a hobby and the increase of DHEA is yet to be proven scientifically, the study indicated that having one hobby that keeps you interested, focused, and gives you a sense of satisfaction in life may boost your youth DHEA hormone, increasing longevity.

Unfortunately, many people today have stopped practising their hobby because of either daily responsibilities or routines or are spending most of their time on social media. This leads to a stressful

modern life. However, this can be changed through Ikigai – by discovering and appreciating life's pleasures that have meaning for one.

The beauty of Ikigai is that one can change the purpose of life as one grows, i.e. cultivates one's inner potential. It could be anything one loves doing, or is passionate about, and one could find it in a completely unexpected area of his life. It could be a simple daily ritual or the practice of a new hobby. Ikigai is about finding meaning and purpose in our daily lives regardless of the constraints one may have.

I hope that the above will inspire you to find your Ikigai and when you find one, please pursue it with all your heart.

Failure is a very hard thing to categorise. Is it losing a sports fixture, is it failing your GCSEs, is it not doing well in a small class quiz? I was so intrigued about the phenomenon of "Failure" that I decided that it would be the subject of my essay. Lots of young people, including myself, are very worried and even scared of failure, but should we perhaps, be excited about it?

"A person who never made a mistake, never tried anything new." Albert Einstein

Firstly, I think we should look at the origins of the word. In the 1640s the word 'failer' meant to be lacking or to not succeed. The ending of the word was altered in the 17th century in English to match with words that ended in -ure, changing the meaning of the word to "thing or person considered as a failure."

Most people see failure as a negative concept and the opposite of success, but what if it isn't? What if we looked at failure in a different light and decide that it is just a stepping stone to success. We all need to fail to be successful but if we live our lives being scared of failure, individuals will never get anywhere and therefore, never succeed.

I have taken Walt Disney as a study for this phenomenon. You will know him as the founder and creator of Walt Disney Studios, but he didn't just succeed to get to where he was; he failed in multiple ways beforehand, and these failures were the building blocks to his success...

Walter Elias Disney was born on December 5th 1901 in Illinois, in the USA. When Disney attended McKinley High School in Chicago, he took drawing and photography classes as well as being a cartoonist for the school paper, but his work didn't stop there. At night, he took courses at the Art Institute of Chicago

but a few years later, Disney changed interests and dropped out of school at the young age of 16 to join the army.

One of Walt Disney's many failures in life was that he was rejected from joining the Army for being underage. But Disney didn't give up; instead he joined the Red Cross and was sent away to France for a year to drive an ambulance. Eventually, after a year of working for the Red Cross, Disney moved back to the U.S. in 1919. Once his time in the Red Cross had ended, he moved back to Kansas City to pursue a career as a newspaper artist. He worked at the Kansas City Film Ad Company where he made commercials based on cutout animation. Later on, Disney opened his own animation business but by 1923 the studio was forced to declare bankruptcy – failing to be a profitable business.

Many people by now would have given up and would have settled for a different job that wasn't so hard to succeed in, but Walt Disney was motivated and persistent and the failure drove him to try harder, he just kept trying his best and did what he could to pursue the things he wanted to achieve in life.

After the bankruptcy, in 1923, Walt and his brother Roy moved to Hollywood and there began the Disney Brothers' Cartoon Studio but then soon changed their name to Walt Disney Studios at Roy's suggestion. From then on the company became very successful – Walt had finally pursued his dream as a cartoonist. During his lifetime, Walt Disney won 22 Oscars but sadly died of lung cancer at the age of 65.

Walter Disney's failures were the very things that made him successful. They taught him key life lessons and resulted in his success. Without them it is very unlikely his name would be the household name it is today.

"I always like to look on the optimistic side of life, but I am realistic enough to know that life is a complex matter. With the laughter comes tears." Walter Elias Disney

In the dictionary, failure is said to mean "A lack of success." But I don't think that is right. Failure is a stepping stone to success, not a lack of it. I think that it is a bad explanation of failure as someone will read that and be scared of failure and if you are scared of failure, you will never push yourself hard enough to succeed.

"It is impossible to live without failing at something, unless you live so cautiously that you might as well not have lived at all – in which case, you fail by default." J.K. Rowling

As much as it hurts when it happens, failure is a necessity in life. Most people have failed many more times than they would like to admit and no one enjoys failing but failure makes us into better people than we were before. Failure is like life's teacher, it teaches us to be kind, thankful but most of all it teaches us to work hard for what we want and believe and if you fail enough times, but keep on pushing, you will – no matter how long it takes – get to the place that you want to be. It is through failure that we learn the greatest lessons in life.

"I've missed more than 9,000 shots in my career. I've lost almost 300 games. 26 times, I've been trusted to take the game winning shot and missed. I've failed over and over and over again in my life. And that is why I succeed." Michael Jordan

Failure also helps us build resilience – the more we fail, the more resilient we become. Resilience helps us realise that it takes a lot of work to succeed and it teaches us to not be put down by something that hasn't gone your way, to try, try again until we succeed and get to where we would like to be.

Most failure comes from the fear of the unknown, the fear of something that isn't written on the walls, the fear of not knowing what comes after.... We just need to take the opportunities we have as they come and face them head on, otherwise we will never learn to know what is on the other side but I do know one thing - it will be worth it in the end.

There are small failures every day of everyone's lives, whether that is spilling your drink, getting a question wrong but we don't get too worked up over them, so why are the bigger failures any different? The bigger failures actually teach us bigger, more important lessons for later on in life so you can't spend your days dwelling on the past – start focusing on the future. So don't be afraid of failure – embrace it, it makes us the individuals we are.

"Success is not final, failure is not fatal: it is the courage to continue that counts." Winston Churchill

Overall, we all need to know that failure is just another step towards success. We may need many steps to get to the place that we want to be, but if you are embracing failure instead of avoiding it, you will turn out as a much better person, think of failure as just another way of doing something right.

I will leave you with this thought:

If you want to succeed you need to fail, but if you don't want to fail, you will not succeed.

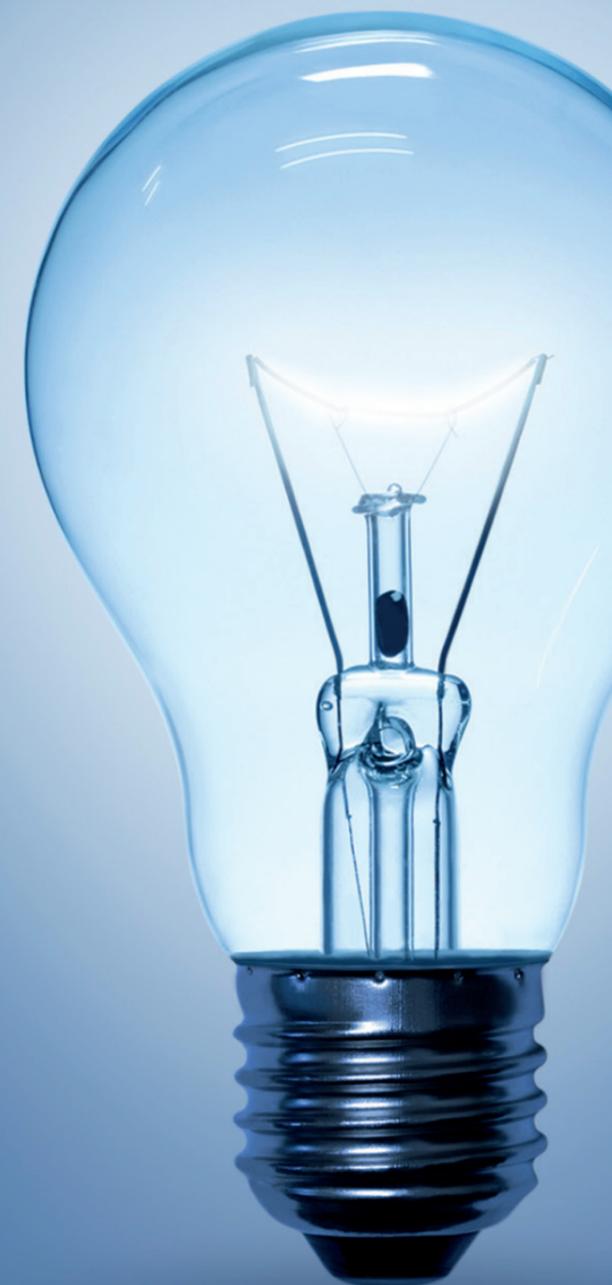
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Highly Commended Entries



Interpreting power within the constraints of a novel

Emma Williams

The question ‘What is power?’ is a question about the most important thing in an individual’s life. It is answered differently by every person: some say power means having authority over people while others may say power is happiness and having fulfilling relationships with those around them. This can be conveyed by an author in a work of fiction, with each character’s interpretation of power reflecting who they are as people and what power means to them. The dictionary defines power as: ‘The ability or capacity to do something or act in a particular way’ and ‘The ability or capacity to do something or act in a particular way.’ However, the real definition of power is interpreted differently by every individual. A work of fiction that can easily be explored for connotations of power is the *Harry Potter* series, written by J. K. Rowling, as there are many instances of power such as fearing a certain individual and the power of love. Due to the abundance of well-developed characters within the novel, there is a possibility of analysing a select amount of characters in relation to a specific idea of power and how they represent that through their role the story.

The first concept of power is evil, and how having others fear you gives one power. The most obvious example to consider in this case would be Lord Voldemort, the main antagonist of the series. It could also be argued that he is the most powerful character overall, however, the theme of power is up to the reader’s interpretation. Voldemort is feared by all, he is ruthless and will kill without any warning. He fits perfectly under the second definition of power given above. Rowling characterises Voldemort in these ways to portray his evil, and that he believes power is the most important thing: ‘There is no good and evil. There is only power, and those too weak to seek it.’ This conveys that power is the most important thing to him, and that he will ruthlessly follow the path to being the most powerful. In addition to this, the implication of his

power is in most of the characters’ refusal to say his name, referring to him as ‘You-Know-Who’.

Another character who seamlessly fits the mould of power being equivalent to evil is Voldemort’s right-hand woman, Bellatrix Lestrange. She will kill anyone in her path, and is feared, having spent many years in prison before breaking out. She is fiercely proud of where her loyalties lie and is prejudiced against anyone who does not believe in the same as she does: ‘Shut your mouth! You dare speak his name with your unworthy lips, you dare besmirch it with your half-blood’s tongue, you dare —’. The idea of power equalling evil is abundantly clear in her character. She additionally uses this concept of evil in her magic, creating pain and death when she feels like it, and overall, mainly using dark magic intended to harm: “I was and am the Dark Lord’s most loyal servant. I learned the Dark Arts from him, and I know spells of such power that you, pathetic little boy, can never hope to compete”. She extends the theme of power through her descent into insanity.

However, power can additionally be perceived in leadership, as seen within the character Albus Dumbledore and the titular character of Harry Potter. Dumbledore is first shown to be the headmaster of Hogwarts school; however, his leadership abilities are later shown to be more complex, due to his allegiance to the Order of the Phoenix, first introduced in the fifth novel. It is an alliance supporting the downfall of Lord Voldemort, led by Dumbledore along with many others.

Dumbledore is additionally influential in politics, and well-respected by the Ministry of Magic the majority of the time (the only time this is not the case was when he defends the truth that Voldemort had returned, something which the government refused to admit). He is stoic and is greatly admired by many. It could be argued that when asked, one would say he is the most

powerful character, due to his influence and beliefs, for example, with the advice of: ‘It is our choices, Harry, that show what we truly are, far more than our abilities.’

Moreover, as previously mentioned, the titular Harry Potter falls directly under the category of being a leader within the war, having been prophesized to kill Lord Voldemort. He additionally leads a student rebellion against the oppressive regimes set in place in *Order of the Phoenix*, titled Dumbledore’s Army as ‘that’s what the ministry is most afraid of’ as described by the students rebelling alongside him. Harry is a natural leader and teacher: ‘Every great wizard in history has started out as nothing more than what we are now, students. If they can do it, why not us?’ and is well-respected by most. Leadership and acting as an influential figure greatly contribute to one’s power, implying that this is what power could mean and the importance of leadership as a concept.

Power can additionally be categorized as intelligence, for wisdom and cleverness are vital for the ability to uphold authority. An example of this is Hermione Granger. She is frequently labelled the ‘brightest witch of her age’ and has a clear influence over her friends as she is the one who makes decisions and has the brains to ensure the survival of the three of them in many dangerous situations. She eventually becomes the Minister of Magic as an adult and was top of every class in school. She describes herself in the later novels as “highly logical which allows me to look past extraneous detail and perceive clearly that which others overlook.”

Hermione’s cleverness allows her fellow classmates and peers to respect her intelligence, and following her election as Minister of Magic, which confirms the theme of power equalling intelligence. Furthermore, Hermione’s teacher Minerva McGonagall also possesses the influential intelligence that is previously

indicated to. She is not only the Head of Gryffindor House; she is also the Transfiguration teacher and Deputy Headmistress, later succeeding Dumbledore as Head. She is highly respected and known for her talents in many areas, especially transfiguration: she can turn herself into a cat at will. Her position as Headteacher at the end of the series further supports the theory of the most intelligent characters acquiring the positions of authority, therefore it can be argued that the most intelligent characters are the most powerful.

Perhaps the most important theme in the *Harry Potter* series is love. A mother’s love is what saves Harry’s life on multiple occasions. This leads to the argument that love is the most powerful thing and beats all other arguments regarding the topic of power. The recurring theme of mothers saving Harry’s life begins when he is one year old with the death of his mother, Lily. Her sacrifice for her son protects him from death, and when a curse intended to kill him hits, he reflects it and instead weakens Voldemort so that he cannot return able-bodied for thirteen years. However, this curse eventually enters Voldemort’s bloodstream and gives him a small amount of this protection, as he acknowledges that it was love that destroyed him: “Do you want to know what really happened thirteen years ago? Shall I divulge how I truly lost my powers? It was love. You see, when dear sweet Lily Potter gave her life for her only son, it provided him with the ultimate protection, I could not touch him. It was old magic, something I should have foreseen.” The recurring theme of love resurfaces later in the series, with main character Ron Weasley’s mother, Molly, willing to die if it means her children would live. Her youngest child is almost killed, and she kills Bellatrix Lestrange in retaliation so that she could keep her children safe “You – will – never – touch – our – children – again!” One could interpret being powerful as having many people you love to bring you happiness, and I believe this is the best way to interpret power.

The wisdom of an old dog: What are the lessons a human could learn?

Hannah Faulkner

The final idea of power conveyed in the *Harry Potter* series is loyalty equalling power; the power of loyalty can make you powerful because you not only have the friendship of an individual, you have their trust, and someone to, in this case, fight alongside. Ron Weasley's unwavering loyalty is the most prominent example, quite specifically when he stood up on a broken leg to defend his best friend from being killed: "If you want to kill Harry, you'll have to kill us too!". He is labelled as the sidekick, but his loyalty makes him powerful as a friend, and this is one of the best qualities for someone to possess.

An additional character who, like Ron, is the best friend of a Potter, is Sirius Black. The best friend of James Potter, following his death that an innocent Sirius is blamed for, ends up spending twelve years imprisoned. He only escapes when he realises that Harry is in danger, and his fierce loyalty to James makes him realise that caring for Harry should be his priority, however much he blames himself for his best friend's death. He would die for those he loves: "Then you should have died! Died, rather than betray your friends, as we would have done for you." This is how he is eventually killed, tragically losing his life in a fight to protect Harry. His loyalty makes him a powerful ally, like Ron.

In conclusion, there is a specific dictionary definition of power, yet power is an ambiguous word whose meaning can be left up to the interpretation of the individual considering the meaning of it. Power is up to one's own interpretation, as there are many ways to realise this. It can be made even clearer within a work of fiction, especially one as well-renowned and successful as *Harry Potter*.

Do dogs have something to teach us?

'Dogs show us unconditional love'. 'A man's best friend'. That is what the accustomed stereotype of a human's relationship with a dog is, but what is the truly profound depth of a dog's wisdom? We frequently hear about studies that suggest why dogs have connections with us or why they behave a certain way in biological terms. Nonetheless, it is rare that we hear about the emotional connection between a canine and its owner, from studies completed by scientists.

When a person gets a dog, it is usually from the age of a puppy because they are deemed to be 'cute' and 'adorable', but what about older dogs? Are they not 'cute' and 'adorable' too? This is a question that divides many, who adopt from shelters, as some say it is more thoughtful to give an old dog a home so their last years can be full of love, however others say that it is a kinder action to look after a younger dog to give them a full life off happiness and affection.

But what about their intellectual value? Often, we hear the phrase 'My dog makes me a better person' but is that because of an intellectual value through which they subconsciously teach us valuable lessons? Which raises a further question of, 'Do we say that about an old dog or a young one?'. Surely, it should be an old dog because even though young dogs have an idea of the world, old dogs have been around for a longer period and have a more meaningful view of life.

Lesson 1: Show Appreciation

Often dogs will display their love for the people around them by jumping for joy when their owner gets back and wagging their tail to show their affection. This is their way of saying 'I am delighted that you are back', but humans do not go and greet the person who came home (usually) in such a joyous manner.

This is because humans expect their companion to come back; dogs, however, have such a strong pack instinct that the instinct can overpower the dog's rational thinking, which results in dogs worrying about their owner's return. On the other hand, it may be caused by a physical problem suggested by Jeff Nichol DVM in a case study about separation anxiety.

My opinion differs from Mr Nichol's theory. I agree with the pack instinct as that is a psychological theory and seems more plausible because a dog considers their owner to be part of their pack. Furthermore, as dogs are naturally pack animals, they thrive on being with other mammals, therefore that loyalty for their pack is based off a natural instinct, which results in them worrying about whether their 'pack' will come home. Therefore, pack instinct is likely to be why they address their owner in a happily contented way, because of a form of relief, which not only stems from instinct but also endorphins that are 'activated' when the dog is active.

Lesson 2: Have trust in the people who care for you.

Trust is a very broad subject which means different things to every person. Sometimes people are open and let people in, others are closed and only let a few people into their personal lives. A person's instinct is personal to themselves, just like a canine.

Dogs take a long time to trust, but when they finally have faith that you are someone they can trust, you have their complete dependency. Furthermore, dogs only trust by their instincts, they do not overthink, which a human may do. They trust that the person they let in will keep them safe and warm. Young dogs, such as puppies, will form a trust with little depth, but older dogs find it a lot harder to form that trust as they may have experienced a bad scenario where they have felt negative emotions.

The Science of Déjà Vu

Elisia Sellar

One case study showed that a ten-year-old Labrador (a breed that is typically level-minded and even-tempered) had previously had bad experiences with an owner and as a result become extremely wary of men. Furthermore, trust had never been known in any 'relationships' which the dog had been part of, which made it a lot harder for that dog to form that bond of trust. Nevertheless, over time, and with a lot of work and different methods, the Labrador became trusting of men. This shows that because an old dog has not been treated well, they had not had a chance to trust fully, so he became old and had no experience of this bond; however, he managed to trust again after all those years.

Lesson 3: 'I'll have your back'

Everyone knows the basics of looking after a dog, but what about them looking after us, in terms of emotional need? Humans have emotions which help them make decisions and, in some way, survive psychologically. We naturally feel negative emotions, such as sadness, which would cause them to display in the method of crying. Dogs can understand empathy to because empathy is an adequately complex emotion. Additionally, research has concluded that they have the emotional awareness of a 2-3-year-old it is therefore difficult for them to understand what is happening as they do not experience the complex sadness that a human may be feel.

Consequently, dogs try to comfort us and make us feel better.

Nevertheless, there is research that suggests that dogs only comfort you because they are 'affected' by your emotional distress which is causing them to feel a less complicated but similar emotion of sadness. They show this 'comfort' to you in the way of nuzzling you. Their aim is to comfort themselves not you,

necessarily. However, my opinion differs from that research and the concluding theory.

In opposition to the above theory, I think that all dogs feel empathy and do genuinely try to console. They do not just stay there for their own purposes, because often biological research about dogs' behaviour is based purely on particular kinds of facts whereas other books about dogs tend to show a deeper emotional connection.

Over the course of this essay I have discussed various lessons that old dogs can teach us. Furthermore, I have concluded that dogs can teach humans lessons but mainly subconsciously. Which brings us back to the introduction statement and question of 'My dog makes me a better person but is that because of their intellectual value that they subconsciously teach us valuable lessons?'. After conducting my research, I do agree with this statement. I believe that the qualities I've discussed are natural characteristics in dogs but not so much humans. For example, my section on 'I'll have your back' is based on pack instinct which is not always found in humans. As the author Nora Roberts said, 'Everything I know, I learned from dogs'.

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Déjà vu is a memory phenomenon that gives you the feeling that you have experienced the present situation before, but you do not retain a full recollection of the faded memory. It is a French term which literally means "already seen". 60-70% of people have a déjà vu experience at some point in their lives, the most common age being 15-25.

In this essay I will uncover the theories and explanations for déjà vu in a debate-like structure between scientific and supernatural conjectures and shine light on this eerie mystery.

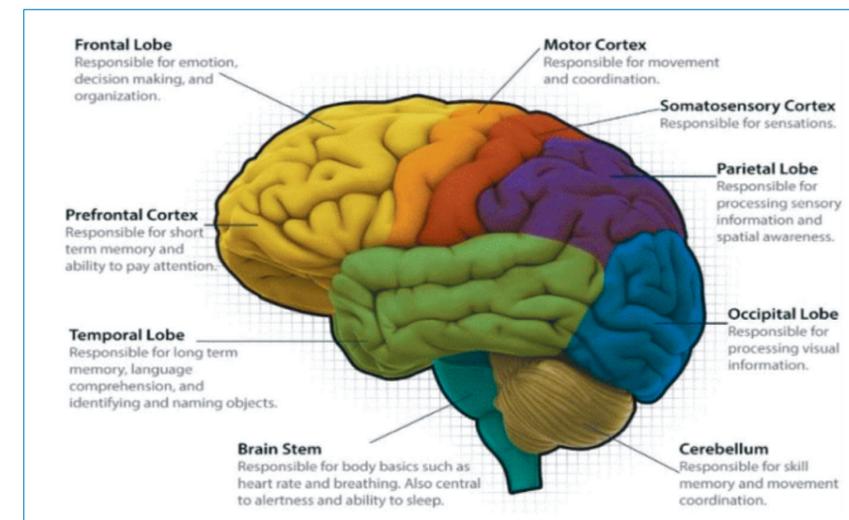
Déjà vu is sometimes associated with precognition and premonition, the difference between them being that precognition is seeing into the future and premonition is a suspicion that something is about to happen in the near future. Some people believe that déjà vu is the result of having premonitions dreams that are stored in our subconscious minds and forgotten by our conscious minds until we experience the situation we had previously dreamed. The average person dreams 6-10 times per night, so the chances we will remember

the dream vividly are very improbable, reasoning why we only get a sense of familiarity and not complete recollection.

However, people argue against this because they believe that a small seizure occurs in the brain regions that are vital for memory formation and retrieval. For example, when seeing a close friend, the spontaneous activity in these regions creates the instant sensation of identification but with déjà vu, a short synaptic misfiring may occur in these areas, creating the illusion of familiarity.

Anne Clearly, a cognitive psychologist at Colorado State University, says, "We cannot consciously remember the prior scene, but our brains recognise the similarity. That information comes through as the unsettling feeling that we've been there before, but we can't pin down when or why". This is precisely why some people refer to déjà vu as the 'tip of the tongue illusion' because it is similar to the feeling when you have a sense of what you are going to say but don't know exactly. Déjà vu is knowing that you recognise the situation but are unknown where this sensation of remembrance has come from.

Another theory suggests that déjà vu occurs when there is a malfunction between the long and short-term memory circuits in the brain (the short-term circuit is primarily in the frontal lobe of the cerebral cortex and the long-term circuit is in the brain's cortex). In saying this, I mean that the new information may not go to the short-term memory but skips straight to long-term memory. Think of this as the new



information taking a shortcut, and it is this skipping to the long-term memory that causes déjà vu.

Simulation believers think that déjà vu is like the glitch in the Matrix. Imagine the world as a computer system, and that computer receives an update, but that update contains a bug. They believe that when the world's 'system' receives an update, déjà vu is the side effect or bug that comes with it.

One study of déjà vu used functional MRI to scan 21 participants' brains whilst they experienced a lab-induced form of déjà vu. You can do this in many ways; you can use virtual reality and recreate a video game like a maze, and the participants would know what turn to take. Another study flashed images too quickly for the eyes to focus on, but they still got a sense of what the image looked like. When shown that image again later on, the participants had said they had seen that image before but could not remember when they had seen it. Fascinatingly, the memory areas of the brain did not light up on the scans, the active parts were the parts of the brain that are involved in decision making. This means that when you experience déjà vu, our brain searches through our memories looking for an error, this could be linked to why simulation believers think that déjà vu is an error in the system.

Should we worry about déjà vu? Déjà vu is normally not something you should be scared of, but on the more extreme sides of things, a déjà vu experience could be temporal lobe epilepsy. This is a chronic disorder of the nervous system which is characterised by unprovoked seizures in the temporal lobe of the brain.

A supernatural theory explains that déjà vu is something you had previously experienced in another life. People who support this believe that the spirit world is like Earth but without any forms of life, it is where your soul goes to prepare for your human life. When you experience déjà vu, it was something your spirit saw before you. The memory isn't a vivid one because fragments of the experience were lost in the transaction between worlds. Other people who believe in this theory think that déjà vu is your spirit telling you are on the right track in your life.

Other people will argue against the spirit life theory and blame the rhinal cortex (the part of the brain that signals familiar feelings) for generating déjà vu. They think that in some way the rhinal cortex is being triggered without memories to back it up, so this gives us a sense of remembrance but being unable to put our finger on what. This is because we aren't actually recalling anything, we just get the feeling like we are. Another belief is that déjà vu is associated with false memories. This particular form of déjà vu would be corresponding to the feeling when you can't differentiate between an event that occurred and a dream. They are so hard to remember precisely because they are false, so they may not be as detailed.

How could parallel universes explain déjà vu? This theory is based on the idea that an infinite number of universes are vibrating at different frequencies, this is why we can't see or hear them. However, when two of these universes vibrate in unison at the exact same moment, this could allow them to interact. Supporters of this theory believe that when these universes are in sync, déjà vu occurs.

Due to the scientific theories having the most evidence which explains déjà vu, I am obliged to support the scientific side. However, my favourite theory is the parallel universe explanation, hence saving it for last.

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Do all superheroes wear masks?

Lucy Jennings



Mental health... overlooked?

Across the globe, there are multiple examples of superheroes who work tirelessly to protect and save others, both in fictional settings and in real-life scenarios. This is an area which fascinates many, including myself. The question that arises is how we define these individuals and whether the term superhero only refers to a masked individual or if any human can become a part of this elite group.

Firstly, I believe it is important to define what is meant by the term superhero by examining the definitions given from several different sources. From my research, if you ask a young child to answer this question the stock response is: a superhero saves the world from supervillains, has numerous superpowers and wears a disguise. Alexa gives the view that it is a character who helps to make the world a better place and protects the public from evil and the Oxford English Dictionary defines a superhero as a character in a story or film who has unusual strength or power and uses it to help people. There is also one source I discovered that referred to a real person who has done something unusually brave to help somebody. These definitions immediately show that some superheroes are portrayed in a mask or disguise whereas others are not.

Historically, the first heroes originated in Ancient Greece, but they were not always good to others. Similar to modern-day superheroes, they would have unique powers or character traits such as being extremely strong or brave, but their powers were not always used to benefit mankind. Some could be violent and cruel, cause damage and hurt others: the opposite to our modern-day perception of heroes and the definitions I discovered.

One of the first widely hailed superheroes who fits the stereotypical definition was Superman. He first appeared in Action Comics #1 in June 1938 and was

created by Jerry Siegel and Joe Shuster. Although not wearing a mask, his costume was designed to set him apart from the general crowd. Superman has multiple superpowers including superhuman strength, hearing, speed, and agility to name a few.

Although the superheroes of comics and film are fictional, I believe these masked or caped crusaders do still have their place in our modern-day society. They teach people moral values such as being courageous, altruistic, generous and the difference between right and wrong. Children will often act out these characters through role play and look up to their values, donning the masks themselves to imitate their heroes. Therefore, they are an educational and moral tool.

I was surprised to discover that some adults are considered as real-life superheroes because they aid their community whilst wearing a disguise or mask, like their fictional counterparts. For example, in Canada, one individual, who refers to himself as Polarman, helps the community by shovelling snow off pavements and keeping playgrounds safe. Another example is in Columbia where Super Pan helps to fight hunger by giving bread three times a week to the poverty-stricken people in Bucaramanga. These individuals reflect many of the attributes in my initial definitions. However, the police's opinion of the real-life superheroes is nearly always negative. They think that they intervene in situations that make it harder for the police to work effectively and could put their lives and others in danger. An article in the Canadian newspaper, The Globe and Mail, claimed that the police have expressed concern that real-life superheroes "insert themselves into situations without knowing all the facts" and are therefore practicing vigilantism.

All superheroes do, however, need their foe, even if it is not one they may expect!

The superheroes I have discussed all in some form wore an item to disguise themselves physically from the rest of the population, be it a mask or a costume. However, I believe that there have also been individuals who can be regarded as superheroes who do not wear this attire. They are carrying out heroic acts, which have enormous impact on society, whilst still having the appearance of everyday clothing.

One of these individuals, I believe, is Elizabeth Garrett Anderson. She was born in 1836 and was one of ten children to Newson Garrett and Louisa Dunnell Garrett. At this time, the rights of women were limited, and expectations were few. Anderson, however, was a determined character who broke boundaries for women's rights. Her many achievements included: becoming England's first female doctor, female M.D. in France, and member of the British Medical Association (Britain's leading association of doctors). She was also England's first female mayor and a suffragette. These are enormous accomplishments in a time where most women of her social status were expected to marry well and remain in the home.

In my opinion, Elizabeth Garrett Anderson is a superhero as she never gave up on her dream. Even though she was rejected by colleges and universities many times purely because of her gender, she was determined and persevered. She had to adapt to different situations so she could reach her goal and I believe she has paved the way for women in medicine even to this day.

Another superhero I feel needs addressing is Stephen Hawking. He was born in Oxford on the 8th January 1942 and is most famous for being a physicist who set out a theory of cosmology explained by a union of the general theory of relativity and quantum mechanics.

He proposed that black holes would emit subatomic particles until they eventually exploded. Hawking also wrote best-selling books. His most famous book was which was published in 1988. In the early 1960s, Hawking contracted Amyotrophic Lateral Sclerosis, which is a rare, incurable degenerative neuromuscular disease. Hawking died on 14th March 2018.

I think that Stephen Hawking is a superhero because, despite his disease that had severe disabling effects, he was able to adapt and find new ways of communicating and sharing his intelligence. Again, he did not wear a mask or a cape but changed perceptions of Science for generations to come, therefore having a major impact on society.

My penultimate superhero, without a mask, is Irena Sendler who was born in Otwock, Poland in 1910 and was a Polish social worker. In 1931, Irena married Mieczysław Sendler and they moved to Warsaw before the start of World War 2. Sendler was a member of an organisation called Żegota who remarkably rescued 2,500 Jewish children from concentration camps and placed them in convents or with non-Jewish families. Sendler personally saved approximately 400 of that figure. On October 20, 1943, she was arrested by the Nazis and transported to Pawiak Prison where she was brutally tortured to try and force her to reveal the names of her associates. On refusal, she was sentenced to death but, fortunately, was released in February 1944. She died in Warsaw in 2008.

I think that Irena Sendler is a superhero because she risked her life to help save innocent individuals who were, through no fault of their own, caught in a conflict and a devastating situation. Even though the consequences of her actions put her own life at great risk, she still did it to help others. Sendler did not need

to wear a mask or a cape to save lives. All she required was her own bravery and acknowledgement of what was right and wrong.

In conclusion, I would like to draw on my own personal experience to demonstrate what I regard as a superhero. This is by no means decrying the people who I have mentioned as I regard them as life changing individuals, but it demonstrates how everyday people can still have superhero status. Recently, I had to stay in hospital because I was very ill. There, I experienced some real superheroes who nursed me back to health. I was cared for by many NHS staff including doctors, nurses, cleaners, surgeons, and radiographers.

Like the fictional superheroes they, ironically, because of the current COVID-19 crisis, did wear a mask. However, this was not to protect or disguise their identity but to protect both themselves and myself from the pandemic we are experiencing in the world in 2020. I am very grateful for the care and the courage they showed when treating me and all the other individuals in the hospital.

I believe I have demonstrated that there is a place in our society for the fictional masked superheroes, the real life individuals who have changed society and their views but also the everyday superheroes who work daily to protect and save the lives of others.

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The Psychology of Sociopaths and Psychopaths

Aimée Gerber



The terms psychopath and sociopath are often placed alongside the terms serial killers, criminals, mass shooters and more; the simple fact is that not all murderers are psychopaths and sociopaths and only a very small percentage of psychopaths and sociopaths are murderers. These common misconceptions about the above anti-social disorders are fed into the minds of people from many sources: the way people with psychopathy and sociopathy are represented in movies, in the media and most importantly the vast majority of the population continuing to be ill-educated about these topics. In this essay, I will be illustrating the difference between a sociopath and a psychopath, why they are more prone to violent crimes, the psychology behind their disorders and where the majority of people with psychopathy and sociopathy stand in society.

To start with, I will define what exactly psychopaths and sociopaths are and then go on to tell you how they differ from each other. Psychopaths and sociopaths are people who suffer from antisocial disorders: psychopathy and sociopathy.

Let's start with a psychopath and some of their traits. Psychopaths account for about 1% of the general population of the world and whilst that sounds like a small amount, that is over 75 million people; or to

put it in perspective, about half the population of Russia. Research has shown that psychopaths tend to have the following common traits: impulsive thinking, narcissism, the inability to feel empathy or remorse, engagement in dangerous activities for the thrill of it, the ability to manipulate and charm others and whilst not all people who suffer from OCD (Obsessive Compulsive Disorder) are psychopaths, the majority of psychopaths suffer from OCD. Psychopaths are born with their disorder and as a result of this, cannot be cured.

Moving on to sociopaths, they, unlike psychopaths develop this disorder throughout their life due to certain events that they may have been exposed to. As a result of this, 54% of sociopaths also suffer from PTSD (Post-Traumatic Stress Disorder), according to a study carried out by Agnesian Healthy Care. Subsequently, sociopaths are more predisposed to violence than psychopaths and therefore this makes it harder for them to stay within the boundaries set by society. While both groups struggle to control their impulses, sociopaths are more likely to give in to these impulses and consequently are more likely to end up in the criminal justice system than psychopaths. Other common sociopath traits are lack of empathy, pathological lying, the ability to lead a double life and change personality. These two disorders seem very similar on the surface but as you may have started to now notice from the above, there are also a number of stark differences.

In the media and films the "villain" or the killer with a traumatic past, are regularly referred to as psychopaths but the above proves that they are in fact more likely to be a sociopath. The other contradictory factor often portrayed in movies is the great attention to detail and meticulous planning that the killer puts into his crime, when in reality psychopaths and sociopaths act on impulses rather than preplanning and motive.

Perhaps the most notorious diagnosed psychopath was Ted Bundy, who was convicted for the rape and murder of 30 women. He was sentenced to execution. In his last few hours, he was interviewed by James Dobson and when asked if he felt remorse for all the pain he cause he said this: "Through Gods help in my last hour I have started to feel pain for all those I have wronged... I hope that those I have wronged realise that in their own town there are people like me who act on impulses which are provoked by the media and particularly sexualised violence and it scares me because when I'm talking about what happened 30-20 years ago it is in my formative stages and what scares and appals me, Dr Dobson, is that the violent movies I see on cable TV violent today is what inspires monsters like me."

This was all said in a calm state. At times, it was as if his voice was about to break but actually having watched the video myself, although he spoke about feeling pain and remorse, it felt more like he was trying to force himself to feel this. This feeds into another article I came across whereby the diagnosed psychopath declared that when he tried to force himself to feel remorse for his actions although he would feel prickling at the back of his eyes, nothing else materialised.

To illustrate the above, I offer a study that shows that psychopaths feel no remorse and sociopaths feel it but only to a reduced degree. A study carried out by Kent Khiel, one of the leading researchers of psychopathy involved the following. They compared 30 people who don't suffer from psychopathy or sociopathy, 30 people who have been diagnosed with psychopathy and 30 people who have been diagnosed with sociopathy; none of these subjects had a criminal record. All were required to stand in a machine that scans the brain and tracks the pupil of the eye. They were also shown three different pictures; one of

several hooded Klu Klux Klan men burning a cross; one of a car on fire but without any casualties and one of students standing around a Bunsen Burner.

Although everyone identified the picture of the KKK, as being morally wrong, Khiel noticed a difference in the brain scans of the psychopaths and sociopaths. When someone who doesn't suffer from anti-social disorders sees these photos there is an emotional trigger in their mind and the physical reaction due to this trigger causes their pupils to dilate. Psychopaths brains however, do not have this emotional trigger; so their pupils stay the same size whereas sociopaths brains have an emotional trigger but as sociopathy is a developed condition there is something that blocks the emotional response, so a sociopath's eyes dilate but quite rapidly contract again.

Another study shows why psychopaths find it hard to live "normal" lives. This is a study that was printed in the Atlantic paper; the study was carried out by Baskin-Sommers, Lindsey Drayton and Laurie Santos. The study asked some diagnosed psychopaths and some people with no anti-social disorders to look at the scenario which was this: A little girl had lost some marbles in her room and the subjects of the study had to anticipate where she would look first. The subjects with no anti-social disorders anticipated her actions correctly whilst the diagnosed psychopaths found it harder to do so and thought she should look in other places. This shows that most people can anticipate other people's actions and have some level of natural intuition, and whilst psychopaths may eventually come to the same conclusion, they do not do it automatically and the process takes them longer. This results in them often acting impulsively and in disproportionate measures to a given trigger or situation which can lead them to be violent.

Freedom of Speech

Laura Watts

Whilst psychopathic and sociopathic traits make it challenging to live within societies boundaries, these same traits are beneficial and suitable for certain career types. Some interesting statistics: 25% of CEO's are psychopaths and 15% sociopaths, 21% of military leaders are psychopaths and 10% are sociopaths, 30% of police officers are a mix of sociopaths and psychopaths. These jobs fit psychopathic and sociopathic personalities well as they are single-minded, not very in touch with their own emotions, meaning they can separate emotion from logic, making them ideal for CEO and military roles.

To conclude whilst a small minority of psychopaths and sociopaths live troubled and challenging lives, the majority live unremarkably amongst us in the world, some even adapting to roles suited to their personality type and disorder.

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Freedom of speech is a largely debated topic, which is widely interpreted across the globe, and has created many strong views. The official definition of freedom of speech, is “the power or right to express one’s opinions without censorship, restraint or legal penalty”, but may different people have interpreted it in their own words. Josie Timms describes it as “a fundamental human right. It reinforces all other human rights, allowing society to develop and progress. The ability to express our opinion and speak freely is essential to bring about change in society.” Timms is suggesting that freedom of speech is necessary in order to evolve, because we need new ideas to be heard and allowed.

Many of the world’s greatest thinkers would have heightened our knowledge of the world around us had we allowed them to share their ideas. We must be careful not to repeat previous mistakes, and to allow everyone to speak. Timms, like many other people, shows freedom of speech in a good light, describing it as “essential to bring about change”.

Others, like Brian Leiter, disagree with her. He writes: “viewing freedom of speech like freedom of action: speech, like everything else human beings do, can be for good or ill, benign or harmful, constructive or pernicious”. The message he is trying to convey, is that speech is similar to action, meaning they should have similar laws and restrictions, as both can be used for good or bad. This suggests that freedom of speech is not always the best option, as there will always be those who take advantage of it and use it for corrupt purposes.

Michael P Zuckert gives an example: “Justice Oliver Wendell Holmes’s observation that yelling “fire” in a crowded theater could lead to panic and serious harm, even death.”. This proves that words are not only similar to actions, but that they can also cause them,

showing that words cannot always go unrestricted. Aside from causing physical harm, speech is also a key factor in bullying, cyberbullying, and suicide. If we restricted words more, we could prevent more depression and create a healthier environment for both children and adults.

Others agree with freedom of speech, because it prevents oppression from people in high power, and stops the government disallowing any comments against their leadership. Freedom of speech allows everyone’s voice to be heard, so nobody is oppressed or forced to be silent. Many times, in England’s history, the people in power have done selfish things, but were not challenged for this, because they could restrict speech, meaning not many people were aware of what was happening. In modern society, it is important that the people know what and who they are voting for, so it is crucial they know all the facts and figures. However, even now, the population still don’t often know the full details of their politicians. Many politicians make promises that they will never fulfill, or don’t mention some of the things they will do in power, so some could argue that free speech does not make much of a difference. I think that we need a middle ground, to separate oppressive or hurtful comments from useful and futuristic ones.

To conclude I think I do not agree fully with freedom of speech, contrasting to my previous views; as I learnt more about this topic, my views changed, and I began to think more about the laws for our actions, as well as words. Throughout this research, I often found myself thinking about the phrase “the pen is mightier than the sword”, by Edward Bulwer-Lytton. This quote can be used in many different situations, and I think that here, the pen represents speech, and the sword represents actions. We have many laws and punishments for our actions, such as the disallowance of murder and

String Theory: The Unsolved Mystery

Sahana Karthik

theft, but according to Bulwer-Lytton, our words are “mightier” and can therefore cause more harm if used unwisely. If this is true, as it suggests that as words can be more hurtful than actions, we should have more laws over words than actions.

Someone disagreeing with me may say that we are not certain Bulwer-Lytton is correct, the sword may be “mightier” than the pen, but I think that them being compared so closely, and to such disagreement, suggests that they are similar enough to cause debate, and there are people on both sides of the argument. We have many rules for our actions, so even if the sword is “mightier”, they are similar enough for our words to have some laws to prevent harm.

I believe that we should be free to express certain views, such as our thoughts on the government, that can be productive, and allow our community to evolve. A recent example of this is the BLM protests. I think that these protests are a good use of our rights, as they allow our society to understand the need for a change in the policing department, and in the overall attitude of the population. On a similar topic, the racist remarks made to start these protests (I know there were many actions involved, but words also played a huge role) were also a type of speech, but these were not useful or kind, and they did not help society in any way. These two examples show the many ways speech can be used.

I think that, like actions, speech is so varied that we cannot give a simple rule for all of it. By expressing our likes/dislikes about things that affect us, and can be changed to benefit society, we grow and adapt to modern, ever-changing life. However, I do think that certain comments that cause a great deal of harm and do not benefit society should be disallowed to prevent upset and anger. Overall, there are some words that are useful and necessary, and some that are the opposite, and we should be able to judge between the two, and prevent as much upset as possible, whilst maintaining a free, happy society.

String theory is one of the most popular and yet most confusing ideas of modern physics. To many, it is a mystery and to a few, it is a solution. I hope you would join me in exploring this the complex theory in simple terms. Let’s begin our journey with this question: *What is the nature of the universe?*

To answer this question, scientists have come up with several stories to describe what makes our universe. Then they test these stories by experiments and theories and finally we learn what is correct and incorrect. The more we learn, the more complicated and weirder these stories become.

For us to understand the true nature of reality, we have to look at things closely and precisely. All of the wondrous landscapes, zoos of bizarre creatures, complex protein robots, all of them made up of countless even smaller things: atoms. We thought they were the final layer of reality until we smashed them together with force and discovered things that can’t be divided anymore: Elementary Particles. Now they are so small that we could no longer look at them.

The next task for our scientists is to make us see things. Seeing is touching, an active process, not a passive one. To see something, we need light- an electromagnetic wave. This wave hits the surface at the subject we are looking at and gets reflected from it into our eyes. The wave carries information from the object which our brain uses to create an image. So we can’t see something without somehow interacting with it.

You might think that this is not a problem with most things. But elementary particles are extremely small. So small that the electromagnetic waves we use to see are too big to touch them. Visible light just passes over them.

We can try to solve this by creating electromagnetic waves with much smaller wavelength but more wavelengths mean more energy. So when we touch a particle with a wave that has a lot of energy, it alters it. By looking at a particle, we change it, this means we can’t measure elementary particles precisely. This fact is the basis of The *Heisenberg Uncertainty Principle* in quantum physics.

What is the nature of a particle?

We have our second question now and the answer is we simply don’t know. If we look hard enough, we can see a blurry sphere of influence but not the particles themselves. We just know they exist. Physicists now have to find a way of doing science with them!

The step is to invent a new story or a mathematical fiction: *The story of the point particle*. We would pretend that a particle is a point in space. Any electron is a point with a certain electric charge and a certain mass all indistinguishable from each other. This way physicists could define them and calculate all their interactions, and *Quantum Field Theory* did indeed solve several problems. All the standard model of particle physics is built on it and it predicts lots of things very well. Some quantum products of the electron for example, have been tested and are accurate up to 0.00000000000002%.

While particles are not really points, by treating them as if they were, we get a pretty good picture of the universe. Not only did this idea advance science, it also led to a lot of real-world technology we use today like Quantum Solvents, Hadron Therapy and Maglev Trains. However, we forgot about a huge problem: *gravity*. In quantum mechanics, all physical forces are carried by certain particles. For a weak force these particles are W-Bosons and Z-Bosons, electromagnetic force uses Photons and strong forces use Gluons.

According to Einstein's general relativity, gravity is not a force like the others in the universe.

If the universe is a play, particles are the actors and gravity is the stage.

To put it simply, gravity is a theory of geometry. The geometry of space-time itself, of distances which we need to measure with absolute precision. But since there is no way to precisely measure things in the quantum world, our story of gravity doesn't work with our story of quantum physics. If we could marry gravity to quantum physics and the standard model, we would have the theory of everything.

What is more complex than a point? A line or a string.

String theory was born. The core idea behind this theory is that all particles are not point like dots but tiny strings-open or closed, straight or curved. These strings are so small that even our best equipment can't confirm that they are not points. It attempts to model four interaction of gravity, electromagnetism, strong and weak nuclear forces. This might be the answer to unified field theory to explain all interactions and mechanics of universe.

What makes this theory so elegant is that it describes many different elementary particles as different modes of vibration of the string. They oscillate due to tension and kinetic energy. Just like a violin string can give us a lot of different notes, a quantum string can give us different particles. Most importantly this includes gravity.

String theory promised to unify all fundamental forces of the universe and it quickly graduated as a hope to the theory of everything. *If atom is size of solar system, string would be the size of a tree.* We are introduced

to tachyon which is faster than speed of light in this theory and later to graviton which governs the gravity and decides how small the strings are.

Unfortunately, string theory comes with a lot of strings attached. Much of the mathematics involving a consistent string theory does not work in our universe with three spatial and one temporal dimensions. String theory requires ten dimensions to work out. So the string theorists did calculations in model universes and then try to get rid of the extra six dimensions to make the theory work in our universe.

There are extra dimensions to space beyond the length, breadth and depth but we can't experience it as they are in tiny spaces. So far, we have not suggested but not proved string theory in an experiment. *Does this mean that string theory did not reveal the nature of the universe?* We could argue that in this case, string theory really isn't useful at all. Science is all about experiments and predictions; if we can't do those, why should we bother about strings? It really is about how we use it. Physics is based on math, for example $2 + 2 = 4$. This is true no matter how you feel about it. And the math in string theory does work out which is why string theory is still useful.

Imagine that we would like to build a cruise ship but we only have the blueprints for a small rowing boat. We can argue that there are plenty of differences like the engine, the materials, the scale. However we must not forget that both are fundamentally the same: things that float. By studying the rowing boat blueprints, we might be able to build a cruise ship eventually. With string theory, we can try to answer some questions about quantum gravity that have been puzzling physicists for decades such as how black holes work or the information paradox.

String theory may point us in the right direction. M theory is an extension of string theory with 11 dimensions (4 space times and 7 very small dimensions).

One of the future predictions is to find cosmic strings which are likely to be billions of light years long, thinner than proton but quite dense. We can now safely assume that string theory is a precious tool for theoretical physicists which will help them discover new aspects of the quantum world and some beautiful mathematics.

So maybe the story of string theory is not the theory of everything but just like the story of the point particle, it may be a vital one.

We don't yet know what the true nature of reality is; but we will keep coming up with stories to try and find out. One day, hopefully, we will.



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