

An abstract, vibrant painting with splatters and brushstrokes in red, blue, yellow, green, and black on a white background. The colors are layered and mixed, creating a dynamic and energetic composition.

THE SOUTH HAMPSTEAD ESSAY PROJECT



South Hampstead
Sixth Form

ISSUE 01 | 2020

2020

ESSAY PROJECT

When girls arrive in the Sixth Form at South Hampstead, we hope that somewhere in the jungle of coursework, clubs and personal statements, they'll find the space to nurture interests of their own.

Each August, this is reflected in the bountiful successes of our EPQ (Extended Project Qualification) candidates, who take on ambitious self-driven research alongside a hefty roster of A Level subjects. However, not every student can find the space in their week (they're a busy lot, after all) so this year we decided we'd try something different.

In this booklet, you will find a selection of essays written for the inaugural South Hampstead Project. At the start of the year, all students were taught a range of study skills such as planning, self-reliance and writing for different audiences. Soon after, we gave them the option to choose between completing an EPQ or turning their ideas into a shorter, more focused essay.

The girls, I'm glad to say, rose to the challenge with panache. Appearing one-by-one in my inbox were essays on Artificial Intelligence, antimatter and the poems of Thomas Hardy. We asked that they also include some reflection on the process and it was clear they'd benefited from the experience, coping with workload troubles, changes of heart and the spectre of global disaster, all of which they took well in their stride.

As fate would have it, the first year of the programme will also be my last at South Hampstead. Nonetheless, I leave with no doubt that the girls will continue to write, think and research their way towards bold and arresting ideas.



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OPENING MINDS

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How do socio-economic classes play a role in the development and integration of children with Cerebral Palsy?

BY ANYA ARGAWAL

Introduction

Cerebral Palsy (CP) is a chronic disorder that occurs in an immature or developing brain usually before birth. It is a neurological disability that primarily hinders body and muscle movement. A few symptoms of CP are - involuntary movements, difficulty with body movements and speech hindrance. It is the most common motor disability that strikes in childhood. In this essay I have examined different issues that arise for children with CP and people around them in accordance with their socio-economic background. 1 in every 323 children has been identified with CP (Centers for Disease Control and Prevention, pg. 1). Cerebral Palsy is a disability, which affects the development of a child in many ways. Treating this disorder requires constant therapy and extra support, therefore can be expensive.

One of the key issues that I would like to bring forward is the stress that guardians/caregivers face during the therapy and treatment of CP in accordance with their socio-economic status. The second area of focus will be the role of public schooling systems

for children with CP and to what extent the role is fulfilled. The final issue will examine the recreational opportunities available for children with Cerebral Palsy. While gaining knowledge on this topic I have learnt about many different issues and consequences faced by children with CP and their caregivers. I came across certain intervention strategies and building on that formed my own possible solutions as well.

My cousin aged 18 also has CP. I have seen her evolve and grow up with this difficulty and thus felt motivated to conduct further research about the disability. Researching further on this topic has broadened my knowledge especially because of my first-hand experience of two interviewees. I have interviewed Judith C. Bierman who is a specialised therapist for CP, her knowledge and experience with the disability gave me a global perspective on this matter. She has been treating lots of patients globally including my cousin. I also interviewed, Piya Marker the director of The Aditya Birla Integrated School in Mumbai, the school my cousin attends.

Issue 1

Cerebral Palsy requires extensive and constant care for those who live with it. This disorder often prevents people from completing normal daily tasks by themselves due to muscular drawbacks. Caregivers include family, therapists, teachers and any other people who look after and aid the patient with the disorder. All these people are

categorised under caregivers as they each care for the children in unique ways. They play a crucial role in the lives of the differently abled children, as they constantly aid children to strengthen their weaknesses and overcome their drawbacks. The team consisting of family and paid helpers support children in order for them to perform daily tasks. In conjunction, therapists and teachers help them learn and overcome their mental and physical struggles.

The numerous additional daily tasks apart from their own can lead to caregivers feeling tired or stressed. They may feel over-burdened due to the immense responsibility of caring for a child with extra needs. Hiring paid caregivers can be an expensive depending on the socio-economic background of a family and often adds to the pressures they already face.

There are several factors that can determine the stress levels of a caregiver of Cerebral Palsy. Research done by Mc Cubbin (1989) and O'Neill (2001) show a direct relationship between the stress of the caregivers and severity of CP in the patient (qtd. in Pushpalatha, 12). The more severe the case of CP, the more stress caregivers may undergo. This shows that pressure depends on the contextual factors from case to case. Further studies conducted by Glenn and Colleagues (2009) show that the pressure felt by a caregiver can depend on a feeling of isolation, insufficient support from partner and demandingness of the child (qtd. in Pushpalatha, 12).

According to research conducted in India, parents of such children mainly face challenges from other family members. According to Mrs. Marker, non-acceptance of the child's condition prevents an understanding in the community. This is because of the lack of awareness and understanding in society. Additionally, in countries such as the United States of America, financial difficulty is a more pressing issue. Statutory agencies need to attend to the attitudes and policies in their organization in order to plan the inclusive environments which parents report will facilitate their child's participation according to research conducted in England (Lawlor). Nevertheless, it is important to note that each family has different factors to cope with and it may or may not be based on where they are residing.

The consequences of these continual problems can lead to physical, social and emotional drawbacks. More specifically it may affect the health, marital status and employment of a primary caregiver. Long-term caregiving could lead to anxiety and depression. Most people also suffer from the economic burden which can add to anxiety and stress levels.

It is extremely important to deduce possible solutions to minimise the stress levels of the primary caregivers as they are a crucial and irreplaceable part of the development of a child physically and emotionally.

In my opinion, some amount of financial aid must be provided from the government to support families with medical costs. Research conducted in Zimbabwe suggests 'Health-related quality of life' checks to monitor when a person is in need of help. Factors such as characteristics of patient/caregiver, economic status, and all contextual factors should be taken into consideration.

Once this is determined, therapy sessions, counselling and support groups can be suggested. Parents found support groups very helpful and were very satisfied with the help they received; they also described the groups as high in cohesion, expressiveness, task orientation, and self-discovery (Solomon). This would help boost the caregiver's morale socially and mentally. Addressing the issue is the first step to seeking help. Seeking social help was proving to reduce stress levels according to research done in Sri Lanka.

Issue 2

Schooling is an integral part of a child's growth. It gives children a platform to learn, helps them develop social skills and scope to improve every day. The integration of abled with differently abled children can be formed in a public environment, which can help develop understandings between all children. This plays an essential role in the integration of children with Cerebral Palsy.

Article 26 of the Universal Declaration of Human Rights states that 'everyone has the right to education. Education shall be free, at least in the elementary and fundamental stages' (Universal Declaration of Human Rights, pg. 1). Regardless of this right, children are not getting access to adequate schooling. Out of 93 million children suffering from disabilities (Unicef, pg. 1) 6.7 million children got the opportunity to attend public school, which is approximately 7.2% children. This is mainly due to their economic status.

The accessibility of education is challenging for families with a low socio-economic background especially when a child requires special attention and needs. Judith C. Bierman believes that the main reason preventing children with Cerebral Palsy from having a complete education is the accessibility of schooling systems. In India, Mrs. Beirman and Mrs. Marker agree that basic facilities such as ramps aren't even provided in schools for children in wheelchairs. Furthermore, governments do not provide funds for special facilities.

Another significant problem is the physical and mental learning barrier. CP only affects a child physically but due to constant physical therapy and focus on physical health, education often falls behind and becomes a secondary focus. Mrs. Bierman also stated that teachers for the abled children were receiving a higher salary in public schools in America compared to the teachers

for the differently abled. This leads to less qualified professionals in the area to teacher children with CP. This is an important obstacle as children with CP should be treated equally, and I strongly believe there is no reason to provide teachers who help children with CP a lesser salary. The right to education applies to all children. However, the lack of reinforcement of this law is a significant issue that prevents children from receiving an adequate education.

Children with CP are not being able to have a schooling system in place, which creates many repercussions. It affects the child directly as their social skills lack and they wouldn't be exposed to a normal learning environment with their fellow students. The integration of differently abled children in an abled environment is extremely crucial for both the abled and differently abled children. It primarily pushes children with Cerebral Palsy to achieve their goals with the help of peers. Furthermore, it helps to include all children in one environment as expressed by Judith Bierman. Consequentially abled children could learn to be respectful, aware and accepting of such disorders. Such co-operation among students can help lead to integration of all children in the future.

I have inferred possible solutions to a more co-operative and vast schooling system of children with CP. First and foremost, financing from the government for facilities and

salaries should be provided to each public school. In the UK, Disability Living Allowance (DLA) and Personal Independence Payment (PIP) can both be claimed by people who have substantial care and/or mobility needs. Furthermore, Caregiver's aid (CA) can be claimed by parents and carers if they earn less than the earnings limit (Working Families). If laws such as this are applied globally, accessibility of public education for children with CP would become a much simpler process.

According to Mrs. Bierman, there are three steps needed to break the educational barrier for children with CP. First is acceptance of all children, next is creating accessibility to each learning space (eg. broader doorways, ramps), and the last step is to plan an Individual Educational Program (IEP) to focus on specific needs for each individual child. This may include hiring aides at school to help children be incorporated in everyday school activities. These strategies may help in creating more educational opportunities for the differently abled in the future.

Issue 3

A recreational activity is an activity of leisure, any activity that an individual may enjoy. Recreational therapy is extremely important for children with Cerebral Palsy. Any activity would help a child acquire a physical, mental and social benefit. It gives children a chance to learn outside of their educational environment. A sport, art or small job can make a child with CP well rounded.

It mainly gives an opportunity for the development and integration of a patient to do activities that abled child do. It helps in the mental and physical state of a child as these activities exercise both aspects. It thus improves the holistic health and wellness of children.

Children with CP aren't able to do most physical activities however with the help of specialised facilities recreational activities can benefit a child in various ways. However, accessibility remains an issue due to the cost of the special facilities and economic backgrounds of the family.

There are varied reasons why a recreational activity is not part of the lives of children with Cerebral Palsy. Research shows that a paucity of sport and fitness programs for children with CP exists. There is additionally a lack of initiative from administrators and professionals in the society.

Another barrier is that fitness and sports programs exist in mostly developed countries such as USA, UK, France and Germany, which only exposes a handful of children to these special facilities. Overall, it is proved that safety; equipment, accessibility, resources, transportation, finances, perceptions and behaviour of abled employees/people are barriers to recreational therapy for children with this disorder. In the UK, a survey was conducted and it was revealed that 33% of parents find the cost a barrier, 4 out of 5 parents say

inadequate facilities are a drawback, and 66% of mainstream schools say transport is an issue (Nancollas, pg. 5).

The consequences of a child not experiencing recreational activities can have downsides. It can lead to supplementary health issues such as chronic pain and fatigue for a patient. If children are not doing activities outdoors it can lead to loneliness or frustration. On the other hand, if these opportunities are provided, it can help children with CP make friends, enhance certain extra skills and develop personal interests. Children with CP would get a chance to work independently which will further their health, productivity, and integration in their own society.

The obvious improvements needed to let recreational activity be an option for children with CP are finances, facilities, and integration. It is important for the society to have a basic understanding of the needs of these children so that they can then promote activities for children with this disorder. Horseback riding and swimming have shown to be helpful physically, mentally and socially for children (Sterba). Patients need to be inspired and encouraged by those around them to participate in these activities. This will definitely help the integration process. In order to facilitate proper equipment for recreational activities the government need to provide and raise funds. These solutions could make therapeutic recreation a larger possibility for children with CP.

Conclusion

During the course of writing this essay, I have come to the conclusion that socio-economic factors do affect the development of a child with Cerebral Palsy. However, the integration mainly relies on the awareness, co-operation, and integration of society with the children. The treatment of CP is costly and that can be a burden for caregivers.

The special facilities for recreation and school can also add to this cost. Schooling is a right which is enforced partially in some parts of the world such as The United Kingdom and The USA. However, education needs to be provided for all students to make people aware of this disorder and integrate patients into society. Recreational activities are a must for the well-being of a child. It helps mentally, physically and emotionally and should be provided by the community.

All these issues need similar solutions. Financial aid from the government is a must. If basics like public schooling and ramps are available, the financial stress would be lifted off families. Awareness and integration will help first the society and then the country to be more active in supporting this cause. In conclusion, factors including the socio-economic status of a child can alter the development and integration of a child with Cerebral Palsy.

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Antimatter: What is it and Why Does it Matter?

BY LIA BLOCH

The 2009 movie *Angels & Demons* - based on the novel by Dan Brown - begins with the actions of scientists at CERN, who use the Large Hadron Collider to create one gram of a highly volatile substance called antimatter.¹ The plot is set in motion when a secret scientific society known as the Illuminati steals the antimatter, with the goal of using it to destroy the Vatican. The resulting bomb contains just a quarter of a gram of antimatter, and yet it still threatens to completely obliterate the city. Antimatter is clearly a powerful science fiction tool, but is it also a reality?

It may have been a reality - or at least a theory - since 1928, when British physicist Paul Dirac wrote down an equation that combined quantum theory and special relativity to describe the behaviour of an electron moving at a relativistic speed.² Just as the equation $x^2 = 4$ can have two possible solutions ($x = 2$ or $x = -2$), so did Dirac's: one for an electron with positive energy, and one for an electron with negative energy. Dirac therefore interpreted the equation to mean that, for every particle, there exists a corresponding antiparticle; its exact match in every way, except for the matter of an opposite charge. For example, for the electron there should be an 'antielectron', or "positron", with

a positive electric charge, but otherwise identical. Unfortunately, however thrilling it is, there are some significant problems with this theory. According to classical physics, matter and antimatter annihilate as soon as they come into contact, disappearing in a flash of energy.² This means that we shouldn't exist - the cosmos should be full of light and little else - yet, somehow, we are still here today, defying the laws of physics. Another dilemma regarding this theory is that the Big Bang should have created equal amounts of matter and antimatter, so why is there far more matter than antimatter in the universe?

Fortunately, there are two plausible solutions to this existential enigma. First, there might be some subtle difference in the physics of matter and antimatter that left the early universe with a surplus of matter. While theory predicts that the antimatter world is a perfect reflection of our own, experiments have already found suspicious scratches in the mirror. In 1998, CERN experiments showed that one particular particle, the kaon, turned into its antiparticle slightly more often than the reverse happened, creating a tiny imbalance between the two.³ The second plausible answer to the antimatter mystery is that annihilation was not total in those first few seconds; somehow, matter and antimatter managed to escape each other's fatal grasp. Somewhere out there, in some mirror region of the cosmos, antimatter is lurking and has coalesced into anti-stars, anti-galaxies and maybe even

anti-life. "It's not such a daft idea," says Frank Close, a particle physicist at the University of Oxford.³ When a hot magnet cools, he points out, individual atoms can force their neighbours to align with magnetic fields, creating domains of magnetism pointing in different directions. A similar thing could have happened as the universe cooled after the big bang. "You might initially have a little extra matter over here and a little extra antimatter somewhere else," he says. Those small differences could expand into large separate regions over time.

These antimatter domains, if they exist, are certainly not nearby. Annihilation at the borders between areas of stars and anti-stars would produce an unmistakable signature of high-energy gamma rays.³ If a whole anti-galaxy were to collide with a regular galaxy, the resulting annihilation would be of unimaginably colossal proportions. No such signs have been reported, but then again, an infinite expanse of the universe remains undiscovered. Finding antihelium or other antiatoms heavier than hydrogen would be concrete evidence for an anti-cosmos, as it would imply that anti-stars are concocting antiatoms through nuclear fusion, just as their ordinary opposites do.³ Moreover, the search for an alternative to the 'normal' has led to \$1.5 billion being spent on the Alpha Magnetic Spectrometer - a machine built solely to scour our universe for cosmic rays. The AMS contains magnetic fields that bend the path of these cosmic particles

to separate matter from antimatter; its detectors then assess and identify the particles as they pass through.⁴ Cosmic ray collisions routinely produce positrons and antiprotons, but the probability of creating an antihelium atom is extremely low due to the huge amount of energy required. This means the observation of even a single antihelium nucleus would be strong evidence for the existence of a large amount of antimatter somewhere else in the universe.

On the other hand, antimatter - though in small amounts - is not as elusive as it may seem. Antimatter constantly rains down on the Earth in the form of cosmic rays; scientists have even seen evidence of antimatter production above thunderstorms.⁴ Other antimatter sources can be found right under our noses: surprisingly, bananas produce antimatter, releasing one positron about every 75 minutes.⁴ This occurs as a result of the small amount of potassium-40 (an isotope of potassium) present in bananas. As potassium-40 decays, it occasionally releases a positron. Like bananas, the human body also contains potassium-40.⁴ The emission of these bewildering, mystical positrons is yet another thing that we share with the household fruit - the other being 50% of our DNA. However, the disappointing truth - though perhaps only of disappointment to those of us seeking a fantastical side to this universe - is that these antimatter particles are very short-lived. They are immediately obliterated by the inescapable, all-

encroaching regularity of our old friend: 'normal' matter.

We now know that antimatter is not just a fictitious fantasy, but this brings us onto the next question: how can we truly understand a substance that vanishes the moment it touches anything? The Antiproton Decelerator (AD) at CERN aims to answer this: it is a unique machine that produces low-energy antiprotons for studies of antimatter, ultimately "creating" antiatoms.⁵ Installed in 2000, the AD made the headlines in 2002, when large numbers of antihydrogen atoms were produced for the first time. This is how the amazing machine works: the Decelerator produces antiproton beams and sends them to the different experiments. After this, a proton beam that comes from the Proton Synchrotron is fired into a block of metal. The subsequent collisions create a multitude of secondary particles, including many antiprotons. However, these antiprotons are too energetic to be useful for making antiatoms; they also have different energies and move randomly. The job of the AD is to tame these unruly particles, and turn them into a useful, low-energy beam that can be used to produce antimatter. Currently, the AD serves several experiments that are studying antimatter and its properties, such as the below ATRAP and ALPHA.

The two CERN experiments, ATRAP and ALPHA, aim to make antihydrogen – the simplest antiatom possible – in

sufficient quantity and for long enough to compare the spectrum of light it emits with that of regular hydrogen.³ The experiments require a near-perfect vacuum – as encountering a single oxygen atom would spell the end for any antiparticle – and a method of trapping the antiparticles by using electric and magnetic fields. In fact, antihydrogen was successfully isolated in 2002 by bringing together antiprotons from a particle accelerator and positrons from a radioactive source of sodium in a magnetic trap.³ However, due to antihydrogen's neutral charge, it was able to slip right through the containing field lines – and our eagerly awaiting hands. ATRAP and ALPHA are still working on this problem: "Capturing antihydrogen atoms is the current frontier, and it's a challenge," says Rolf Landua, a physicist at CERN. "So far nobody has managed to do it, but I'm pretty sure we will."³ Hopefully, this is true, and, someday, we will turn science fiction into reality.

Another CERN experiment – AEGIS – is designed to find out whether gravity acts on antimatter in the same way as it does on 'normal' matter.³ Gravity is a relatively weak force, so the experiment uses uncharged particles to prevent electromagnetic forces from drowning out gravitational effects. The plan is to build highly unstable pairings of electrons and positrons, known as positronium, and excite them with lasers to prevent them annihilating too quickly. Next, clouds of antiprotons will rip these pairs apart, stealing their

positrons to create neutral antihydrogen atoms. Pulses of these anti-atoms shot horizontally through two grids of slits will create a fine pattern of impact and shadow on a detector screen. By measuring how the position of this pattern is displaced, the strength – and, most interestingly, the direction – of the gravitational force on antimatter can be measured. It's a clever idea, but the devil is in the detail, says AEGIS spokesman Michael Doser. "No one has ever made controlled positronium like this, nobody has ever made a positronium excited state with lasers in an environment like this and nobody has ever made an antihydrogen pulse like this."³ If the research is successful, and gravity does affect antimatter differently, it will tell us something not just about antimatter but also about the fundamental theories underpinning modern physics. Einstein's general relativity tells us that the force should work identically on any type of matter. Equally, the standard model predicts that matter and antimatter are identical to all intents and purposes. "If we find that either of these things differ," says Landua, "then we have found something extremely important."

Such antimatter investigations are promising, but what of antimatter's potential uses? As in *Angels & Demons*, the idea that humanity might one day harness the annihilative power of antimatter for destructive purposes has a ghastly fascination. Comfortingly, Landua does not believe that this will happen any time soon: "If you add up all the antimatter we have made in more

than 30 years of antimatter physics here at CERN, and if you were very generous, you might get 10 billionths of a gram,"³ he says. "Even if that exploded on your fingertip it would be no more dangerous than lighting a match." Even if physicists could make enough antimatter to build a viable bomb, the cost would be astronomical: "A gram might cost a million billion dollars," says Landua. Frank Close points out the time problem too. "It would take us 10 billion years to assemble enough anti-stuff to make the bomb Dan Brown talks about".³

Unfortunately, the same manner of reasoning applies for antimatter as a clean, green energy source: "Maybe it would work if there were lumps of antimatter that nature had spent 15 billion years making for us," says Close. As it is, we would have to make them one anti-atom at a time, which costs far more energy to make it than we would get out of it – about a billion times more, says Landua.³ Nevertheless, antimatter is a popular fuel for futuristic vehicles in science fiction popular culture – for example in the TV shows *Star Trek* and *Futurama* – as just a handful of antimatter could potentially produce a huge amount of power.⁴ Antimatter rocket propulsion is hypothetically possible, though, again, the major limitation is gathering enough antimatter to make it happen. There is currently no technology available to mass-produce or collect antimatter in the volume needed for this application. However, a small number of researchers have conducted simulation studies on propulsion and storage. These include

Ronan Keane and Wei-Ming Zhang, who did their work at Western Reserve Academy and Kent State University, respectively, and Marc Weber and his colleagues at Washington State University.⁴ One day, if we can figure out a way to create or collect large amounts of antimatter, their studies might help antimatter-propelled interstellar travel become a reality.

Although these ideas are not possible at the moment, there are other, more realistic methods of harnessing antimatter, such as those currently used in medicine. PET (positron emission tomography) uses positrons to produce high-resolution images of the body. Positron-emitting radioactive isotopes - like those found in bananas - are attached to chemical substances that are naturally used by the body, such as glucose.⁴ These are then injected into the bloodstream, where they are broken down, releasing positrons that meet electrons in the body, thereafter annihilating. These annihilations produce gamma rays that are used to construct images. According to this, antimatter has already proven its use, and we haven't even scratched the surface of the universal mirror. Furthermore, scientists on CERN's ACE project have studied antimatter as a potential candidate for cancer therapy. Physicians have already discovered that they can target tumours with beams of particles that will release their energy only after safely passing through healthy tissue; using antiprotons adds an extra burst of energy. The technique was found to be effective in hamster

cells, and results are yet to be seen in human cells.⁴

Although there is still much to learn about the inner workings of antimatter, it holds enormous potential for the future, and is definitely not just a mere science fiction tool. As well as the practical aspect of antimatter, the theoretical side is fascinating. For all we know, everything could have an antithetical representation of itself, opening up endless possibilities; there could be a parallel universe where the laws of physics are opposite to our own. Nonetheless, we will never uncover all of the mysteries of this universe; after all, it is constantly expanding. Though this outlook may highlight the futility of interstellar investigation, - and fundamentally any investigation into the nature of the universe - utility has never been humanity's true goal. As demonstrated by the 1969 moon landing, we live to explore, to seek more to this universe, and to indulge our fantasies. To me, this is what antimatter, physics, and ultimately any intellectual subject is all about.

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Is the 'Perfect' Dog Worth it?

BY IZZY BOWDEN

This essay will explain the recent trend of designer dog breeding and argue that its increasing popularity at the expense of animal welfare is wrong and immoral.

Dogs are the most variable mammal on earth, with artificial selection leading to approximately 450 recognised dog breeds around the world. Each breed has specific traits of form and shape, such as body size, shape of skull and colour of fur. It also has distinct behavioural traits, such as guarding, herding and hunting as well as personality traits such as boldness, aggression and friendly companionship to humans.

Modern dog breeding dates back to the late 19th century, when the functional traits of what had evolved as domesticated descendants of the wolf became less important than their form, as the role of the dog in society changed. The Victorians bred dogs with the aim of defining a specific combination of characteristics and features. Over time these characteristics became more and more predictable and gave rise to a "purebred" which would then always breed true. Regulators such as the Kennel Club in the UK were created to set standards of characteristics

that a dog must have to be registered as a given breed, protecting and perpetuating the purebreds. In this sense, "cross-breeding" has always existed; however, in recent times, the practice of breeding two separate breeds together has expanded exponentially and with distinctly different motivating purposes. The "designer dog" has become a commodity sought after for its "perfection". Analysis comparing dog ownership from the UK wide White Cross Vets database of dogs registered between 2006 and 2016 shows a significant trend towards increased designer crossbreeds with more curious names, with a 3738% increase in Cockapoos, 1100% in Shorkies and 358% in Sprockers.

Many have argued for the advantages of crossbred dogs. It is often claimed that they can add strength and vigour to existing breeds as it limits the likelihood of pre-existing genetic diseases being inherited, although there is no proof of this. It is true that purebreds do sometimes suffer from a weakness to genetic conditions that have been passed down generations through being bred too closely. Crossbreeding can also help with troublesome or painful physical characteristics of a purebred; for example, the pug, which was originally bred in China in ancient times, can have breathing problems because of its face shape - crossing a pug with a beagle can produce a more natural-looking face and alleviate these problems.

However, the practice of crossbreeding is inherently random and unpredictable. The particular combination of physical and personality characteristics that are desired will only appear in some of the puppies while others may have the undesirable characteristics of both parents – what happens to those dogs? Most obviously, predicting the size of a puppy is more difficult in crossbred dogs, especially if the two parent breeds differ significantly in size. This can lead to potential difficulties, and indeed great danger, when it comes to delivery. If the puppies are too big for the mother to give birth to safely, this will endanger both her life and that of the puppies. It may also cause feeding and behavioural problems with rearing the puppies. The life expectancy of resulting puppies will range between those for the two parent breeds.

Other problems relate to personality characteristics from breeding dogs with different temperaments. For example, rottweilers tend to be bold and sometimes aggressive as they have been bred as working guard dogs. Poodles, by comparison were bred to be companions. It would be difficult to predict the personality a crossbreed of these two dogs might produce. Such conflicting temperaments may lead also to mental anguish and confusion for the resulting dogs. Another example, highlighted by the former secretary of the Kennel Club, Caroline Kisko, is the cross of a husky and German shepherd. “The husky’s instinct is to hunt and the German shepherd’s instinct is to round animals up. If a cross of these sees a

rabbit, which is it supposed to do?”

In terms of genetically carried difficulties, it is important to remember that crossbreeding may multiply as well as diminish these problems. Labradors are prone to hip dysplasias and poodles to eyesight problems. You may eliminate both in your puppy or have a puppy vulnerable to both conditions. A particular problem is the fashionable desire to breed dogs smaller than is healthy which can cause significant health issues, such as chronic pain, breathing difficulties, arthritis and weak bones. Most of your characteristics, such as your eye colour and nose shape, are controlled by several genes interacting. However, some characteristics, such as the colour of fur in mice, are controlled by a single gene. The chromosomes you inherit carry your genetic information in the form of these genes, many of which have different alleles. Each allele codes for a different protein and the combination of alleles you inherit will determine your characteristics. Some alleles are expressed even when they’re only expressed in one of the chromosomes from the parents involved. These alleles are dominant and are always expressed if they are present; for example, black fur in mice. However, some alleles only control the development of a characteristic if they are present in both chromosomes from both parents. These alleles are recessive and are only expressed if there are no dominant alleles and the organism has two identical alleles for a characteristic, otherwise known as

homozygous. For example, attached earlobes is a characteristic that comes from two recessive alleles.

You can trace genetic characteristics through a family through family trees, which can be used when tracking inherited diseases, showing a family likeness and showing the different alleles organisms have inherited, by examining which characteristics are expressed. This means that family trees can be used to work out if an individual is likely to be homozygous or heterozygous; having one dominant and one recessive allele, where only the dominant is expressed, for particular alleles. This is what allows the practice of selective breeding, where people attempt to speed up evolution in order to achieve the characteristics of animals or plants that they desire. It works by artificially selecting which members of a group you want to breed, using family trees to predict which members are most likely to have the alleles they’re looking for. Then the animals are used as breeding stock and they select organisms from their offspring that show the desired characteristic and only breed again with them.

Selective breeding is essentially the same as the breeding processes involved with this designer trend, as people are crossbreeding dogs to achieve a specific breed with the most desirable characteristics. However, this crossbreeding does not have the same purpose of achieving a higher yield or resistance to certain diseases,

as selective breeding is usually used in agriculture. Instead the purpose behind this crossbreeding is a particular aesthetic and because the trend is so popular. As well as this there are also many limitations of this type of crossbreeding, which are actually surprisingly similar to many of the disadvantages linked with purebred dogs. It greatly reduces the number of alleles in a population, as only individuals with the chosen alleles are allowed to be bred. This reduces variation between individuals as well as the variation in the alleles for the given characteristic. If the environment were to become unstable, through climate change or a new disease emerging, this lack of variation can mean that very few of the organisms in the population can cope with the change, resulting in the population dying out very easily. This occurs often, especially in puppy farms, where a minor bacterial infection can take out an entire litter of puppies, as none are naturally immune from variation and mutation in their alleles. There are also problems with inbreeding associated with this trend, as some breeding populations have been so closely bred to achieve a particular appearance that animals are mated with close relatives. This again results in very little variation in the population, causing some breeds to be particularly prone to certain diseases or inherited genetic defects. This specific disadvantage is often linked with the practice of breeding purebreds, and it is actually claimed that crossbreeding widens the gene pool, increasing variation. This is true, however the

crossbreeding involved in this trend and trying to achieve certain characteristics is in fact more similar to selective breeding, which is why it can lead to the same problems.

The designer dog craze did begin in pursuit of an arguably noble cause. In 1989, Wally Conron, a breeder in Australia, crossed a Labrador retriever with a Standard Poodle. He was looking to produce a guide dog for a blind woman whose husband had severe allergies, and who therefore could not have a regular Guide Dog. Provided the puppy inherited the poodle and not the Labrador coat, this was an idea with potential for many people who suffer with allergies which prevent them owning a Labrador or similar breed. Mr Conron named his crossbreed dog a Labradoodle, a cute title that added to the popular craze that then took off for owning such dogs. Mr Conron has repeatedly stated that he regrets initiating the fashion, saying it has caused “a lot of damage” and that he had “created a Frankenstein”. Because the likelihood of breeding desirable characteristics is outweighed by that of breeding undesirable ones, a lot of undesirable or problematic dogs would be born. As Mr Conron said, “for every perfect one, you’re going to find a lot of crazy ones”. This issue is greatly exacerbated in the hands of unscrupulous breeders, such as puppy farms.

In the years that followed there was a huge increase of cross breeding,

combining all sorts of pure bred dogs with increasingly convoluted portmanteau names such as Cockapoo (cocker spaniel and poodle), Chorkie (chihuahua and Yorkshire terrier) and Malshil (maltese and shih-tzu). In each case, the perceived cute appearance was the reason for the cross, rather than any working purpose. The craze was exacerbated by celebrity owners publicising their designer dogs and creating a mass market for owning similar animals. The Kennel Club have said that rogue breeders are mass-producing puppies to meet the latest “celebrity-driven trend”. Cultural trends also have influence: the RSPCA have seen a rise in breeds of dogs such as Dogues de Bordeaux and husky types, as people buy dogs based on popular cultural trends such as the Twilight films or Games of Thrones series. The RSPCA warned that demand for designer dogs was “fuelling puppy farms” where conditions for mothers and puppies are often very bad and unwanted dogs from each litter are put down. The Kennel Club says that many crossbreeds are bred purely for financial profit, with the health and welfare of the dogs not in mind. Mothers are bred too frequently without time to recover between litters, which as well as being cruel, leads to weaker puppies with compromised immune systems and more prone to illness. Female dogs are also abandoned or put down when they are no longer able to breed. Inbreeding, the breeding of dogs too closely related, often happens, meaning the puppies are more likely to develop serious health problems. Behaviourally, puppies

from puppy farms are not properly socialised to become good pets. They have not experienced a normal home environment, met different people and are likely to have been removed from their mothers far too early, missing out on learning how to interact with other dogs. Such puppies are likely to develop social anxiety and other behaviour problems.

Unlike purebreds, the physical and personality characteristics of a crossbred puppy are not at all predictable and the Kennel Club and Battersea Dogs Home have said that many dogs are abandoned by their owners when they turn out not as expected, or promised, by unscrupulous and now criminal puppy farm breeders. Because the ancestry of the dogs is not documented as it is the case with purebreds, it is very difficult to know how a puppy will develop as it grows. There have been many calls for the introduction of improved regulation of breeding conditions. Lord Black of Brentwood said in the House of Lords that “we need to look at introducing regulation [that] now exists in some European countries to stop the torture breeding of these animals”. He was instrumental in the introduction of the recent new legislation banning puppy farms. The statute is known as Lucy’s Law. Lucy was a Cavalier King Charles spaniel, who died in 2016 after suffering terrible conditions on a Welsh puppy farm. Her plight inspired the Lucy’s law campaign, launched by the vet and campaigner Marc Abraham, which

gained widespread support from the public and the animal welfare sector. Under the law, from April 2020 all third-party sales of puppies (and kittens) six months or younger will be banned. Puppies have to be sold by the breeder, from the place where they were born with their mother. The aim of the legislation is to crack down on puppy farms and other untrustworthy sellers. It will be interesting to see to what extent this now illegal practice will be reduced or whether it will just be driven underground.

Unethical crossbreeding is an issue which affects other animals of course. The British Veterinary Association has warned the breeding of Scottish fold cats should stop because of health concerns. This breed has a natural dominant-gene mutation that affects cartilage throughout the body, causing the ears to fold down and towards the front of the head, giving an “owl-like” appearance. The breed originated in Scotland in the 1960s but had a surge of popularity after celebrity owners such as Taylor Swift and Ed Sheeran posted photos of theirs on Instagram. However, the mutation also causes lifelong painful arthritis.

Beyond the domestic sphere, designer hybrids have been bred with wild animals. The liger is the offspring of a male lion and female tiger, while the tigon has a lion mother and tiger father. The leopon is the progeny of a lion and leopard, and the jagulep is a jaguar-leopard mix. These big feline

hybrids do not exist in nature and are produced by big cats being crossbred in captivity, solely to become curiosities in zoos and wildlife parks. Experts in big cat conservation point out that with hybrids there's a much greater chance of defects. Susan Bass, director of public relations for Big Cat Rescue, notes that ligers can suffer from unsustainable growth – “their hearts give out” and “their organs literally can't handle the weight”. The breeding of these feline hybrids, for motives of profit and entertainment, does not aid conservation, sends confusing educational messages and is unethical and irresponsible. Similar concerns arise with the selective breeding programme in the 1990s in Dubai to produce the cama, a hybrid of a male dromedary camel and female llama. This was done with the aim of creating an animal capable of higher wool production than the llama thereby increasing profit levels.

There is some point to the fact that the purebreds we have today originated from owners crossing different breeds to achieve certain physical, behavioural and personality characteristics, and that today's cross-breeding is potentially acting as a foundation for creating future purebreds. However, this historic cross-breeding was for particular practical purposes and, in the most part, before the scientific understanding of the health implications of breeding dog breeds. The dogs currently being used to cross-breed have been bred pure for generations and have very

strong natural tendencies to certain behaviours and characteristics. Therefore, breeding them together has greater health implications than the origins or purebreds.

Overall, it is clear that the practice of cross-breeding for reasons of trendiness or fashion should end, as it threatens the health and welfare of animals for no sustainable justification. There is hope that the new legislation banning puppy farms will lead to a significant decrease in the popularity of these crossbreeds.

'We should not judge past literature by the standard of the present.'

BY MARNI DAGTOGLOU

The very first time that man put pen to paper in an attempt to put an idea into words, literature was born. Throughout history it has been used as a form of expression. A piece of literature illustrates a time period and, within that, a class of people. Dependent on this, every book is written from a very specific perspective. As time passes, we cannot help but view literature through a changing lens. Therefore, our judgement of literature must differ from the standards of the original reader to that of the present day. In order to explore this topic closely enough, through this essay, the reader will view 19th century literature through the lens of present-day judgement. This lens cannot be removed however it can be realised. This active realisation of the conditioning we have had due to the influences of the present-day, allows us to contemplate that each period of history has influenced its own generations of people, permitting them to judge societies that have different moral and social values. Allow yourself to take a step back and view the changing standards of our world's literature from a distance. Watch as the decades go by and the standards of society change the way we judge literature. Know that, if we as a people, who have corrected our behaviours and

refined our views, wish to uphold our current values, be it political, moral or societal, past literature must, therefore, be judged by the standards of the present.

'Marriage in Regency England was a very different institution from what it is here and now'. Marriage laws and societal views have altered tremendously over the centuries, most prominently in the position of the woman. Seen through literature, it is clear to say that matrimony must be understood in its context but judged by the standards of the present. A major theme in Jane Austen novels in the 1800s, as well as in connection to inheritance, marriage is placed at the heart of importance for almost every Georgian woman. Austen presents the little power women had unless they gained income through a marriage of wealth and status. Characters in Austen very often don't inherit the fortune needed to live comfortably, hence their only solution is to marry wealthy or face descent into poverty. When Austen was writing, this applied to women in particular due to the law of primogeniture. This law meant that, in the absence of a will, 'since the Norman conquest of England in the 11th century, it was presumed that kings would simply pass the power to rule to their first-born son', a legal practice that, due to its abolition in England in 1925, results so that, an estate is shared equally between all children of the deceased, regardless of gender. Consequentially, women's only option was to rely on the charity

and support of their brothers in order to get by, further justifying their need for a 'good marriage'. In respect to Austen's descriptions of the importance of marriage in the Regency era, we as current day readers, who are permitted to have a family without marrying and do not always need to rely on the husband for our income, do not relate entirely with the intensity of matrimony as a common focus. We lean towards Austen mainly for her unforgettable witticisms and relentlessly ironic tone. Austen, as narrator, through almost caricaturing the 19th century 'Novel of Sentiment' and allowing her characters often to hang themselves with their own ropes through their extensive self-exposing speech, certainly allows us to mock a great many of her characters and their actions. However, the necessity of marriage is still the intense basis of most of her character's motivations and this must not be forgotten. This necessity is something that we, as present-day readers cannot entirely understand due to how dramatically our social perspectives of marriage have evolved.

Austen explores the 19th century significance of the strong link between wealth and matrimony, something modern day readers do not have to preoccupy themselves with in quite the same way. This is seen in *Sense and Sensibility* where Mr Henry Dashwood dies with only a life interest bequeathed to the family estate. The property goes to his son, John Dashwood and then to his son after him, leaving his daughters unprotected, with little income to live

off. In *Pride and Prejudice*, Charlotte Lucas sums up the average plight of 19th century women where it is stated that 'marriage [had] always been her object; it was the only honourable position for well-educated young women of small fortune'. Therefore, Austen conveys to us that the only way to live comfortably was to marry on the basis of economic tact through her focus on the trials and tribulations of the women who find themselves under the laws of primogeniture. She explores this contemporary issue through the Bennet daughters, who lose the right to inherit Lady Catherine's fortune, which instead goes to the pompous Mr Collins. Hence, Austen allows us, as readers of the present day, to understand the context of her time and yet, with changes in law and society, our ways of seeing have been altered, leaving us to respond with a certain, if unconscious level of judgement.

Women's work in the Regency era was minimal and dramatically less available than today, something that should be consciously taken into account by modern day readers. Women's only real chances of income, albeit small, were through work in factories or domestic service. Some were writers and artists, but mostly anonymously to enable their work to be taken seriously to generate sufficient income. Austen herself remained anonymous when publishing four of her most successful books, including *Emma* in 1815, when it wasn't entirely acceptable for a woman of her status to publish a book for profit. However, she did choose to credit the

book to a woman, signing the cover with 'By a Lady'. Through this, it can be seen that the plight of women is one that has and continues to change and progress over time and is a difference we can therefore appreciate and try to understand, leading us to judge society for limiting women in such a way.

The vital need to maintain one's marital and sexual reputation in the 19th century in order to avoid being disregarded by society was also explored by Austen. In *Pride and Prejudice*, Lydia rejects the motivation of wealth in marriage, eloping with Wickham on a whim. Her family's desperation to avoid societal judgement represent the severe consequences that would occur if the two were found to be living together before marriage. It was detrimental to leave one's reputation ignored as a bad reputation could lead to ruin. Thus, readers must acknowledge that modern day standards on what constitutes a bad reputation have changed drastically since the 19th century and are most often seen as a progression, resulting in us not judging Lydia and others like her to anywhere near the extent that would have been expected of society at the time.

An act of arguably the greatest consequential ruin to the reputation was to have a child out of wedlock: a child 'born of parents who were not married at the time of birth', otherwise known as 'birth of unlawful matrimony'. Women were 'disgraced, abandoned and cast out by society, even by their

own families, until the 1960s' if they had a child out of wedlock. Gender inequality in the laws of the 1800s punished women with about a year of hard labour in prison beating hemp while men only served three months in prison. Furthermore, the father would commonly reject the baby, wanting to escape the consequences of wedlock and having the ability to do this as a man. Surviving records show that, in London, only 20% of unmarried men paid for their illegitimate children. Although gender equality has some way to go yet, it cannot be disputed that society does not frown on the actions of women the way it did during the 19th century.

The damages of having a child out of wedlock is a theme explored throughout Victorian literature, especially in that of Dickens. The young Oliver in Dickens' *Oliver Twist* represents an example of the life led by an orphaned child born out of wedlock. Right from the beginning, Oliver is 'despised by all, and pitied by none' because he is born into bastardy as an illegitimate child. His mother dies during childbirth, forcing him to grow up in a workhouse owned by Mr Bumble. Oliver famously says 'Please, Sir, I want some more' highlighting the desperate hunger of the boys in the workhouse. This demonstrates the terrible state of these orphan workhouses during the Victorian era, with a common maltreatment that we can hardly even imagine in the modern era.

Oliver's mother is a common example of a woman in the 1800s who, after giving birth out of wedlock, was left to fend for herself; homeless, hungry and weak. As a single mother, she represents those who would have to look after their bastard child of their own accord with little left to support them and the child because, as a woman, they couldn't get many jobs, let alone with a baby to look after. Often the only path left for the mother was to go into a workhouse with her child which had vile conditions and often treated women very badly. Therefore, although we do not judge Oliver's mother for giving birth out of wedlock as her society would have, we do judge her society for maintaining these seemingly unjust standards.

Another issue developed by Dickens, which has now entirely changed in legal terms, is debt, the dire consequences of which deemed it a serious and unredeemable criminal offence up until the late 19th century. He said of debt 'Annual income twenty pounds, annual expenditure nineteen six, result happiness. Annual income twenty pounds, annual expenditure twenty pound ought and six, result misery' which conveys how debt could ruin people's lives and that of their families. From 1543, debt cases were administered by Bankruptcy Commissions. The council took them case by case after multiple creditors commissioned by the Lord Chancellor. It had control over the debtor's assets and the power to put him in, or free him from, jail.

As a reader of Victorian literature, we must also understand that the issue of debt was particularly personal to Dickens as it caused his father (John Dickens) to be thrown into Marshalsea Prison in 1824, when Dickens was only 12 years old. This encouraged him to portray children of poverty in a particularly astute way throughout his writing, having lived through the aftermath of his father's debt. Imprisonment for debt was only abolished in 1869, too late for John Dickens. Little Dorrit, 1855-57, was said to have been written as a response to this, directly attacking the debtors' imprisonment law. Little Dorrit's father was even known as 'the Father of Marshalsea', borrowing addictively and unable to survive outside the protection of the debtors' prison. Moreover, Mr Micawber in David Copperfield was very likely modelled off John Dickens, borrowing 'man to man' in order to maintain the lifestyle of a gentleman. Dickens uses the subject of debt as a way of exploring how people of varying levels of wealth and status in society are brought together. Because debt hardly features in literature today except by borrowing from Dickens himself, we have separated its 'financial sense of credit from its various moral and social senses'. That is to say, we no longer have the connotations of fear towards debt that those of Dickens' era experienced regularly, due to the legal changes that have been implemented in order to improve the justice of the consequences of debt. Therefore, if we are to uphold the morals and decisions that lawmakers have made for and

before us, we must judge harshly the consequences of debt depicted by Dickens.

Overall, from reading the literature of Dickens and Austen, it is clear that there has been significant progress made by our lawmakers, politicians and philosophers over the dealings of issues such as marriage, bastardy and debt since the 19th century. In addition, the views and standards of society have altered so that we do not punish others in the same way and for the same issues. This causes us, as modern-day, readers to look down upon the treatments described by literature of its characters and their actions and, ultimately, to project our judgement onto them, albeit unconsciously. The influences of our society have conditioned us to maintain basic morals and values which make up the majority of the way in which we view situations and behaviours described in past literature. Due to the inherent need to uphold these standards of our society in order to avoid relapsing into backward, and nowadays societally unacceptable, views of the treatment of others, it can be seen that we, as modern-day readers, must judge past literature by the standards of the present.

"I cannot but think that he who finds a certain proportion of pain and evil inseparably woven up in the life of the very worms, will bear his own share with more courage and submission". Thomas Huxley said these words of Charles Darwin on the publication of "The Origin of Species" but to what extent are they reflected in the themes of the poetry of Thomas Hardy?

BY LOTTIE HASSAN

Published in 1858, Charles Darwin's 'The Origin of Species' not only had a seismic impact within the scientific world but also greatly influenced the literary world, with writers adopting aspects of Darwinian ideology such as George Eliot and Alfred Tennyson. Hardy viewed himself as "among the earliest acclaimers of 'The Origin of Species'" and this influence is prevalent throughout his novels, 'Tess of the d'Urbervilles' and 'Jude The Obscure'. Although Hardy is better known for his novels, he considered himself primarily a poet with much of his poetry rooted in the natural world. It is unsurprising therefore, that the impact of Darwin's theories was so profound on him.

"Hardy's extraordinary sensitivity to the variety, abundance, beauty and pain of even the most minute natural phenomena makes him the first great poet of Darwinism". In his poetry Hardy reflects the very qualities that Huxley attributes to Darwin himself writing of the empathy, acceptance and courage that Victorian society needed in the light of Darwin's theories.

Firstly, Darwinian ideology led Hardy to also have an increased appreciation for the "pain [...] in the life of the very worms" as through the recognition of their common ancestry he adopted an empathetic outlook towards the natural world. Hardy argues that if "all species are connected in the unity of life then humankind has a certain ethical responsibility towards its environment and its fellow creatures." This outlook is demonstrated through his poem "Nature's Questioning" in which Hardy utilises personification to show the bond between mankind and the natural world. Hardy describes the "Field, flock and lonely tree [...]// Like chastened children" revealing Hardy's own sympathies towards nature whilst also evoking similar pity from the reader by making it seem more vulnerable. Furthermore, Hardy builds more sympathy through exposing God's supposed neglect of his creations when writing "Impotent to tend" revealing how Darwin's evolutionary discoveries led Hardy to doubt his religion, questioning how God could allow such pain and suffering in the world if he was truly omnipotent or omnibenevolent. Hardy continues to make reference to

the common ancestry when stating "unconscious to our pains" using the pronoun "our" as both Hardy and nature ultimately have limited control over the harsh realities of life. The idea of an ambivalent God in the face of nature's suffering is also shown in "The Blinded Bird" where Hardy details the brutal Victorian practise of blinding songbirds to supposedly make them sing sweeter. The poem suggests the suffering is inflicted on the bird by humankind "with God's consent" revealing further Hardy's religious disillusionment and heightened empathy for animals' suffering. In addition, he writes "needle thou, // I stand". The juxtaposition of the words "thou" and "I" convey the idea of the narrative voice standing united with the bird as if its physical suffering is reflected by him through the emotional pain that this bond elicits. In addition, Hardy also demonstrates common feeling with the bird when he describes how its "groping thy whole life long" reflecting the bird's physical blindness but also echoing Hardy's own continuous, groping for religious clarity in a time of scientific exploration often referred to as the "Age of Doubt". Hardy wrote a series of poems on birds seemingly fascinated by the way in which humankind could harm and trap something that is so innately free overseen by an uncaring God. This idea of the maltreatment of birds is also explored in "The Bird Catcher's Boy" where the boy mourns how "Larks bruise and bleed in jail". This further emphasizes the injustice of the world as the word "jail" has connotations of punishment yet the birds are innocent,

fragile and undeserving of such cruelty. The bird's vulnerability is reminiscent of Tess in Hardy's novel "Tess of the d'Urbervilles" who he often described using bird imagery. She also is too emotionally evolved for the world she inhabits rendering her trapped in an invisible cage created by a harsh, uncaring society. Furthermore, "the difficulties of emotionally sensitive creatures in an indifferent world" are also shown by the boy in the poem who is subjected to offensive and dismissive treatment from his father who calls him a "dolt" simply because he possesses this empathetic capacity ultimately leading to his death at the end of the poem. He also is too sensitive for the harsh world that he inhabits.

Secondly, Huxley refers to Darwin's submission to the impact of his theories both on society's response but also on his own religious beliefs. Hardy faced his own life with a feeling of "submission" and the acknowledgement that he forms but a single link in the evolutionary chain is prevalent throughout his poetry. In 1889 Hardy wrote in his notebook that "the story of a face which goes through three generations or more, would make a fine novel or poem on the passage of time" and he reflected this interest in many of his poems. "Heredity" explores Hardy's own place as a link in the evolutionary chain. The poem demonstrates "a particular focus of Hardy's sense of entrapment in a Darwinian universe in which the individual is produced by a 'line' of progenitors whose habits or characteristics he or she repeats. He

saw himself as a product of a dying family whose history culminates in his own experience. ” Hardy states in the poem “I am the family face;// Flesh perishes, I live on” where he seems to recognise his own mortality through his acceptance of the physical decay. However, he also accepts that in certain ways this lack of originality in family bloodlines facilitates their immortality as certain traits are passed on from generation to generation although Hardy himself was childless. It’s clear that although Hardy was resigned to this idea of inheritance, the lack of individuality it gave him distressed him. In “Transformations” Hardy utilises tree imagery to show how interwoven humans are with nature in an endless cycle which creates new life from death. The poem states “This branch may be his wife//a ruddy human life”. The branching reflects Darwin’s own analogy of the tree of life in which diverging lines show branching descent of species producing new varieties of genes in order to prevent extinction. Hardy reveals his acceptance of death when stating ‘so they are not underground, //But as nerves and veins abound// In the growths of upper air’. This suggests that, due to our interconnectedness with nature, loved ones never truly die as they are transformed becoming almost a new species. In the poem “The Pedigree” Hardy views by moonlight the ‘sire-sown tree’ of his ancestry with its twisted branches, until he sees a face form and then a mirroring of that face to a series of faces to the point of origin ‘past surmise and reason’s reach’. In this poem Hardy seems once more

dissatisfied with his lack of individuality as he accepts frustratedly that he is a ‘merest mimicker and counterfeit’, a particularly painful realisation for such a creative man. It was not only Hardy though who was not content with this lack of uniqueness that Darwinism rendered him with. “Evolutionary ideas resulted in a general mood of melancholy in the Victorian public, as mankind was confronted with its own insignificance”. Darwin’s influence on Hardy is also reflected in the very language he uses. He creates new compound words such as “sire-sown tree” in “The Pedigree” and “years-heired” in “Heredity” suggesting the evolution of language itself as different words are combined giving birth to new meanings with “years-heired” denoting both time and succession.

Finally, Huxley refers to Darwin’s “courage” in the aftermath of his theories. Hardy also attempts to show courage in his poetry often demonstrated by a flicker of hope in response to nature’s harshness or indifference. In his poem “The Unborn Pauper Child” Hardy’s outlook shifts throughout the poem. He begins by lamenting the child, urging it not to be born, yet by the end of the poem he accepts that while the world seems evil and the human race hopeless, the ability to have hope that exceeds reason is what makes human beings so unique and allows them to endure hardships in pursuit of joy. He begins by describing how “Hopes Dwindle; yea// Faiths waste away” observing the futility and brevity of hope soon snatched away by

the cruel realities of life. By the end of the poem though, Hardy’s argument has altered as he writes “That I can hope// Health, love, friends, scope// In full for thee; can dream though wilt find”. He recognises that the hope of attaining all these things is enough to make life worthwhile even if ultimately such hopes are never achieved. He acknowledges the need for the courage to have some residual hope in the face of adversity. In “The Darkling Thrush” Hardy returns to his series of bird poems with a vulnerable thrush demonstrating the courage to sing in spite of the harsh world surrounding it. The beauty of its song provides restoration in the beauty of nature and spreads an inspiring force of hope to others. Hardy begins the poem by describing the bleak wilderness in which the thrush sings, stating “The ancient pulse of germ and birth// Was shrunken hard and dry” conveying the idea of something twisted, unnatural and barren in stark contrast to the bird. Furthermore, Hardy describes how the thrush ‘Had chosen thus to fling his soul//Upon the growing gloom” which gives the idea of the thrush’s song as a light in the dark, a gallant attempt to combat the bleak reality that is devouring nature. The use of the present participle “growing” exhibits the idea that the gloom is forever encroaching. Hardy acknowledges how he himself finds it hard to share in the thrush’s feelings of hope as he claims it has “little cause for carolings”. The word “carolings” typically has associations with religious songs suggesting that the thrush is able to retain faith even when Hardy himself begins to doubt.

In addition, in “Nature’s Questioning” Hardy refers to a “forlorn Hope over which achievement strides?” which draws upon his idea of “evolutionary meliorism ” in which humankind strives towards some as yet unrealised goal that over generations improvement may one day be achieved. Hardy’s decision to use a capital ‘H’ in the word “Hope” simultaneously shows how important the need for hope is but also hints at a higher power as it mirrors the capital ‘G’ in the word ‘God’. Although these poems show the green roots of some form of hope and courage for mankind’s future the advent of the First World War in 1914 served to severely dent Hardy’s limited optimism leaning.

In conclusion, the themes of Darwinism are repeatedly shown in Hardy’s poetry. Hardy makes “Darwin’s revolution a cause for poetic rethinking of human and non-human life ”. He writes of the empathy, acceptance and courageous hope which Huxley also sees in Darwin. This shows that Hardy, rather than being a traditionalist happiest looking backwards at a simplistic rural life as he is often viewed, possessed a capacity for a forward-thinking openness and acceptance of change that was by no means present in all Victorian society. Whilst Hardy may have felt cautious of the changes brought about by industrialisation, he nonetheless accepted the advances being made simultaneously in the world of science, being among the first to adopt the theories that Darwin expounded, working through the feelings that they evoked in him through his poetry.

Should stem cells be used to treat Autoimmune diseases?

BY TYRA-LILY LUBEGA

Autoimmune diseases affect approximately 8.5% of people worldwide and are conditions where the body's immune system is unable to distinguish between foreign cells which come from invading organisms and self-cells which are healthy bodily cells, and in turn the immune system fights itself and begins attacking healthy body tissue. For example, type 1 diabetes is a common autoimmune disease whereby the immune system destroy insulin producing beta cells preventing the body from being able to produce adequate amounts of insulin for blood glucose regulation. Like type 1 diabetes, many autoimmune diseases are thought to be a result of genetic predispositions as there have been recurring patterns of genetic tendencies across families, however further research needs to be conducted to confirm this and expand on the role genes play in autoimmunity. The various treatments available for autoimmune diseases are thought to be less than ideal, for example immunosuppressant drugs weaken the immune system, resulting in the body becoming more susceptible to infections, which would be hard to fight with an already suppressed immune system. With roughly 80 different autoimmune diseases and no concrete cure, research is being placed into stem cells and their potential to treat and possibly cure them.

Stem cells are undifferentiated, unspecialised cells which are not adapted to any particular function, and have the potential to differentiate into any type of specialised cell in the body. Stem cells fall under three main categories: totipotent cells, which can differentiate into any type of cell and form a whole organism; pluripotent cells, which can differentiate into any type of cell but not form a whole organism; and multipotent cells, which can only differentiate to form a range of cell types within a certain type of tissue. Stem cells originate from two main sources inside the human body, embryos and adult body tissues, such as the bone marrow and umbilical cord. Therefore, with these properties and extensive research, stem cells are able to provide an alternative method to autoimmune disease treatment. For example, haematopoietic stem cell therapy and mesenchymal stem cell therapy can provide the opportunity to drastically improve the patient's quality of life.

The use of haematopoietic stem cell therapy can potentially be used to treat autoimmune diseases as haematopoietic stem cells can give rise to any type of blood cell including lymphocytes, such as T cells and B cells which are a very important factor of the specific immune system. Furthermore, haematopoietic stem cells are known for their ability to self-renew and importantly their pluripotency. An example of this is a clinical trial that was carried out with patients with severe lupus, an autoimmune disease which attacks multiple body organs such including

lungs, kidneys and liver, as well as the brain. In this instance, the aim of this therapy was to generate a new, well-functioning immune system whilst also attacking and destroying the current malfunctioning immune cells. The majority of the trials carried out involved autologous haematopoietic stem cell transplantation whereby the patient's own stem cells are used. In this procedure, the patients receive injections which stimulate a large number of the desired haematopoietic stem cells to be released into the blood stream from the bone marrow which is a crucial source of stem cells. These cells are then obtained from the blood and once a sufficient amount has been collected, the patient undergoes radiation therapy treatments or is given cell killing drugs to destroy the already present, autoimmune disease causing mature immune cells. Once this is completed the stem cells are then injected back into the patients' blood stream where they move towards the bone marrow where they can carry out their function by differentiating to form new mature immune cells which function properly and are able to distinguish between self and foreign cells. The trial that was conducted, where this therapy was carried out on seven lupus patients, resulted in their immune systems being restored, and after three years the patients had reported to not have lupus as well as have no reliance on immunosuppressant drugs, effectively proving the haematopoietic stem cells to be beneficial.

However, the approach of obtaining hematopoietic stem cells from the

patient's own blood, places the patient at high risk for their autoimmune disease to worsen because of the continuous use of growth factors, which allow the mobilisation, essential for haematopoietic stem cells to move from the bone marrow to the bloodstream. Also if the haematopoietic stem cells were to be contaminated with the patients mature immune response cells it would decrease the success of the treatment in some patients.

To follow the use of haematopoietic stem cells, mesenchymal stem cells have the potential to be used to treat autoimmune diseases and although they do have similarities with haematopoietic stem cells as they both can be derived from the bone marrow, unlike haematopoietic cells, mesenchymal cells are multipotent and can be obtained from multiple other sources such as the placenta, umbilical cord and adipose tissue. These stem cells have the ability to regulate the immune system whilst still possessing the ability to fight off disease. In addition, Mesenchymal stem cells stimulate the production of T regulator cells, which have the function of suppressing the immune system by acting to control and regulate it and ensures the body recognises self-cells and doesn't initiate an immunological attack on itself. The Mesenchymal cells used to treat these diseases can be isolated from donated umbilical cords from normal healthy births, whereby each mother is tested for diseases and has their medical history reviewed, and each umbilical cord undergoes rigorous testing prior to obtaining the

stem cells, and then giving them to the patient via an Intravenous (IV) drip. Stem cells from this source are referred to as allogenic mesenchymal cells and are grown in labs to create large banks, and they present many advantages. Not only does the umbilical cord provide an abundance of mesenchymal stem cells, but these stem cells are also more robust and are not rejected by the patient's immune system due to the fact that it is unable to recognise these particular umbilical derived stem cells as foreign. Mesenchymal cells can be proven to be advantageous to patients with type 1 diabetes as the stem cells derived from umbilical cord reverse the autoimmune response, which can lead to the regeneration of insulin producing beta cells. Success with the use of Allogenic mesenchymal stem cells is also evident in the Graft versus Host disease (GVHD), where clinical trials were carried out and the 2-year mortality rate was decreased, which has in turn provided essential information for large scale clinical trials.

Additionally, there have been studies which have investigated the use of Mesenchymal cells derived from embryonic stem cell lines as opposed to isolates from adult tissue. In one specific study, an animal autoimmune disease model, experimental autoimmune encephalomyelitis (EAE), which reflects some of the autoimmunity characteristics present in multiple sclerosis patients, was used. In this instance, the mesenchymal stem cells were delivered to the EAE mice and they all showed signs of therapeutic properties, such as a drastic decrease

in the severity of the disease. This was able to provide evidence that the use of Mesenchymal stem cells derived from human embryonic stem cells by differentiating was also a possibility and perhaps are better option due to its evident immunosuppressive and renewal properties.

However, despite the many opportunities for autoimmune disease treatment that stem cells provide, the use of stem cells can be viewed to have many ethical issues, for example, it involves the destruction of embryos, which means there are many religious and moral objections, as people believe that life begins at conception and destruction is therefore murder. Nonetheless, umbilical cord stem cells are said to be able to overcome this issue to a large extent, but unfortunately they are only multipotent unlike embryonic stem cells which are pluripotent, so this restricts their usefulness. Additionally, apart from the ethical issues that stem cells pose, the activity of stem cells has to be strictly controlled because if division is uncontrolled, it can produce masses in the form of tumours which can lead to the development of cancer. For instance, there is a prominent risk associated with tumorigenesis after the use of mesenchymal stem cells, as they can be compared to tumour cells in as sense, due to their ability to multiply rapidly for a long period of time, high viability (ability to last successfully for a long time), and their resistance to apoptosis which is programmed cell death.

Other limitations of stem cells, specifically Mesenchymal stem cells are that extracting bone marrow is an extremely painful and invasive procedure, there can be a low yield and in some instances a limited source of tissue is available. Also, Haematopoietic cells from bone marrow has higher rates of morbidity and mortality, and with that from peripheral blood, collection may take several days which makes it a draining process. Furthermore, in general stem cell therapy and research can be deemed as expensive due to the fact that it is highly specialised, which means that its progress could be slow and it might not be as accessible to patients as the current treatments which are more cost friendly.

In conclusion, stem cell therapies provide a variety of possibilities for the development of the treatment of autoimmune diseases, and possibly even a cure. Although there still needs to be a large amount of research and clinical trials, and despite the ethical issues, limitations, and possible side effects such as tumorigenesis that come with the use of certain stem cells, they have the ability to drastically improve the quality of life of patients with autoimmune diseases who are limited to the treatments that they can receive and whose treatments can only do so much for them. Also the extensive research conducted and successful clinical trials should make stem cells a more promising candidate for treating autoimmune diseases. Therefore, the use of stem cell therapies such as haematopoietic stem cell therapy and mesenchymal stem

cell therapy should possibly be viewed as the new, life changing treatment for autoimmune diseases.

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Cover artwork: *The Hampstead Murals* by Gillian Ayres (1930 – 2018) are on display in the atrium, commissioned for the school in 1957. The trailblazing works reflect a spirit very much in evidence at South Hampstead – vibrant, rich in colour and pioneering in ambition.

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Impress Print Services Limited Reg. 2220