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Can we survive any longer?
By Matthias Abebe

All current living creatures are results of survival. The inbuilt instincts and efforts taken to continue one's existence have pushed organisms to develop in complexity and intelligence all leading to where we are now - a dying planet. In this article I will be discussing the theory of natural selection and evolution; the development of human survival strategies and what the future may or may not hold.

Evolution is the overall change in allele frequency in a population over time; alleles being different variations of the same gene. However evolution doesn't merely occur, it is just a description of change, it needs a mechanism which acts every day for billions of years and this mechanism is natural selection. Natural selection is otherwise known as survival of the fittest and describes the process of organisms, with favourable features suited to their environment, surviving and reproducing leading to an increase in the frequency of that allele in the gene pool. Over millions and millions of years the number of organisms with this characteristic due to the allele will have increased and this visible change in the species is evolution by the means of natural selection.
However in order for natural selection to occur two things must be present: genetic variation and a selective pressure. Genetic variation is the term used to describe the differences in the DNA sequences of the genomes of individuals within the same species and it is essential for evolution. This is because it allows for there to be a variety in alleles which under the right selective pressure can give an organism an advantage over the rest of its kind. A selective pressure is anything that causes competition and forces organisms to survive for example the introduction of a new predator, a new disease or a change in environment. Without a selective pressure these varying alleles will be neutral and have no effect meaning natural selection will not occur and overall no evolution in that species. The change in complexity and intelligence due to evolution is noticeable because of the adaptations visible in organisms. There are three types of adaptations: physiological, anatomical and behavioural adaptations. Physiological adaptations are features of the internal system that help maintain homeostasis despite external stimuli. It helps organism to survive in many ways one example being snakes. The physiological adaption is the fact that something in their internal workings must have developed which could create zootoxins that are present in their saliva thus creating venom. The toxins in the venom means any organism they place their fangs into is immobilised and eaten. This increases the probability of survival and reproduction which in turn leads to an increase of venom producing snakes. Anatomical adaptations are structural features visible to the eye which improve the likelihood of survival of an organism. Anatomical adaptations can also be seen through dissections. An example of a structural adaptation is the gecko. Many geckos have tails that resemble their heads so that predators attack their tails instead. This is so that when a predator makes the mistake of biting the gecko's tail off the gecko can get away whilst the decapitated tail twitches in the predators mouth. The last form of adaptation is behavioural. Behavioural adaptation refers to the actions that an organism takes which betters its chances of survival. There are many forms of

behavioural adaptations one being the bowerbird. The bowerbird makes an immaculate nest collecting twigs, plants and plastic all in order to attract the attention of a mate. This improves the chance of reproduction and the continuation of life. The more of these adaptations an organism has the more complex it is and all in all the better it will be at coping with the struggle of life. Charles Darwin and Alfred Wallace were the first to propose the theory of evolution and it has now become the most accepted explanation as to how we've become what we are.

The timeline of human evolution is extremely long, controversial and contains gaps. A common misconception is that we evolved from apes, gorillas or chimpanzees. We shared a common ancestor that lived around 8 million years ago with some of these primates however we are all modern species. One of the most significant discoveries was that of Lucy the Australopithecus. Estimated to be 3.2 million years old Lucy was discovered in my country, Ethiopia and was evidence that bipedalism (walking on two feet) came before the increase in brain size of humans during their evolution. However it also proved the fact that brain size was increasing as Lucy's inner skull had a capacity of around 440-550 millilitres whereas the average gorilla skull capacity is around 500-700 millilitres and modern human skull capacity is around 1,300 millilitres. Changes in Lucy's skull structure also implied that other regions of the brain were starting to be used thus showing the increase in intellectual capacity of our ancestors. Here we see that there has been a change in our evolution path. The development of major characteristics may have been what had helped us to survive until that point but this acts as a transition from structural development to what can be seen as intellectual development. Intelligence was the way forward; it became our new method of survival.

The discovery and use of fire is an example of an early behavioural adaptation which showed the use of our intellect; a prime example of our modern survival strategies is the discovery and use of different medicines. There are ancient examples of medicines and remedies used by the Egyptians at around 300B.C. however I will be focusing on the much more recent development of medicine starting with the use of plant extracts. Most drugs before 1953 were mainly plant extracts or chemically similar to some plant extracts e.g. aspirin. The use of such medicine may have been beneficial at the time but didn't allow there to be any control of potency or strength and the presence of many substances in the plant extract meant some chemicals could counteract the purpose of the medicine. There needed to be change, medicine needed to evolve. The late 1920s and 1930s were monumental years for medicine they marked the discovery of penicillin by Fleming and the development of sulpha drugs. These were immensely significant as they were the first steps to treating bacterial illnesses which were previously causes of death. The 1930s also marked the development of vaccines for yellow fever and typhus. Vaccines help reduce the number of disease outbreaks in a population by making the majority of people immune to it. There is currently above 2,500 medicines in the pharmaceutical industry however humans face a new selective pressure that is forcing the need for adaptation-cancer. Cancer is the abnormal growth and division of cells which can spread to the rest of the body. There are many new medicines and treatments that are being developed which help to battle cancer including surgery (use of invasive techniques to remove cancerous tumours) and chemotherapy. Chemotherapy uses cytotoxic drugs to kill cancerous cells thus helping remove the cancerous cells. Hormone therapy is another form of treatment which lowers the level of hormones in a patient through the use of special medicines. The lowering of hormone levels slows down the growth of cancer cells. There are many other treatments such as external or internal radiotherapy and bone marrow transplants which all act as examples of how humans have used intellectual ability to use resources in order to survive.

It is clear to see that present day medicines are complex and have evolved drastically however there seems to be more room for development. A new theory is personalised medicine. The study of genomes of different people can help to see how their body will react to different drugs and can help doctors to “personalise” medicines to increase efficiency and minimise any risk of rejection or allergic reactions. This will be an immense step forward for medicine and the treatment of humans as it can tend to the specific needs of patients as a pose to broad medicines.

On the other hand people have started to question how many steps we can take. Whilst we have developed both as organisms and as intellectual beings we have damaged all that is around us and ourselves. Over use of antibiotics has led to the development of super bugs resistant to drugs ironically due to evolution. Our use of the raw materials provided by the Earth has been detrimental. We have caused extinction of certain species and have emitted plenty of greenhouse gases leading to global warming. This then leads to extreme weather which again kills of more species that inhabit this world alongside us. As more and more of us survive the planet seems to grow in strain and strife. The population is growing and resources are decreasing in quantity due to our interference with nature. Hopes of the inhabitancy of Mars or another planet exposes the underlying problem we all face our home is dying. Therefore we need to evolve to this selective pressure and take actions which helps preserve the life of our sacred planet otherwise we’ll be forced to answer the question – “can we survive any longer?”

“One general law, leading to the advancement of all organic beings, namely, multiply, vary, let the strongest live and the weakest die.”
— Charles Darwin, the Origin of Species

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The establishment and maintenance of the reputation of William Shakespeare
By Noon Ahmed

William Shakespeare, widely regarded as the most renowned writer in the English language (1564- 1616) was a poet, playwright and actor. Before his uprising and death, Shakespeare was rated as just another playwright among many others, if that. During the beginning of his career he was even held under criticism and accused of being an 'upstart crow' by Robert Greene, the most distinguished writer at this time. Scholars differ on the interpretation of this criticism, but most agree that it was Greene's way of saying Shakespeare was reaching above his rank, trying to match better known and educated playwrights like Christopher Marlowe, Thomas Nashe or Greene himself. Since the late 19th century, Shakespeare's status has come to form what it currently stands to be; arguably outperforming any other Englishman or man of his profession. No other pieces of theatre or literature have been performed nearly as often as his productions, nor have they enjoyed the same reception. Then, how did his unparalleled literary genius come to show? How did he manage to construct his reputation and more importantly, how has he maintained it?

Before the 1570s, English had hardly any modern literature and criticism of any writing only came to light at the time of Charles I's reign. The publications of Shakespeare's poems took a prominent lead against his plays. His plays were written for performance only by his own company, and due to the lack of law against rival companies using or taking plays, Shakespeare and his company resisted to any formal printing of them. The piracy or attempted piracy of many of his plays suggests his potential esteem at the time, despite this being then a common practice. If any of his plays were to be printed they would be in the form of cheap quarto, such as a pamphlet. The First Folio formed the 1623 published assortment of Shakespeare's plays. While almost half of Shakespeare's plays had previously appeared in print publications (in a cheaper format with smaller font), the First Folio contained eighteen full plays that had never been before printed. Among these were the most famous and renowned pieces of literature, including: Macbeth, Julius Caesar and Antony and Cleopatra; without it we would be missing *As You Like It, Measure for Measure, The Tempest*; we would have not heard of prominent phrases such as '*All the world's a stage*' or *'If music be the food of love, play on'*.

The First Folio's display of plays which had already appeared in publications is notably different from those in which they were first published. For example, the Folio's text of Hamlet misses 230 lines that are present in the previously printed versions, but an additional 70 lines of which those lack. Other plays such as Romeo & Juliet and Henry V all differ varyingly in comparison to previously published editions. These alterations imply that Shakespeare's text was seldom stable- plays as printed carry adjustments that were put into action as soon as they entered the theatre. It is also suggestive that Shakespeare may have revised his plays and reformed them for either publication or to meet the changing performance demands. Another aspect to note from the Folio is the contents of it that convey Shakespeare's status as a literary figure (7 years after his decease). The Folio's impressive design opens with a selection of poems and prefaces which praise Shakespeare's effect and significance to literature and the English language, portraying him as a writer whose work had a prosperous future with a firm status and would therefore probably outlive its day.
The preface to the Folio contains a short ten-line poem by Ben Jonson, devoted to Shakespeare. Below an engraved portrait of Shakespeare, Jonson draws attention to the Bard's relevance and worth, celebrating him as his '*Beloved'*. While Jonson was a well-known, successful writer and poet, classically educated and had studied in depth the English

language, society, art, philosophy and other civilisation studies of Greece and Rome, Shakespeare had contrastingly little education. Not only does this represent Shakespeare optimistically in respect to him managing to attain such a revered level of respect from one of the most renowned of society, it also comparatively displays him as able to reach the same echelon of quality of work and publications to those such as Jonson, regardless of his absent edification. This would have unquestionably contributed to his assembly as a literary icon. During this period, English plays were (by most) regarded or accepted as credible forms of literature. The First Folio was the earliest English book of its kind which is made up of plays only and entirely. Not only does it portray Shakespeare's already acclaimed status as a writer but also the development of English theatre in producing its literature. When the Bard's closest friends, John Heminge and Henry Condell, produced the collection of the plays that is the First Folio, they divided them into their respective categories of Comedies, Histories and Tragedies, as they are still known today. Older versions of Shakespeare's work publications such as those in quarto format did not survive. Such 'bad quartos', as they were known as, discredited Shakespeare as the author and disregarded the entireties of plays. The First Folio not only published whole plays but made reference to Shakespeare as the rightful owner and praised him, contributing to the construction of Shakespeare's literary genius.

The ever-changing society values and customs have also affected the reception of the plays and the formation of Shakespeare. As Ben Johnson writes within his poem- markedly at the head of his folio, *'He was not of an age, but for all time',* words that still hold true at present, even to critics. The timelessness of Shakespeare's plays and themes within them allow them to be enjoyed with the ever-changing society, keeping them fresh and relevant. What comes to be so venerable about his work is how relatable his theatrical topics are to common livelihood. *Othello* is an ideal example of this. The theme of racism and internalised self-doubt that is infiltrated in the character of Othello allows it to continue to resound in today's society. Other issues within it, such as the mistrust of differences and domestic abuse make up the headlines in news now. His work has been adapted in a number of ways, one being the reflection of them from theatre to television, appealing to the modern social groups of today, enabling them to be still appreciated by all ages rather than disregarded by some. Notably, adaptations of Shakespeare's plays almost offer a commentary of the period in which they were produced. Alterations in language and costume for example aid in placing the production in a certain time frame or era. These variable adaptations increase our capability of understanding and valuing the Bard.

King Lear is an example of one of Shakespeare's plays that have been adapted to mirror and intrigue the audience of when it was produced. *King Lear* tells the story of a king who after retirement, decides to divide his kingdom amongst his three daughters to avoid any potential family or political conflict that may come to show after his death. Its original performance and reception featured an all-male cast, although some protagonists of the play were female. Shakespeare had a company of 26 actors, and required approximately a week to learn stage and perform each play. The staging of physical scenes were accredited to those who had experience in fighting (most did), thus these high stake these would be realistic. Actors learned from one another due to no kind of drama school or a director, therefore plays were staged collaboratively with the author. The Naham Tate adaptation or '*tateification´* of King Lear portrays the difference in production over time and the reason for these changes. From it we have come across the main difference of the reworking is the return of King Lear to the crown instead of his death in the original. This may be due to historical and political happenings of this time. In the 1680s, after the Interregnum, Charles II was restored to the English monarchy. Lear's reinstatement to the throne rather than his decease was altered in

order to fit in the political and social changes of its time. Other differences such as Cordelia not dying served as a form of celebration of the overthrowing of Cromwell and reaction against Puritanism. Due to this, England was in a state of contentment and as a result wanted to celebrate and maintain this. A happy ending within plays reflected this happiness and suited the audience. These changes allow Shakespeare's work to be more topical and relatable. Its adaptations enabled the sustenance of relevance by appealing to the norms and customs of the society and environment of when it is produced, preserving it as entertainment.

Shakespeare's plays are still rehearsed, learned and performed today. Yet the beauty of Shakespeare's talent is shown not so much in the basic themes of his works but in the originality with which he painted images and meanings of love, power, greed, discrimination, hatred, and despair. Queen Elizabeth in the movie *Shakespeare in Love* (1999) stated that William Shakespeare was the first author to 'successfully put the very essence and truth of love into words'; although only a movie, the statement is even so accurate. It was this truth and ability to mirror raw emotion which caused his plays to attract both courtiers and peasants to the theatres, breaking boundaries of status or reputation by playing to a common premise.

Another sign of a truly paramount writer is one who finds even the existing vocabulary of his language restrictive to his own creative perception; Shakespeare often found this to be the case and on many occasions developed his own lexis that now are in common use (examples of these would be words such as 'premeditated', 'amazement', 'dislocate', 'lackluster', or even using the masculine singular pronoun "his" for "its" , now used for effect poetically, and using some nouns as verbs, such as "he chided as I fathered"). This demonstration of independent adaptation of the English language, even under criticism, illustrates Shakespeare as an undoubtedly not only skilled but gambling writer, willing to go against established norms as a means of staying true and expressing his own identity. Few modern writers have such proficiency as to create new words which become permanent in language and common usage even centuries later.

The astonishing writing skill and flare with which Shakespeare created his accurate portrayals of human truth and emotion have not been rivalled or replicated since his death, nearly four hundred years ago. Sceptics even question how anyone of such modest education could write with the intellectual perceptiveness and poetic power that is displayed in Shakespeare's works. To simply ignore such an integral part of literary history would be impossible, as shown my modern works which rest their relevance and success in the lessons learnt from Shakespeare. Literature simply cannot survive without William Shakespeare.

What are you passionate about?
By Marcos Costa

Every time a person asks me what I am passionate about, I always am unsure of the answer. Many thoughts explode in my mind but there is never that one specific firework. A passion is defined as 'an extreme interest in or wish for doing something' (Cambridge University Press, 2017). Passion is important because it can give you a motive to get out of bed every day. At the moment, school is what gets me out of bed and I miss it when I don't. Passion is one of the reasons you have to achieve success in your life. Being passionate not only helps the person but it can also affect others. Whatever you are passionate about may eventually help others, by directly changing their lives or making them motivated with a passionate person as an example. However, a passion is fuelled by time, effort and money. A passion requires a person to commit to what they are doing; it requires motivation. That initial motivation is always hard to keep. We might feel extremely motivated to do something that would benefit us in the long term. We start doing and feel like we can achieve our goal. Take New Year's Resolutions as an example: how many people actually are able to complete all their goals or at least do it for longer than a month. So motivation is needed to have a passion. Passion later motivates you to continue doing what you are doing. It is just like rolling a snowball down a hill. It needs some effort at first to obtain some momentum and after it is unstoppable.
The good thing about passion it can be seen as a hobby. A hobby is a job that you enjoy doing so it no longer feels like a job. Being passionate about your job makes it more enjoyable and then the job becomes a hobby. This can be seen on football players. Cristiano Ronaldo, one of the World's best football players ever, he started his career in a small, second division Portuguese team called Sporting B in 2002 (Polaris Sports, 2017). He was 17 years old and he probably didn't think he would become one of the top players by 2008, a year after being transferred to Manchester United. He was passionate about football since he was a kid, and he continued to do what he likes, the best he could, and he is still playing football today with the same passion. Why doesn't Christiano Ronaldo stop playing football? After all these years he has being one the highest paid players ever, with a salary of £21 million in 2016 (Total Sportek, 2017). He is still playing football and he could've retired a long time ago if his goal was to get money. On the other hand, he will probably play professional football until the day no club wants him.

How do you find your passion? The best way do to it is by trying as many things that spark your interest. Firstly, you start to understand what that thing really is. Sometimes it is not what you thought it was and you discard it as soon as you get into it. I thought I would like to work on economics but after seeing what an economist does, I immediately knew I was going to hate it. So after you try it, you might like it. Now it is time to go deeper into it. Some students think doing Art or PE in their GCSE is going to be easy; you draw in Art or you play sports in PE. Easy. But once introduced to the subject and start to see how demanding it actually is, you know it isn't that easy.

I honestly don't have a passion or at least I don't know about it. However, I enjoy a variety of things. I like to study Biology and Maths. They are favourite subjects. Furthermore, I enjoy non-academic things music and sports. This shows that even I don't have a passion, it doesn't mean I don't have like anything else.

I like to study Maths because I love to find out the many ways problems can be solved and normally, the most efficient way to do it. During a maths lesson, many students can have a popular way of solving problems. When a student has a different way, it's always interesting

to consider how the other person thinks which many times can be very different to the way one thinks. What I really like about Maths it's that it is logical; everything has to make sense to a certain degree. This allows the different but correct way of solving problems. The topic I like the most is algebra, and the way you can manipulate number and functions to obtain a result. The most satisfying part of algebra is when you start with a long and complex equation, which effortlessly simplifies to a small and simple equation where, luckily, an integer answer is found.

Biology has been my favourite subject since I started studying Science and even before it. I really like to work with living things and to understand the way they work. My favourite part is studying DNA and how it affects organisms. DNA is what every living cell has and uses as the instructions for its basic functions. What I really like about DNA is how it can mutate. A mutation is when a genetic code randomly changes a bit. Many mutations are silenced: they don't affect us. But some can be either beneficial or harmful. Focusing on the beneficial ones, they slightly change an organism and makes it better adapted to its environment. The organism would likely reproduce and its offspring may contain its mutation. Over time, the frequency of the mutated gene can increase and organisms with it survive better than the ones without it. This is an example of how natural selection occurs. The evolution of every living thing is determined by the changes it has on its DNA. Therefore, this means DNA is crucial for the survival of every species in the world. That's what fascinates me about DNA, how a chemical chain can destine the future of a species, whether it will be able to survive its changing environment or become extinct and forgotten. Not the dinosaurs though, they are cool.

Why do I like music? Music is 'the art of sound that expresses ideas and emotions in significant forms through the elements of rhythm, melody, harmony, and colour' (Dictionary.com, 2017). For me, what makes me like music is playing with a band. I play the guitar alone at home but when you are in a group and start making music, especially when the music is good, you feel like everyone is connected and depends on the other, just like a building needs its columns to stand. If you don't have one player, the music loses a component of its transferred emotion. It's incomplete. But music it's not always about playing, sometimes it is all about listening to others. Songs can transmit feelings; they can make us feel energetic, wild, free, unstoppable, and they can make us feel down, sad, weak. It can also make us remember. Sometimes you link a song with a vacation, a stage in your life or other people. This makes me really like music because it is also one of those things that are present in our daily lives and only when you take time to appreciate it, you find the enormous world it contains.

Diverting to sports, I find them necessary. I always have done sports since I was a kid. From football, to judo, to sailing. I have had the opportunity to experience many sports and my favourites so far were rugby, snowboarding and rowing. These are very different sports. They cover land, water and snow. But there are very specific thing about these sports that makes me like them so much, even if they are very so different.

Rugby is a team sport and I like to see a game as a battle. There is always a strategy in a sport, and for rugby it can be seen as a battlefield. You got to defend at certain times, certain locations, as well as you need to attack to get territory. The closer you get to the goal line the better. You need to push your adversary team back and break their defences to get past their defensive line and run to the goal line where you touch down the ball and get a try. I used to

play as a winger so my job was to run as fast as I could and not get tackled. I was fast so it wasn't that much of a problem.

I only started rowing when I was 15. Rowing is also a team sport. The boat only moves if there is a crew. So rowing also has its team spirit, however, you need to bond to your team otherwise you won't enjoy being stuck in a floating cylinder in the middle of a river without anywhere to go. But rowing is also very disciplinary. You must follow the rules of the river as well as the orders your coach gives you. Rudeness is not normally tolerated because it makes everything unpleasant. I like rowing for the other indirect benefits too. It is a great way to relief stress, get healthy, feel good about your body, and it overall makes you a happier person. Some people ask me why I like rowing so much, it is very monotonous after all. I tell them it is about exceeding yourself and getting better every stroke. However, when you are too motivated and push yourself too much you get injured. This is why I had to stop rugby, I pushed a tendon in my foot to the limit and almost broke it. And I been out of rowing for 3 months because my knees didn't adapt to the increased demand of my second season.
After considering my hobbies, I realised that I can try to guess where my passion could be. I really like music but I can't see myself becoming a musician any time soon, I'm not even that good. I think I'll keep music as a distraction. Also, looking at my previous career in sport, I can't get better at it if I keep injuring myself and making me miss more of it. Also, you need to be in the same sport for longer. On average, I changed sports every year. Now, there is only two options left: Maths or Biology. I do love Maths, I love teaching Maths to others and it's one of the only subjects I don't mind doing homework for. I like and I'm good at Maths, but I prefer Biology and think is more interesting. I want to know more a lot more about it. And with this I assume that my passion may be hiding in a field of Biology, awaiting to be unveiled. But that's not definite, I still have many things to discover and I might find it somewhere totally different. Who knows?

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To what extent is cloning ethical?
By Julie Dao

Cloning has been the cause of many insightful debates which raises many though-provoking and ethical issues. Cloning is producing genetically identical copies of an organism from a single original parent cell. This occurs in asexual reproduction for unicellular organisms such as bacteria when it multiples rapidly. Identical twins are a primal example of natural clones because they are share 100% of the same genetic makeup. This is a result of the human zygote usually dividing into two cells which then each develop into separate embryos. Commercially grown potato varieties are examples of a clone which consists of a large number of organisms. In order to create large clones, cloning needs to be a repetitive procedure but organisms can be tracked to the original parent cell. The physical appearance of clones is not always identical because environmental factors are a massive influence of an organism's appearance. The word 'clone' was initially used in the early 20th century for asexual reproduction to create plants. Therefore, 'clone' has originated from the Greek word 'twig' (Allott and Mindorff pg. 196).

Artificial cloning includes gene, reproductive and therapeutic cloning. Gene cloning creates copies of genes whereas reproductive cloning involves producing copies of whole animals. The National Human Genome Research Project often utilise gene cloning although they forbid the use of cloning mammals. Therapeutic cloning is associated with producing a cloned embryo in order to obtain stem cells with the same DNA as the donor cell. Stem cells have the unique property of being unspecialised so it can differentiate into different types of cells. They are often used to enhance knowledge behind disease diagnosis at a molecular level. On the other hand, mutations within stem cells could ultimately lead to cancer after proliferation, which may inhibit the use of stem cells as a diagnosis for human disease ("Cloning Fact Sheet").

In 1996, the production of Dolly the sheep was a staggering development in animal cloning through somatic-cell nuclear transfer. Cells were extracted from the udder of a donor adult and they were cultured in the laboratory. An egg from another sheep was obtained but the nucleus was removed from it. Cells from the udder and the egg without the nucleus were fused together with a pulse of electricity. Alternatively, the empty egg and the somatic cell can be fused through injection. A third sheep acts as a surrogate mother for the resulting fusion. When the surrogate mother gives birth to the lamb, it is genetically identical with the donor (Allott and Mindorff pg. 199).

The discovery of animal cloning through Dolly has led to medical and agricultural advancements such as genetic modification to produce milk which consists of a protein required for blood clotting. Scientists are developing this to try and extract this protein for humans whose blood is not able to clot properly. Contrastingly, reproductive clothing is not always an efficient process, evident from the case of Dolly, 277 cloned embryos were tested before the researchers were successful. Reproductive cloning carries severe risks such as health problems within cloned animals such as organ defects and an increased birth size. Telomeres are located at the tips of chromosomes and these shrink every time cells undergo division. However, after periods of time, the ability for cells to divide deteriorates due to the short length of the telomere which causes the cell to die. Cloned animals may often have chromosomes shorter than the average which in effect decreases the lifespan of the organism ("Cloning Fact Sheet").

The immense controversy surrounding cloning in humans has sparked “the great cloning debate” in 2002 in Washington, DC which encompasses both biology and politics in order to “regulate the hard ethical dilemmas raised by biomedical advances.” (Sam Brownback and Mary Landrieu, 2002) Francis Fukuyama is a prime example of an extremist, who claim that left-wingers demand for perfect human nature. ("The Great Cloning Debate") This is supported by the principle which involves the killing of a human being due to the nucleus being removed from an egg to insert somatic cells to initiate stimulation. This inextricably links to the unnatural process of cloning. It challenges religion as it is the creation of new organisms from other cells and can also be perceived as a violation of human dignity due to the artificiality of reproduction. ("Is Cloning Wrong?") Cloning in humans especially will lower our own individual sense of value and would “contradict the most fundamental principle of medical ethics, that no human life should be exploited or extinguished for the benefit for another.” (George Bush, 2002) Ms Landrieu acknowledges the striving effects cloning can have for medical research but claims that “there are safer, less worrisome means to the same end” which rejects cloning for scientific advancements.

Arguments proposed by Leon Kass are more concerned for the complete modification of human nature which will shape the perception of future generation. The embryo industry requires a large number of eggs in order to create a cloned embryo. Charles Krathammer (2002) outlines how cloning opposes Christian beliefs and feminism as women are placed in a threatening position where they could be pressurised to contribute to the embryo industry. ("The Great Cloning Debate") Therefore, this unnecessarily contradicts the idea of free will. One must question the unsuccessful rate of cloning and its undesired consequences of defects and abnormalities as well as the much shorter lifespan. Despite the success of Dolly, she still suffered from arthritis. The nuclear transfer technique caused deformities, death and abortion in other foetuses. Success rates range approximately from 0.1 to 3 percent which is a shockingly low figure. ("Learn.Genetics") Another argument is associated with the commodification of individuals due to the manufacture in a controlled process. It would encourage parents to conceive for the sake of it rather than the willingness and desire to love and raise a child. However, one may also argue that the decision of parents to clone their child must have originated from the fact that it is highly valued. Therefore, the opposition would state that the likelihood of accidental cloning would be minimal.

Information and data has resulted in scientific advancement which has been invaluable. Human genetics can be advanced and cloned organ substitutes are also a possibility which is critical in cases of organ failures. There have also been agricultural developments such as in farming in order to produce a more sustainable market. Ultimately, cloning is a fundamental function of nature. Many concerns with cloning include the reduction in diversity of the human gene pool. Conversely, cloning is unlikely to be widespread so this will have not an immediate and direct impact. This is also particularly due to the minority of the population who require the technology for cloning to proceed due to the time-consuming nature of cloning and the effort required for it. Nuclear transfer can potentially avoid the transfer of disease caused by the egg cells which will be able to eliminate genetic traits from the gene pool which would have equal significance as the eradication of infectious disease. ("BBC News | HEALTH | 'Designer Baby' Ethics Fear") Despite the claim that cloning limits any reduction in diversity, cloning is ultimately the production of genetic copies rather than the act of mixing the genes. This is a major disruption to evolution and deters of development of humankind. Furthermore, one acknowledge the environmental impact on clones which allows for distinct personalities and preferences which eliminates the identical nature of clones if we

negate the reductionist approach involving genes. Ultimately, clones are still individuals like everybody else who are equally conscious (“Goodbye Dolly”).

Furthermore, organisms will be able to possess the desired traits which make it easier to replicate them and thus an experimental advantage. Consequently, this will eradicate the preconception that animals endure traumatising conditions in research conditions. Another way in which cloning will drastically reduce the amount of pain that organisms suffer is how it will help them to recover from any injuries. During cloning, the organism’s cells would be used and because of the complimentary tissue match, perhaps the organism’s recovery will be much more efficient. This eliminates any time-consuming and complicated procedures. ("The Pros And Cons Of Cloning: Is It Worth The Risk?") The proposition arguments are highly conflicting towards religion as supporters believe that an unplanted ball of cells cannot be defined as a human being and possibly less of a human being that stems cells obtained from in-vitro fertilization. Michael Gazzaniga (2002) claims that cloned cells have “no nervous system.”

Cloning evidently has a huge significance for the development of science and new discoveries every day. This is extremely beneficial for long-term success in terms of helping to sustain agricultural developments and saving the lives of the many with organs which are unable to function. However, we must consider the factors which counteract how much cloning contributes towards science. The likelihood of unsuccessful cloning is a massive risk and will cause immense suffering amongst the majority of organisms which negates the claim that cloning will reduce harm on organisms. Ultimately, cloning opposes animal ethics to every degree and must be reconsidered.

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Black Holes
By Anna Durrant

The term 'black hole' was born in 1967, first used by theoretical physicist Professor John Wheeler. Prior to this, what we now call black holes were referred to as 'dark stars', or 'frozen stars'.[1] Our current understanding of black holes is that they are each a region of space-time containing an incredibly massive (meaning it has a high mass) and dense body of matter. Due to the correlational relationship between mass and gravity, the body produces a gravitational field that, up to a certain distance from its centre, is strong enough to prohibit light from escaping from within the region[2]. This is why black holes appear as black - they do not emit any light.

There are currently three different kinds of black holes that we know about: stellar black holes, super massive black holes and intermediate black holes. Stellar black holes are the smallest; they are born out of the collapse of a large star. This collapse occurs when a star essentially runs out of fuel, meaning that there is no longer a sufficient amount of small atoms in the star's core for nuclear fusion to occur. Nuclear fusion is the process by which stars release energy. It is thought that there are several million stellar black holes in the Milky Way alone, the closest one being approximately 1,600 light years away from Earth[3]. Super massive black holes, on the other hand, can be a million or even a billion times more massive than a stellar black hole. It is thought that a super massive black hole lies at the centre of every galaxy, including the Milky Way. Due to their significant scarcity in population in comparison to stellar black holes, little is known about the origin of super massive black holes. However, it has been theorised that they are created as a result of thousands of smaller black holes falling together. In size, intermediate black holes are between stellar and super massive black holes. They were not discovered until as recently as 2015[4]; before their discovery it was generally accepted among the scientific community that black holes were either very large or very small, and there was no middle ground. Similar to super massive black holes, the origin of intermediate black holes is unclear, but it has been suggested that they form when stars in a cluster collide together as part of a chain reaction.[5]

Black holes are thought to consist of two parts: the event horizon, and the singularity. Under physical law, nothing, not even light, can escape from within a black hole once it has crossed the event horizon. The event horizon of a black hole is essentially the 'point of no return'; once light has surpassed this boundary it is permanently trapped within the gravitational field of the mass[6]. The required escape velocity at the event horizon of a black hole (escape velocity is the speed at which an object must be travelling in order to overcome the force acting on towards a particular point; in the case of black holes, this force is gravitational force) is greater than the speed of light[7]. Since only light can reach this speed, and nothing can exceed it, this means that nothing can escape once it has passed the event horizon. The gravitational singularity of a black hole is a one-dimensional point in space-time where most of the mass is concentrated. This point takes up an infinitely small region of space, resulting in density and gravity becoming infinite. At the point of singularity, the laws of physics that

[1] Masters, K. (2015) *Who came up with the name "black hole"? (Beginner)*.
[2] Smith, H.R. (2017) *What is a black hole?*
[3] Masters, K. (2015) *Where is the nearest black hole? (Intermediate)*.
[4] Jenner, L. (2015) *Astronomers Identify a New Mid-size Black Hole*.
[5] Redd, N.T. (2015) *Black Holes: Facts, Theory & Definition*.
[6] Ibid.
[7] Mastin, L. (2009) *Event horizon and accretion disks*.

govern the rest of the universe do not apply; what happens at this point can only be theorised, so we can never really know what happens.[8]

Whilst black holes do not emit any radiation, the region around them does; this emitted radiation is called Hawking radiation, and was first discovered by Stephen Hawking in 1974. According to quantum theory, matching pairs of particles and antiparticles are constantly being created in empty space, such as the space around a black hole. In most scenarios, these two particles collide and annihilate each other. If this occurs just outside of the event horizon of a black hole, however, there is the possibility that the antiparticle (the member of the pair that has negative mass) will fall into the black hole, and the particle (the member of the pair that has positive mass) will escape. The escaping particle is observed as thermal radiation being emitted by the black hole, even though this is not the case, since black holes do not emit anything. Due to the antiparticle's negative mass, when it falls into the black hole this results in a reduction of the black hole's mass. Therefore, a black hole will gradually reduce over time, and cannot last forever.[9]

One of the main questions that people ask about black holes is: what would happen to you if you fell into a black hole? The answer that has generally been accepted by the scientific community is that two different scenarios would play out: reality would split into two parts that would run at the same time. To an observer on the outside of the black hole, as you approach the event horizon of the black hole, your body appears to stretch and contort and your motion slows down, until you reach the event horizon, at which point you freeze. At the event horizon, your body appears to be completely still is slowly being burned up due to high energy Hawking radiation. However, there is another reality experienced by you, the person inside the black hole, that is entirely different to the one observed from outside of the black hole. If the black hole in question is a very large one, perhaps a super massive black hole, you would actually not feel anything as you passed beyond the event horizon, and you would continue to not feel anything as you travelled towards the point of singularity. If the black hole is a lot smaller, in this case the gravity experienced at your feet (assuming you had entered feet first) would much larger than at your head, so your body would stretch out. Other than that, the size of the black hole does not affect what happens. The reason for the alternate realities is that the observer outside of the black hole is still acting under the laws of physics. Quantum physics says that information can never be lost, therefore, to the observer, it cannot seem as though you have ceased to exist by surpassing the event horizon. Other laws of physics simultaneously require you, the faller, to pass through the horizon without being affected by the heat of the radiation present there. Consequently, two outcomes occur with neither being more real than the other. However, another law of physics states that information cannot be cloned, so essentially there cannot be two copies of you, even though this appears to be what happens. This is called the black hole information paradox, and is currently puzzling the scientific community.[10]

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Has religion limited scientific advancements?
By Mariam Jallow

There is no doubt that scientific advancements have greatly improved human life with things such as antibiotics, electricity or vaccines; however there has been conflict between science and religion on certain issues, more increasingly with sciences' drastic progression leading to things such as 3 parent babies. Whereas many scientists see it as the just next step to improving human lives, religious people view these actions as immoral as it closely resembles actions which they believe only God can create. There have been various instances throughout history where religious organizations such as the church has prohibited research into science which some believe has limited/ slowed the development of scientific discoveries. There are those who believe that there is some compatibility or independence between science and religion whereas others believe that the two are completely unrelated and address "fundamentally separate forms of knowledge and aspects of life" (En.wikipedia.org, 2017). If the latter is true then it suggests that religion should not be a factor that should be considered when it comes to what happens in science; however, this is not the case which implies that there is some overlap meaning they are somehow compatible.

Albert Einstein once wrote "Science without religion is lame. Religion without science is blind."(Debate.org, 2017) This quote demonstrates the interdependent nature of science and religion as it implies that one cannot exist fully without the other. This is quite a controversial statement as Einstein, who outwardly rejected the validity of religion still, to an extent, accepted that the influence of religion was needed in science in order for science to develop further. His belief may stem from the fact that "Much of science comes from religion" (Debate.org, 2017). Between the 9th and 15th century the Islamic world exceeded European cultures in their scientific and mathematical developments. This can be seen in Islamic architecture which involves intricate geometrical patterns. "The Islamic religion created basic understanding of light and they created the astrolabe"(Debate.org, 2017) with people such as Ibn al-Haytham, an Arabian physicist, mathematician and astronomer, developing scientific theories that helped to increase peoples understanding of the world. This was called the Islamic golden age where vast developments were made in numerous scientific areas.

Despite religious contributions to scientific development in the past, the harmony between science and religion seems to have been lost as many new scientific methods have been questioned by religious organizations such as the church. Some believe that this conflict is as a result of modern scientific developments contradicting with teachings in religious scriptures, however there is evidence of science and scientific ideas that promote the scientific method in those scriptures. For example in the Bible it says "the universe is governed day-to-day by rational natural laws, not by the whims of deities." (Job 38:33; Jeremiah 33:25). This verse went against the belief system at the time as it states that there are verifiable reasons for the things that happen; as opposed to everything being caused by gods and humans having no control. The fact that the bible says this shows that it supports the idea behind science as it confirms that there is a testable and justifiable reason for everything which is essentially what science aims to prove. There are also hadiths (saying of the prophet) in Islam which says "Seeking knowledge is compulsory on every Muslim" (WhyIslam, 2017). This show a parallel between religion and science are they both aim to find the truth and learn more about the world which shows that religious teachings not only support scientific research but encourage it.

The objections made be religious organizations against some scientific research are mainly against the ethics of the science as opposed to the science itself. Many leading scientific research which is believed to have the potential to cure a vast number of life threatening diseases include unethical methods, usually involving the use and disposal of embryos. William Provine, a historian of science believes that “modern science directly implies that there are no inherent moral or ethical laws, no absolute guiding principles for human society"(the Guardian, 2017). This suggests that the direction in which scientific development is going; despite becoming more advanced; is also becoming more unethical. The disposal of embryos contradicts with religious teachings as that view it as a form of murder and the bible says “thou shall not kill.” However, this is a belief that is held by many people weather religious or not and so the ethical concern isn’t necessarily to do with religion; however it is mainly religious organizations that confront the issue. Without this objection, scientific development may be much further than it is as it would not have as many restrictions. This could potentially benefit a wide range of people suffering from diseases which are currently incurable. This suggests that religion has in some way limited the rate that science has developed. Although, it could be argued that it is needed in order to ensure that science does not reach a point where it completely disregards ethical considerations. Despite the concerns raised by religion, science still continues to use unethical methods which suggests that despite possibly being slowed by religion, science is still developing and so the restrictions put in place by religion may not have had much of an impact on the development of science.

This raises the question of whether religion really has limited science and if it has is it justified to do so? One the one hand religion aims to save the lives of thousands of unborn embryos whereas science aims to save the lives of thousands of people who are suffering from life altering diseases. They both have a similar aim of saving lives however they just differ on the life that is being saved. Essentially "both religion and science were originally set for one goal; the truth" (Debate.org, 2017) and so less emphasis should be put on how they differ and more on how the can coexist to help further maximize human development.

CANCER: A SWING BETWEEN LIFE AND DEATH
By Daniyah Kaukab

Let's begin with an introduction to cancer, despite it being a norm in today's world and mostly every person aware of it. So, what is cancer? Metastasis, a process which leads to the formation of cancer, this process is the explanation of when altering cells in the body divide and grow uncontrollably to form lumps or masses of tissue called tumour and spread over other parts of the body, along by invading other healthy cells which destroys them. This starts decreasing and eliminating the presence of healthy cells that help in normal functions for life, such as fighting diseases. In the case of leukaemia cancer affects the normal blood function by abnormal cell division in the blood stream. In summary, Cancer a six-lettered word that can change a person's whole life from the moment their doctor diagnosed the problem. As this disease is undefeatable by the body itself alone.

Major causes of cancer:

Gene mutations that occur after birth, these are the gene mutation that occur after you are born and are not inherited. Several forces can cause gene mutations; such as smoking, radiation, viruses, cancer causing chemicals (carcinogen), obesity, hormones, chronic inflammation and lack of exercise.

There are several causes of cancer but below I have highlighted two of the basic and common traits of having cancer, along with reasoning.

YOU! shocked, but I'm afraid this is true, it all starts with the life style decisions you make and choose to live with forever, cause most of the habits you inherit due to environmental factors would last a lifetime as they are easy to be addictive to but hard to discontinue. One of the example from many is smoking; regardless of people acknowledged about the life-threatening effects of smoking, thanks to the technology today and the cigarette packets itself contains the warning which just seems to be a formality, because people cannot stop the use of it as it contains tobacco that has nicotine which is addictive, this chemical is so dangerous that even if small amount of it is injected into the bloodstream it can kill a human in less than an hour. The first Gresham Professor of Physic, Matthew Gwinne described tobacco as "***A custom loathsome to the eye, hateful to the nose, harmful to the brain, dangerous to the lungs***". But you don't die instantly by smoking cigarette because it contains very little amount that aren't deadly but still not on the safe side, as eventually the build-up leads to serious complications, e.g. lung cancer, caused by the harmful chemicals in tobacco that contribute into the formation of tar, this substance sticks inside the lining of the lungs and on the cilia, preventing the cilia to remove bacteria and foreign particles that enter the lungs during breathing. This leads to infections and long term disease, such as cancer.

Second factor of cancer; genetics; this is possible when a person it born with genetic mutation or faulty gene. Also, can happen due to faults in the DNA, cancer happens when gene mutated cells cannot correct the damage in the DNA, examples of mutations include: deletion-bases removed, insertion-bases inserted, substitution-bases changed, these bases mentioned are the four bases present in DNA, which are adenine pairs with thymine and cytosine with guanine, these pair up as stated and create the chemical cross-links between the two strands of DNA double helix. The arrangement of these bases codes for a protein, therefore when these are altered by the above mutations, it could produce a wrong protein in the whole process of protein synthesis. Another cause is cancer can affect the process of apoptosis- programmed cell death, this is the process by which unwanted cells commit suicide, this is important in maintaining the regular functions and activities of a cell, when cancer affects this it leads to again uncontrolled cell growth, therefore allowing the growth and division of cancer cells.

Signs and symptoms:

To determine whether you may have cancer and should visit a doctor, here are some of the signs or symptoms you may look for indication.
Chronic cough, chest pain and breathlessness.
Lump in your breast.
Changes in bowel habits (lasting more than few weeks).
Unexplained bleeding.
Unexplained weight loss.
Unexplained low grade chronic fever.

Diagnosis of cancer:

As cancer, can be in any form or location in the body, the right diagnosis is extremely important for immediate precautions and treatment to be carry out without wasting further time and allowing it to spread and grow. There are four main categories in which cancer can be diagnosed. Firstly, cancer diagnosis by physical examination, which is feeling or observing the presence of a lump or tumour, change in skin colour or enlargement of an organ. Secondly, laboratory testing, in which the urine and blood samples from the patient are examined and inspected for any signs of cancer. Thirdly, imaging tests, this involves the use of various variety of machine equipment to be used to detect the cancer, like Computerized Tomography (CT), Bone scan, Magnetic Resonance Imaging (MRI), Positron Emission Tomography (PET) scan, ultrasound and X-ray. Lastly, biopsy, that is the examination of tissue removed from a living body to discover the presence, cause, or extent of the disease.

Prevention of cancer:

The first and most obvious solution that could prevent a person from cancer when they may have a likelihood of developing it, is trying to change their lifestyle that is becoming detrimental to life. It may be a difficult step to take due to the addictive aspect, for example cigarette has a physical addictive effect as it contains nicotine and as the smoke is inhaled it quickly travels to the brain and a temporary feeling of relaxation and an elevated mood is caused, which then after when the body has gotten rid of the drug the person starts craving another cigarette and again once it finishes the body starts showing signs of withdrawal, this then results in a 'positive feedback'. This process seems never ending, but in today's world overcoming this addictive habit has been made a lot easy by the facilities provided by different organisations and the selling of products that help you crave less and then eventually quit. Or alternatively to cure stress there are many other solutions that include, having a break, you can 'walk away your stress'-going for walk, this method works by sparking nerve cells in the brain that relax the senses, plus exercising, these two elements produce chemicals called endorphin in the brain, that act as natural painkillers for the brain that aid in the relief of stress. Maybe the advantage of smoking and other chemicals that you may argue is that these effects instantly without working for it whereas the other beneficial and non-harmful methods seem like a lot of effort and that there is no time for slow method in a busy work life. Don't forget both have a long-term effect, one leads to suffering and eventually premature death but on the other side leads to a healthy and prolonged life.

Now moving on to the prevention of cancers that are not intentionally inherited but caused by various infections; such as: cervical cancer from human papilloma virus, hepatoma liver cancer from hepatitis B and C, stomach cancer from *H. pylori* bacteria, and several other cancers, to control the spread of the infections before they become untreatable or uncontrollable, that may cause inevitable harm. One of the examples is cervical cancer that is prevented by the vaccination of HPV (human papilloma virus-wart virus) given to children

before they are sexually active, this vaccine is usually given in two to three doses depending on the age within six to 24 months' period. The vaccine is given at a young age of about 12 to 13 years in order this makes the body immune to the virus and this happens as the vaccine is given the body produces antibodies in reciprocation to the protein, therefore if ever in the future the person is infected by the real virus the same antibodies would be produced quickly to prevent the entry of the virus into the cell to cause the infection thus protects the body. The vaccine hepatitis B also works in the same manner as HIV vaccine but his instead protects against hepatitis B virus (HBV) and human immunodeficiency virus (HIV).
These were some of the many preventions of cancer that could be cured and prevented on the right time, if action is taken.

Treatment of cancer:

Get treated for cancer is not a smooth ride, and the person would be treated inconsideration of the stage the cancer has developed to. Early stage, the person is lucky enough to be treated fast, less painful, less side effects and lead a normal life expeditiously, whereas on the other hand for a mid-stage to last the pain and struggle increases and at some point, the treatment may no longer be beneficial for the person or its diagnosed too late to be cured leading to a regretful and painful death.
First and foremost, surgery; the oldest treatment for can which is successful if the cancer is detected at an early stage and has not spread immensely throughout the body, the solid cancer could be completely cured by getting rid of it by cutting. Radiotherapy; providing radiation to cancer cells over a period in small doses can kill the cancerous cell, because the DNA in cancer cells is easily and quickly damaged and those cells can't repair their DNA whereas healthy cells would be very least affected. Chemotherapy, chemotherapy drugs effect cells that are continuously dividing in which case cancer cells are most targeted by these drugs due to their uncontrollable dividing, as normal cell also divide on regular bases they are also slightly affected but do have time to recover back to normal. Targeted therapy works in a way that the drug only targets cancer cells and has very minimal effect on healthy cells. The process of this treatment is that it interferes with the chemical pathways of the cancer cells or bind to specific receptor cells on the surface membrane of the cell. Finally, immunotherapy, the method of using antibodies which would block receptor cells on cancer cells. In future, this would allow the body to become immune and produce antibodies to detect and kill cancer cells before they become dangerous.

Side effects of cancer treatment:

Any form of treatment is never pleasant and brings with it numerous side effects that must be suffered by the patient. The side effects of cancer vary person to person, effect different aged people differently, and have an impact on the person based on the amount of treatment given. These are some of the many side effects that happen, that are anaemia, appetite loss, bleeding and bruising, hair loss, pain and many more.

Realising that the journey through cancer isn't smooth or pain-free, referring to the title; 'cancer: a swing between life and death', if not genetic, cancer can be controlled by the person the same way a swing is controlled, the person is the one choosing in which direction they want to swing; the life or the death and how fast. The more input you put the more the outcome, that can be physically experienced on a swing so relating it to cancer, the more unpleasant input in the body the worse the outcome and vice-versa. Why chose the wrong path that would bring misery and tears and you having to except it with it without your will, whereas choosing the right and healthy path to life would bring loads of smiles and a smooth

life, your body will thank you. All the decision is in your hands!

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What are the reasons the 'Communist Experiment' failed and does this show that Communism is unattainable in a progressive society?
By Freya Lewis

In December 1922, approximately five years after the October Revolution, the Union of Soviet Socialists Republics (USSR) was officially created. It went on to become one of the world's most powerful, and internationally influential states[11]- playing an integral role in the defeat of Nazi Germany, as well as acting as the United States' adversary in the Cold War. It's approximately 69 years of existence became known as the 'Communist Experiment', as it was the first state to design its political and economic system around Marxist Socialism. The collapse of the USSR and its communist government happened as dramatically as it was formed, with Mikhail Gorbachev resigning live on television on the 25th December 1991 as the USSR dissolved- its satellite states seizing political independence. The Soviet Union was heavily flawed, and there are various reasons for its eventual failure- the most significant being its inherent social and economic problems as well as political tensions (particularly towards the end of its lifespan). Its competitive role in the Cold War also contributed to the Soviet Union's downfall. However, the impossible task of bringing the ideology of Communism into a reality on such a large scale meant that the Soviet Union was most likely destined to failure anyway, as would any other progressive state that implemented Communism as its political and economic system on such a grand scale.

One reason the 'Communist Experiment' failed and the USSR collapsed was due to the economic stagnation in the 1970s and further economic crises. Under Leonid Brezhnev, who was Premier of the Soviet Union until his death in 1982, the country experienced a period dubbed the 'Era of Stagnation' which affected the domestic economy. While around 10% of the gross national product went to the military[12] during and after the Afghan-Soviet War, production in the USSR fell seriously behind other industrialised countries. Workers were not paid enough to give them an incentive to work, so production output suffered. Abraham Ascher writes in Russia: A Short History that 'a witticism attributed to Eastern European workers also accurately describes the attitudes of Soviet labourers: "You [the government] pretend to pay us, we pretend to work".'[13] This effectively illustrates the state of apathy the Soviet economy fell into. The fact that the government did not admit the stagnation was happening and did very little about it (claiming the country had reached 'mature socialism') is a significant factor in the eventual fall of the USSR and failure of the 'Communist Experiment'. Furthermore, in 1979, the USSR invaded Afghanistan after political tensions between the Afghan Communists and Mujahedeen rebels.[14] This lengthy war- which the Soviets eventually lost- put strain on the already vulnerable economy and caused some social discontent as living conditions began to slide.

After becoming Premier in 1985, Gorbachev was unable to revive the economy within a Communist framework, so resorted to more capitalist economic changes under perestroika, such as more opportunity for private ownership. Therefore, a major reason the Soviet Union collapsed is because the economy was unable to function effectively with the restrictions of the Communist ideological system: the USSR refused to economically adapt and move with

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[11] History.com, *USSR established-Dec 30th 1922* http://www.history.com/this-day-in-history/ussr-established [Accessed 20 Apr. 2017].
[12] Abraham Ascher, *Russia A Short History New Edition* (Oxford: Oneworld Publications, 2009).
[13] Ibid, page 217.
[14] Blogs.bu.edu, *The War in Afghanistan and its Effects on the Soviet Economy | Guided History* http://blogs.bu.edu/guidedhistory/russia-and-its-empires/mikhail-yeremeev/ [Accessed 21 Apr.2017].

the times. This was exemplified with the example of technology. The economy could not progress and reach the heights of modernised Asia, Western Europe and America because of the suspicion around technology (for example personal computers) and how they may have been used for counterrevolutionary purposes. This lack of innovation and progression was a factor in the economic stagnation and eventual crisis of the USSR- as was the sudden change caused by perestroika, of turning to the free market after decades of a centralised economy. One reason the Soviet economy had so many problems was long term political mismanagement. However, it was after Gorbachev became premier that Soviet politics collapsed and became a major factor in the dissolution of the USSR itself. Gorbachev introduced dramatic reforms: perestroika and glasnost which restructured the economy along more capitalist lines and relaxed social and political repression. This faced opposition from both sides of the government: hard line Communists saw the reforms as too liberal and others thought the reforms were not enough and were happening too slowly. Gorbachev started getting calls to resign, particularly after a year of revolutions in 1989, where several Eastern European countries displaced their Communist governments. The USSR was beginning to disintegrate and with the end in sight, it was clear that something had to change, and that Gorbachev days were numbered.

In August 1991, hard line Communists (many of which army officials and members of the KGB) attempted a coup d'état against Gorbachev. Although the coup fell apart after just three days[15], it became clear that Gorbachev's career was coming to a close. International leaders began to envisage a Russian future without Gorbachev. This acted as a catalyst for the end of the Soviet Union and the fall of Communism in Europe as while Gorbachev's political capital rapidly decreased; Boris Yeltsin (who by 1991 was Gorbachev's clear rival and successor) became popular. It had been Yeltsin who had defeated the coup d'état and he, like most ordinary Russians, was disillusioned with Communism and intended to change Russia's political situation. As he began to effectively become Russia's widely accepted leader, it became clear that when Gorbachev (who by now was seen as a failure) collapsed, the Soviet Union would do so simultaneously- ending the 'Communist Experiment'.

The economic and political failure of the USSR would inevitably spill over into Soviet society, and when it did a melting pot of revolution and dissatisfaction came to the fore. The Soviet people had been suffering for years under repression and a steadily declining standard and there were clear cracks in the society, for example the prevalence of alcoholism (in 1980 eight to nine percent of the country's national income was lost due to alcohol abuse[16]). People had been forced to become accustomed to the inadequate life they were living. Therefore, when Gorbachev introduced 'glasnost' ('glasnost' meaning openness), for the first time people were given the opportunity to openly critique their government and country: journalists began to reveal the economic and political problems the Soviet Union had been experiencing, such as corruption. This resulted in widespread social protest as people took advantage of their newfound freedom. This provided the necessary political instability for the coup attempt and Yeltsin's rise in power, and therefore the fall of Gorbachev and collapse of the Soviet Union.

These social freedoms given to the USSR's population resulted, not only in just protests against Gorbachev, but the breakup of the Soviet controlled Eastern Bloc. Gorbachev

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[15] History.com, *1991 Coup attempt against Gorbachev collapses* http://www.history.com/this-day-in-history/coup-attempt-against-gorbachev-collapses [Accessed 23 Apr. 2017].

[16] Abraham Ascher, *Russia A Short History New Edition* (Oxford: Oneworld Publications, 2009).

significantly relaxed control of the Eastern Bloc[17] and decentralised the political power from Moscow. This taste of freedom caused Eastern Europe to experience a year of revolutions as Satellite States threw off their Communist governments and opened their borders to the West- perhaps most poignantly symbolised by the fall of the Berlin Wall in November 1989. By 1990 all of the formerly Communist regimes in Eastern Europe had been replaced by a democratic government[18]. This signalled the end of the 'Communist Experiment' because it became clear that no one feared Communism any more, and it was only a matter of time before the government in Moscow fell (as it did in 1991 with the attempted coup d'état) as the Soviet empire rapidly frayed away.

To what extent the United States (USA) contributed to the collapse of the Soviet Union and the Fall of Communism is not always entirely clear. It is certainly true that being embroiled in the lengthy conflict that was the Cold War contributed to the decline of the Soviet economy. The USSR failed to find many economic partners and suffered many sanctions from the USA, as well as taking part in an extremely expensive (yet futile) arms race. Therefore, due to the desire to win Cold War and international pressure (mainly coming from the USA) the USSR was forced to spend money it could not afford on its military and disregard social issues and sacrifice economic progress.[19] This was also exacerbated by the USA's involvement in the USSR's conflicts, for example funding and have the CIA train the Mujahedeen who fought against the USSR in the Afghan-Soviet War. Furthermore, it became very difficult for the USSR to convince the world that the system of Communism was superior to that of capitalism as the 20th century progressed. The USSR failed to keep up in terms of modernisation with the USA and the economies of countries in Western Europe strongly juxtaposed those in Eastern Europe. For example, after Germany was divided many East Germans escaped to democratic West Germany (particularly skilled workers in what was known as the 'brain drain') leading to the Berlin Wall being erected in 1961. Although the Berlin Wall was not pulled down until 1989, this still illustrates the difference in quality of life between the 'East' and 'West' and highlights why the USSR found it so difficult to advertise the Communist way of life.

However, despite the fact the Cold War certainly made things difficult for the USSR, it is likely that the empire would have imploded anyway. When Communism did eventually fall, rather than catalysing the process, the USA watched and let events take their natural trajectory, which implies that the USA did not feel the need to play a part in the collapse of the USSR itself. Furthermore, some go as far as to say that the USA actual prolonged the existence of the USSR through the rivalry induced by Cold War conflict.[20] After the fall of Communism, Boris Yeltsin said 'The world can sigh in relief. The idol of communism, which spread everywhere social strife, animosity, and unparalleled brutality, which instilled fear in humanity, has collapsed'. Abraham Ascher argues that Yeltsin is saying that 'communism failed because it was from its inception a utopian and thus unattainable idea that was incompetently implemented by ruthless ideologues.'[21] This begs the question of can true

[17] History.com, *Perestrokia and Glasnost* http://www.history.com/topics/cold-war/perestroika-and-glasnost [Accessed 24 Apr. 2017].
[18] History.state.gov, *Fall of Communism in Eastern Europe, 1989* https://history.state.gov/milestones/1989-1992/fall-of-communism [Accessed 24 Apr. 2017].
[19] Insider Monkey, *Five Big Reasons Communism Failed* http://www.insidermonkey.com/blog/5-big-reasons-communism-failed-336631/5/ [Accessed 24 Apr. 2017].
[20] HowStuffWorks, *Who won the Cold War?* http://history.howstuffworks.com/history-vs-myth/who-won-cold-war2.htm [Accessed 24 Apr. 2017].
[21] Abraham Ascher, *Russia A Short History New Edition* (Oxford: Oneworld Publications, 2009) page 230-231.

Communism ever be achieved in a progressive society? If one were to assume that the Soviet Union collapsed due to its own shortcomings, then one could assume that the same fate would befall any other empire as large as the USSR that tried to implement Marxist-Socialism as its political, social, and economic ideology. Two states that declare themselves Communist in 2017 are Cuba and the People's Republic of China and both states are examples of the limitations of Communism. While calling themselves Communist, China's impressive economic growth is down to implementing capitalist policies, such as allowing businesses and privatisation, as well as taking part in foreign investment and trade[22]. Cuba, on the other hand survived the collapse of the Soviet Union and have maintained a totalitarian state where the Communist Party control most areas of life. However, there are obvious limitations to the implementation of Communism. The regime is oppressive and there is no tolerance to political opponents, there is serious poverty due to a long term vulnerable economy, where half the population survive on less than $1 a day[23]; and the state is not modernised in most areas (except perhaps the education and health system). This illustrates the fact that when a country becomes Communist, they must sacrifice their ability to modernise and adapt (this including social liberties) because of conflicting principles and interests. When a country tries to do both, such as the USSR in Gorbachev's attempts to preserve Communism while implementing perestroika, the system inevitably collapses. This therefore shows Communism is simply unattainable in a progressive society.

In conclusion, the 'Communist Experiment' decisively failed due to economic and political shortcomings, as well as the social tensions this led to. Although the USSR was greatly hindered by the Cold War and failed to assert communism as a favourable alternative to capitalism, the United States cannot be credited with the collapse of the USSR and fall of Communism in Eastern Europe- the 'Communist Experiment' was doomed to fail from the start because of inherent problems of the ideology itself. These inherent problems, it must be noted, are not necessarily unique to the USSR and are likely to befall any country that tries to implement Communism in the modern world, proving that not only did the 'Communist Experiment' fail- it is unachievable in a progressive society.

[22] Katie Simmons, *China's government may be communist, but its people embrace capitalism* http://www.pewresearch.org/fact-tank/2014/10/10/chinas-government-may-be-communist-but-its-people-embrace-capitalism/ [Accessed 24 Apr. 2017].

[23] The Week UK, *Pros and cons of communism in Cuba* http://www.theweek.co.uk/americas/35627/pros-and-cons-communism-cuba [Accessed 24 Apr. 2017].

The brain and its impact on the human body
By Oscar Nash

The world; what a beautiful, intricately made place we live in. Isn't it just fascinating, incomprehensible and wonderful, how everything came to be just how it is?

From an early age I have always wanted to know how things work, why they work in the way that they do, and what I can do to amend them when they go wrong. This passion developed further as I began to take a real interest in the human body; its physical chemistry and biology.

Humanity is such a major part of this world; over 7 billion of us, each with a body different to each other, but similar in many ways. Therefore, how can the body possibly be left untouched, or even ignored, when there is much to discover about it?

The world and the human body are closely linked, so closely linked in fact, that they are almost merged as one. A particular interest has built up in me, concerning how the human body interacts with the world. This includes the effects that the body experiences, depending on the environment and conditions that it must adapt to.

In this short article, I will be attempting to discover and explain more about my passion for the human body, specifically the brain, including its amazing ability to control the body and deal with the obstacles in its path.

The body is powerful, and is driven by an organ as equally powerful; the brain. I would dare to say that it is impossible for any human to comprehend just how powerful the brain is, because it would require more brainpower than is 'unlocked' within us.

The truthful reality is that we know very little about the brain. We know little about its capabilities, its functions, and how alterations or different stimuli may affect it. Research into the brain - such as electrical stimulation and MRI scans - are used to uncover more about how the brain functions, but theories and ideas change often based on new discoveries and supporting evidence. Therefore, the knowledge that we currently have could be challenged or disproved by new evidence that is being discovered. For example, it has been believed that even the most intelligent people on earth - those considered to be 'geniuses' - only use 10% of their potential brain power, at their most intense state of mind. However, this theory is now considered a myth, as a BBC article explains that: 'finding an unused portion of our brains isn't the way it's (potential for brain function improvement) going to happen.'

The brain has a fascinating capability; to 'rewire' itself. The brain is made of around 86 billion nerve cells, called neurons, which compose what is known as the 'gray matter'. The neurons are joined by trillions of connections - synapses. The brain also contains billions of nerve fibers - called axons and dendrites - which is the 'white matter', used to transmit impulses.

If these nerves or connections become damaged due to trauma, then the neurons become ineffective at transmitting chemical impulses along synapses, to stimulate a response by the targeted part of the body (for example, a muscle contracting). Therefore, the brain calculates and develops a different route, and effectively 'rewires' itself, to ameliorate the damage.

An example of this was investigated in the broadcast '*Incredible Medicine*', of a man who became a virtuosic pianist overnight, due to the way that his brain rewired after he suffered a head trauma. Similar accounts have been given, such as brain injury patients who have developed the ability to speak in another language, without any previous capability to do so before their trauma.

Without the brain, bodily functions would cease altogether. An extremely important portion of the brain is the hypothalamus - part of the diencephalon - which links the nervous system to the endocrine system, via the pituitary gland (the hypophysis). Therefore, it is responsible for producing and controlling the secretion of essential hormones, which are used to control the functions of different cells and organs.

The most important function of the hypothalamus is homeostasis, which maintains all of the body's vital conditions. These include internal body temperature, electrolyte levels, blood pressure, and body mass. If there is even a slight change in each of these, then it can be potentially detrimental to human health. Therefore, any fluctuation from the body's set level for each of these factors is only temporary, because the brain ensures that levels are restored to normal in order to keep the body in balance. Just one of the hormones that the hypothalamus produces, and controls the release of, is dopamine. This is released to send signals to nerve cells, resulting in positive, reward-related emotions experienced after activities such as exercise. Without the hypothalamus, internal body conditions would not be regulated effectively, resulting in potential death from a mere packet of crisps, due to chemical imbalances within the body!

The hypothalamus also plays a part in personality, because it determines behavioural functions, a major part of which are emotions. The emotions that a human feels are controlled by a series of chemical releases, which inform the brain how to react to a situation. Therefore, it is clear that there are two factors to the brain; the tangible and intangible. A fantastic quote from an experienced brain surgeon, Henry Marsh, sums up the intangible factors of the brain: '...moving through thought itself, emotion and reason, that memories, dreams and reflections should consist of jelly, is simply too strange to understand.'

The brain is unique in its response to pain. Pain has an intensity - that ranges from 0 to 10 - and a character, including sharp, dull, burning and aching. Pain is caused by nociceptors (nerve cells that sense for tissue damage) sending signals to the spinal cord and brain, leading to neurons and glia (gray matter). The signal then reaches the cortex, where a response is determined in reaction to the pain, according to the salience network which deals with the most prominent danger to the body. Endorphins are released to help the body cope with pain. Just as Saxey said: 'pain is what the patient says it is' . This is a truth that should not be neglected, because pain is the brain's signal to act upon a potential danger, in order to avoid damage.

The development of drugs has enabled certain pains to be alleviated, but the brain responds to different drugs in different ways, and this can result in side effects to certain medications. New treatments that directly stimulate or block pain sensing networks are being developed, and even tailored to individuals, which reduces the risk of side effects. This is made possible by the use of tools such as MRI scanners, to map brain pathways and to determine how drugs can affect them.

Excessive use of drugs - specifically recreational drugs - can lead to addiction, where the brain craves more frequent and heavier doses. This can have adverse effects on the brain, because serotonin receptors (associated with happiness) can become permanently damaged, leading to many psychological problems, and emotional imbalances. However, there is still much more research to be done on the effects that drugs can have on the brain, including the short and long term impacts.

In honesty, this article has barely glanced the surface of what has been discovered about the brain. There are still many more points that can be covered, because the brain has so many different functions. At the same time, even the most experienced brain surgeon or neuroscientist knows a relatively limited amount about the brain, when considering just how much more there is to discover, and the amount of information which is unknown. However, what can be taken away from this is that the brain is a wonderful, powerful and complex creation, which has the ability to do things that are unpredictable and incomprehensible to the human mind.

This is the reason that I have such a passion for the brain; there is so much potential, so much to work with, and so much yet to uncover. This, for me, is an exciting prospect, one that inspires a burning desire within me to delve deeper into discovering more about the brain. With determination and open-mindedness to all possibilities, the brain becomes an extremely promising possibility of the future; something that could potentially revolutionise the way in which humans live, if its power can be fully exploited. The inevitable news is, opinions and ideas about the brain are constantly changing, so there is likely to be a long way to go...

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Is data good for democracy?
By Helen Webley-Brown

Democracy can be defined as "a system of government by the whole population or all the eligible members of a state, typically through elected representatives[24]." With the ongoing advances in technology enabling faster and more realistic manipulation of data; data is as "good" for democracy as it is for tyranny, anarchy and autocracy. Data can be used as a tool to inspire public loyalty to the establishment, just as it can be used to provoke hatred and distrust.

Voting is a crucial part of the formation of a representative democracy. In order for democracy to be obtained and maintained, public trust in the government that it elects and the election process is vital. Free access to political data can clarify the complex democratic system that governs society, encouraging both political awareness and participation, thereby aiding democratic processes. If the public is able to raise concerns or appraisal for a government venture, such as fracking, the actions of the government can be aided and better-informed. The availability of data encourages political conversations; as the public gains a greater understanding of how and for whom the government works, the government gains a greater understanding of how and for whom the public wishes for them to work.

In 1997, Tony Blair's government published a white paper entitled "Your Right to Know", in which the following was stated: "Openness is fundamental to the political health of a modern state" and "unnecessary secrecy in government leads to arrogance in governance and defective decision-making." The public's desire to have a greater understanding of what data is kept and by whom, has tested the democracy which governs them. It is my opinion that democracy is ultimately built on trust - that of the public and that of the government that they elect. In exercising their democratic right to vote, the public trust that their vote will lead to representative government officials. Similarly, the elected officials trust that once a party has secured a majority vote, it will be accepted by the electorate and opposing political parties. The availability and transparency of data allows the public to hold governments to account for their actions, further supporting the democratic ideology of shared, devolved power. In fact, the slogan for "data.gov.uk" is "opening up government". In 2000, the government established the Freedom of Information Act, providing public access to data held by public authorities. This is achieved through requiring public authorities to publish certain information about their activities; and by allowing members of the public to request information from public authorities. Open, accessible data is an integral medium through which public confidence and trust in their democracy and government is improved. This was made evident in a 2011 survey carried out on behalf of the Information Commissioner's Office, where 81% of public bodies questioned agreed that the FOI Act had increased the public's trust in their organisation[25]. Therefore, it is evident that for the trust that democracy is founded upon to be preserved, there must be equal access to data. If the public deems their government to be neither transparent in their actions nor open to releasing the data which records it, then faith in democracy can be threatened. Data is trusted far more than personal

[24]"Democracy" OED Online. Oxford University Press, March 2017. Available at: https://en.oxforddictionaries.com/definition/democracy

[25] "What is the Freedom of Information Act". Available at: https://ico.org.uk/for-organisations/guide-to-freedom-of-information/what-is-the-foi-act/

opinion; it provides businesses, governments and individuals alike with another means with which to validate their beliefs.

As technology becomes increasingly ubiquitous in our everyday lives, the ease at which we view data - real or manipulated - will continue to have a large influence on the way we view our role, and the role of democracy in society. As the expansion of datasets and the way in which we interact with it advances, data and politics will become increasingly intertwined. The danger to democracy lies not in the data itself, but the way in which it is used by the media and the government. If the public does not trust those that possess and distribute the data, then data's influence on democracy becomes limited, and somewhat pernicious. As shown by *Figure 1*, over the years public trust in politicians and journalists have remained at low levels, in comparison to other professional roles. Public trust in data determines not only the influence of data over people but also those who rules over them.

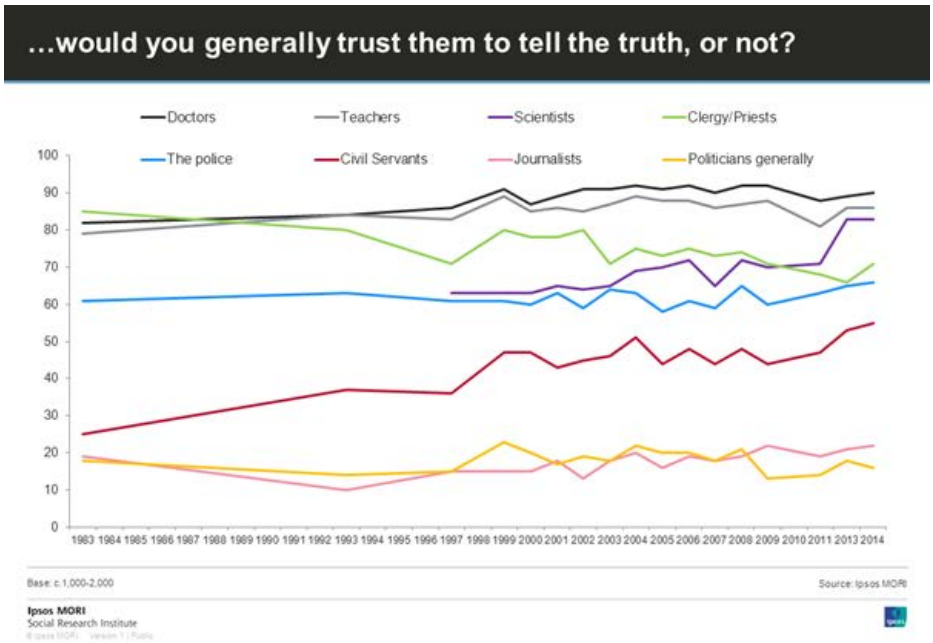

Figure 1

Perhaps, it is overly optimistic to state that an increase in open data leads to an increase in public trust in government, which leads to an increase in political participation - thereby improving democracy. Increasing the availability of data does not automatically equate to an increased transparency of government or even a greater democracy. Technological advances, including the dissemination of the internet and the expansion of data that came with it, promised a new age of equal understanding and awareness. Conversely, it can be argued that the growing disparity in education on the use and analysis of data, impedes and negates democracy. In a survey by "Digital Catapult Centre" it was found that 96% of respondents claimed to understand the term 'personal data'. However, when it came to describing it, less than two-thirds (64%) chose the correct definition.[26] Equally shared power is a fundamental principle in democracy. The release of data, and the power that is derived from the information within it, can only be accessed and interpreted by a select few. This disparity in the ability to understand available data, not only flies in the face of this principle but impedes

[26] Catapult, Digital. Trust In Personal Data: A UK Review. Available at: https://www.digitalcatapultcentre.org.uk/pdtreview/

democracy. The majority of the public do not possess the skills to analyse, interpret, or use the data made available to them. Instead, the benefits of released data is reserved for the educated few - those with the appropriate skills to interpret data or the wealth to hire those who do. Therefore, to what extent can it be said that data benefits democracy - a system designed to share power amongst all citizens and their elected officials - if the power derived from the ability to interpret data is not shared equally amongst the public?

The use of data in politics has increased exponentially. As more people have access to technology, more data is collected and stored. The amount of personal data available to politicians, businesses, and laymen, alike is beneficial to not only their understanding of the consumer, electorate or public, but also a way to target them. It makes sense, and seems more democratic, for those who are elected to represent the public to be given continuous briefings about public opinion, not just a vague gauge once every five years around election time. This would enable them to better understand the desires of their electorate. As personalised Facebook feed content and targeted online advertising will tell you, due to increased social media usage, personal data can be the best means through which to gauge public opinion. The way in which private firms and governments, collect, store and utilise their data is of ethical concern. The data collected from search engine records and social media profiles have the potential to influence our behaviour patterns both on and offline. This manipulation and controlling of individual behaviour is more reminiscent of a dictatorship than a democracy.

The feeding of personal data into algorithms used by organisations, such as Google and Facebook, has a profound effect on the way we see our society. What users click, like and share often resonates with their own political opinions, and these algorithms use this data to feed the user with similar posts. This creates a "bubble" in which we are only given the political narrative we agree with.[27] The extent to which filtered data influenced the 2016 American Election is heatedly debated; however, its influence on American society is made evident in the Pew Research Center that found 44% of Americans get their news from Facebook. Therefore, 44% of Americans are at risk of not having equal access to unbiased data, potentially making important decisions based on half-truths. Perhaps the best way to determine whether data is "good" for democracy, is to examine whether a lack of data encourages autocracy. North Korea is a prime example of state interference in the access to data, with only a few thousand out of 25 million having the wealth and government permission to use the internet. The effect of the aforementioned algorithms can be, albeit controversially, compared to "Kwangmyong", North Korea's intranet service. All content on North Korea's intranet is filtered by the government before being accessed. [28] It can be argued that these examples of controlling and restricting of data accessible to the public, especially that of a political nature, is undemocratic as it has the power to manipulate voting behaviour and opinion of political leaders. It is possible to compare the North Korean's tight control and open censorship of the Internet and data, with firms, such as Google and FaceBook, who manipulate what news is distributed to their consumers. Instead of accessing all the data and news available, we are given just a small window through which we can only see what we agree with. This government and private company control of data is visible in both democratic states, such as America, and autocratic states, such as North Korea.

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[27] Solon, Olivia. Facebook's failure: did fake news and polarized politics get Trump elected?. Available at: https://www.theguardian.com/technology/2016/nov/10/facebook-fake-news-election-conspiracy-theories

[28] McGoogan, Cara. North Korea's internet revealed to have just 28 websites. Available at: http://www.telegraph.co.uk/technology/2016/09/21/north-koreas-internet-revealed-to-have-just-28-websites/

Suddenly, invasion of privacy and state-spying can be found closer to home. It is not possible to simply declare data as good or bad for democracy, instead, much like the political parties that exist within democracy, it lies on a spectrum. Thus, it becomes evident that whilst data can certainly be used as means of social mobility, it's has the potential to be used as a means of undemocratic social control.

The role of data in democratic process such as elections is becoming increasingly prevalent. Each political party possesses vast databases of electorate information in order to attempt to predict and influence voting behaviour and election outcomes. Undoubtedly, data has played a positive role in the effectiveness in political campaigns, as political parties are better informed of where to campaign and which demographics to target on different matters. However, this has also led to greater disparities in power and coverage between parties, with main parties dominating politics and smaller parties failing to attract the electorate. The political party with access to the largest data banks and the wealth to hire the best data analysts are at an undeniable advantage to other parties. Suddenly, our democracy, which is thought to be founded on principles of transparency and equal opportunity, simply becomes a power struggle between the wealthy few. In turn, our democracy becomes more akin to a plutocracy, with those with the wealth to possess and interpret data, having the power to control and manipulate society. Smaller, yet equally important, parties are left without an equal chance in reaching the voting public. Thus, the electorate is made to vote whilst uninformed of all possible alternatives and robbed of exercising their right to vote without manipulation.

Data is 'bad' for democracy if it impedes or regresses it. Therefore, in order to ensure that we are able to ascertain the merits of data for democracy, it is essential that how, and by whom, data is collected, stored, and accessed, is decided not by the select few that can interpret and analyse it, but by the entire affected populace. The availability of data can encourage greater political participation, yet it is naive to assume that public access to this data equates to public understanding of data. Data has the ability to transform our society and benefit our democracy. It is up to those with information power to ensure that the inequality gap in interpreting data becomes as narrow as the ever-shrinking gap in access to it. As technology and the data that it collects becomes more prevalent in society, many ethical questions on privacy, ownership and anonymisation will be raised. For data to be truly beneficial to our democratic society, it is essential that all members of society are involved in this debate. Data can only be determined as "good" for democracy if it adheres to and abides by democratic processes.

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