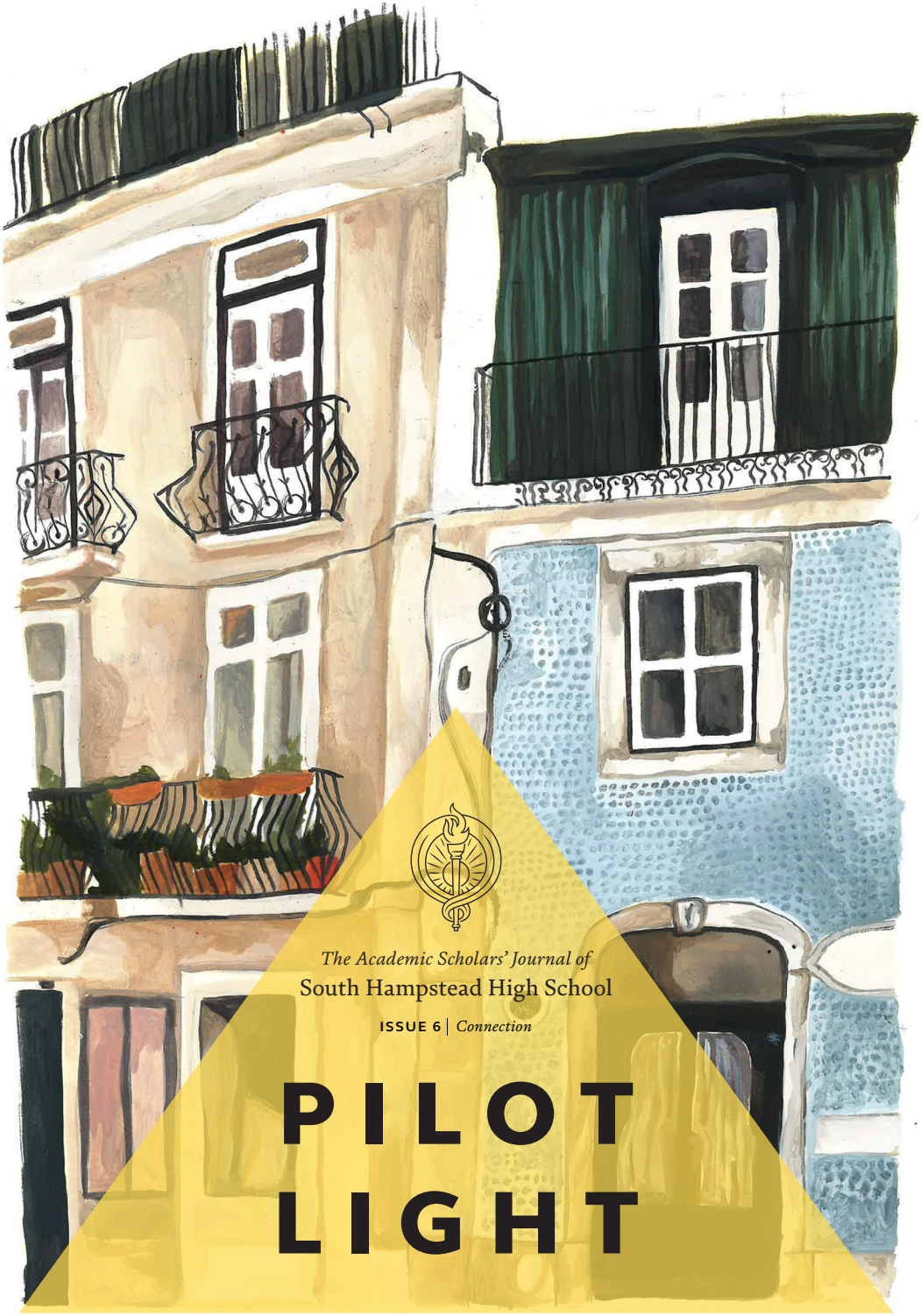


The Academic Scholars' Journal of
South Hampstead High School

ISSUE 6 | *Connection*

PILOT LIGHT

CONNECTION

This year's edition of the Pilot Light journal brings together some truly fascinating articles exploring the theme of connection, written by our Lower School Academic Scholars. Seeing the multitude of ways in which students approached the theme has been inspiring, and it reflects the wide array of ideas and perspectives that are encountered at South Hampstead. The topics span everything from Divine Connection in the Odyssey to Mycorrhizal Connections in Trees, and even the HS2 railway project! This collection is a testament to the curiosity, creativity, and intellectual spirit of South Hampstead – I hope you find it as engaging as I did!

KATIE, UPPER SIXTH

Deputy Head Girl - Academic & Scholarship

Contents

British Empire Impacts - Positive or Negative?

AIYLA, YEAR 7

Many people know what the British Empire (BE) was: that it was the largest example of imperialism in world history, and that, at its prime, it covered over 30 million square miles of land all over the world. Imperialism as powerful as this leaves a lasting legacy, yet there is much debate on whether the British Empire had an overall good or bad impact on our lives. So, the question still left to answer is, "Are there more positive or negative connections between the BE and our current lives?"

Firstly, the slave trade was used frequently during Britain's imperialism. In the 1730s, Britain was the world's biggest slave-trading nation, and over 90% of all Africans were forcefully shipped to the British Caribbean and North American colonies. Now, although the slave trade is instinctively looked down upon, there are unfortunately many things that emanated from slavery that brought some people and institutions economic benefits.

For example, many companies still in operation originally started during this slave era. Widely known banks such as HSBC, Lloyds and Barclays were all established on the back of slave-labour.

On the other hand, slavery also disrupted many connections between countries, for many nations would not honour countries so involved in the slave trade. This shows how the history of slave trading still affects nations and individuals today.

Another area of interest that impacts modern life is the railway system built in India: numerous people in England feel proud when reflecting on the fact that over 55,000km of railways were built, but the process by which they were constructed was devastating.

Indians were forced to work in terrible conditions for extensive periods of time and the job was far from safe. Fatal accidents often arose from building the rails high up and in one project, over 25,000 Indians died.

Though around 22,500 trains now run in India a day, providing work to over 1 million people, this knowledge upsets people. This makes it unclear whether the railways ended up having a positive or negative impact.

Finally, nearing the end of Britain's imperial past, colonies beginning to break free of the Empire led Queen Elizabeth II to come up with the idea of the Commonwealth.

Although Queen Elizabeth declared her lifelong service to the Commonwealth ("I declare before you all that my whole life […] shall be devoted to your service"), the Commonwealth is a sensitive topic that raises divided opinions. On one hand, there are those who believe these countries have the right to freedom and shouldn't be ruled over by others. Others, however, are not convinced that the Commonwealth is fair.

These citizens feel annoyed when British royals are treated the same way as during the Empire (e.g., when waving from the backs of cars) and that, as with the Empire, there is a British leader in charge. Also, when Prince William and Catherine visited the Caribbean, there were protests over the royal family's past, which was thought to be racist. All the evidence suggests that past British monarchs have left a wound too deep for the present British leaders to heal.

To end, all that we have left to think about is our future. As King Charles III said, the Commonwealth's growth "demonstrates clearly that whilst we may not all have a shared history, we have common ambitions for a better future". His words show that although the BE was not fair in its execution, it has brought all of the Commonwealth countries together, and we all share the same goal of building a better and more equal future for everyone. Therefore, the effects that the British Empire has on the present day are positive overall.

Bibliography

- *Duck, Cyber. "Message from His Majesty the King for the Commonwealth Day Service of Celebration." Commonwealth. Cyber Duck, March 11, 2024. https://thecommonwealth.org/news/message-his-majesty-king-commonwealth-day-service-celebration.*
- *Heffer, Simon. "Queen Elizabeth II: For Country and Commonwealth." www.lowyinstitute.org, October 21, 2021. https://www.lowyinstitute.org/the-interpreter/queen-elizabeth-ii-country-commonwealth.*
- *Sanghera, Sathnam. Stolen History. London: Random House, 2023.*
- *UK Parliament. "The Transatlantic Slave Trade - Heritage Collections UK Parliament." Parliament.uk, 2021. https://heritagecollections.parliament.uk/stories/the-transatlantic-slave-trade/.*

SHARE THE SAME GOAL

The Smarter Side of Phones for Women

ALICE, YEAR 8

When you consider the mobile phone as it is today, it can be easy to think only of the more negative impacts: the harm to your wellbeing via stress, poor sleep, and a lowered attention span. I would like to focus here on some specific factors affecting women and girls, with a particular emphasis on the more positive side. My aim is not to dismiss the negative effects but simply put them more into context, alongside the many benefits the telephone has brought to women, historically as well as today.

Picture the scene: you're a housewife and stay-at-home mother in 1950s suburban America. You live in a detached house, with a good standard of living, but lacking in opportunities for companionship. You often feel bored and isolated, but then the telephone becomes more available to everyone and more commercial, too. It's a brand new invention, designed to allow you to connect to people all across America. This is going to change your whole life!

The telephone was first patented by Alexander Graham Bell in 1876. In time, it would provide all sorts of people with the freedom to speak to one another quickly and easily. Women in particular loved this new invention. A survey conducted on suburban New Yorkers in the years before World War II, when telephones had only recently begun appearing in households, showed that women spent four times longer than men talking on the phone. The telephone helped women to converse with people who didn't necessarily live nearby. An AT&T advert from the time boasted of how the phone could bring a 'means of overcoming distance [with] immediate, person-to-person contacts'. Women embraced the opportunity to stay in touch with family and friends, and 'save a walk where a call might do'.

There can be no doubt that the telephone and, later on, the mobile phone have brought about huge social changes, experienced by women all over the world, and in different situations. In developing nations, women have, often for the first time, been able to open private bank accounts and start businesses using financial apps. A 2016 World Economic Forum report found women in Bangladesh enjoyed having their wages paid directly to a personal online account instead of being given cash, making it easier to keep the money they earn instead of having to hand it over, e.g. to another family member.

As Muhammad Yunus, a 2003 Nobel Peace Prize winner, said, 'The quickest way to get out of poverty right now is to have one mobile telephone.' This is also helped by the independence mobile phones bring. It is now possible to interact with distant organisations, such as public offices or schools in other towns and even countries, without having to travel. Maternal and child mortality rates are improved by better access to reproductive and antenatal information, as well as improved contact with professionals.

To conclude, while the phone has its disadvantages, it has also brought many benefits to the world - and women in particular - from the very start of its invention, and as it has slowly evolved into the smartphone. It has allowed for better and easier communication with women almost everywhere, allowing them to connect with friends, family and organisations without having to travel long distances or take up lots of time. Smartphones, in particular, have helped women in developing nations to be more financially independent by having their own bank accounts and accessing education remotely. Overall, the phone has brought women increased freedom and an easier connection to the rest of the world.

Bibliography

- *Claesdotter-Knutsson Emma, Frida André, Maria Fridh, Carl Delfin, Anders Hakansson, Martin Lindström, "Gender-Based Differences and Associated Factors Surrounding Excessive Smartphone Use Among Adolescents: Cross-sectional Study," National Library of Medicine, November 22 2021. https://pmc.ncbi.nlm.nih.gov/articles/PMC8663478/.*
- *Fisher, Claude S., America Calling: A Social History of the Telephone to 1940. California: University of California Press, 1994.*
- *Haidt, Jonathan, The Anxious Generation. New York: Allen Lane, 2024.*
- *Klapper, Leora, "How mobile phones are changing women's lives", World Economic Forum, April 4th 2016. https://www.weforum.org/stories/2016/04/how-mobile-phones-are-changing-womens-lives/.*
- *Rotondi, Valentina, Ridhi Kashyap, Luca Maria Pesando, Simone Spinelli, Francesco C. Billari, "Leveraging mobile phones to attain sustainable development" Proceedings of the National Academy of Sciences of the United States of America, June 1 2020. https://www.pnas.org/doi/10.1073/pnas.1909326117.*

SOCIAL CHANGES

The Connection Between Smell and Memory

AMELIE, YEAR 9

Have you ever smelt something familiar and have it bring back a flood of memories? There is more of a connection between smell and memory than there is between memory and any other sense. We are on the cusp of finding out why this is and how we can use this discovery. This essay will explore the science behind the connection as well as new research being done around it.

Smell is extremely connected to our memories. For scent to travel to the brain, molecules waft into the nose and bind to odour receptors. Brain cells called olfactory sensory neurons turn the different smells into electrical signals which then fire along axons to different parts of the brain. These signals briefly stop at the olfactory bulb, which identifies smells, before travelling to key sections of the brain: the amygdala, which helps make emotions, and the hippocampus, which stores and organises memories. If the smell comes at the same time as something important, the hippocampus and amygdala can decide to remember it indefinitely. This means that, even years later, a smell can bring back the memory and emotions of that moment. Our other senses have to travel through the brain's thalamus before they reach the hippocampus, while the olfactory (odour) system is right next to the hippocampus and amygdala, so more of those signals reach them. This could be why studies have found that, compared to other senses, memories brought back by smells are generally more emotional and more likely to be from a long time ago.

A lot of research is currently happening to find ways to use our sense of smell in medicine. One study found that each receptor in the nose of a mammal is linked to a specific gene which scientists could manipulate to change how the brain sees smells and could even make the brain form false odour memories. This could help researchers to study how the brain responds to its environment, and how these responses could be reversed to help recover from trauma. Some researchers also think that familiarsmells could help bring back memories to people with memory loss conditions. Although this has not been proven to work, it's already being used in some care facilities by introducing familiar smells like hot dogs and forests. Research also suggests that loss of smell can be one of the first symptoms of Alzheimer's disease and this could be due to the brain's connection to our sense of smell.

"Research also suggests that loss of smell can be one of the first symptoms of Alzheimer's disease and this could be due to the brain's connection to our sense of smell.

Most people associate certain smells with certain colours. A study was done in which blindfolded people were given a piece of paper dipped in fragrance to smell. They were then asked what colour the paper was. The study found that citrus scents were associated with orange, grassy scents with green and brown, etc., for nearly everyone. Some companies try to use the link between smell and memories as part of their branding. All Nike products use its signature scent - 'the smell of a rubber basketball sneaker as it scrapes across the court and a soccer cleat in the grass and dirt'. These smells aim to create 'immediate and memorable connections between brands and consumers'. 'Signature smells' are becoming very popular.

So next time you put on your favourite Nikes and smell that familiar scent, you'll know what that is and why it reminds you of all those memories you made wearing them.

Perhaps with technology evolving, we may find new solutions, but today, it remains uncertain whether there will be further elements added to the periodic table.

Bibliography

- *Clinic, Cleveland. 2025. "Scent and Sensibility: The Link between Smell and Memory." Cleveland Clinic. January 16, 2025. https://health.clevelandclinic.org/smells-and-memory.*
- *Mouly, Anne-Marie, and Regina Sullivan. 2010. "Memory and Plasticity in the Olfactory System: From Infancy to Adulthood." Edited by Anna Menini. PubMed. Boca Raton (FL): CRC Press/Taylor & Francis. 2010. https://www.ncbi.nlm.nih.gov/books/NBK55967/.*
- *Walsh, Colleen. 2020. "What the Nose Knows." Harvard Gazette. February 27, 2020. https://news.harvard.edu/gazette/story/2020/02/how-scent-emotion-and-memory-are-intertwined-and-exploited/.*

The Connections Between a Growing Population and Cultural Globalisation

AMELIE, YEAR 8

Culture is a social construct connecting individuals to broader senses of heritage and community. Without it, society would be bland, lacking diversity across different nations. Cultural globalisation is the interconnectedness of cultural elements worldwide. This therefore leads to the fusion of mainly Eastern and Western practices and the creation of new ones altogether. Although cultures have historically evolved slowly, current technology and media now provide exposure to other cultures at a rate unimaginable in the past.

A growing population leads to a more widespread community in which individuals can be influenced. These influences can spread and become indented into various cultures faster now due to the connectivity that growing technology gives us. The International Telecommunication Union reports that, in 2023, over 5.3 billion people (about 67% of the world's population) were online, and this statistic is likely to have grown in the past two years, meaning that cultures can change so swiftly today because most of the population can learn from each other with a mere swipe or click.

Geography and history are driving factors for cultural development. Climate affects crops and animals, directly affecting food and clothes - essential parts of our lives. Whether a country is landlocked or coastal affects its trade. History forms customs and languages; when a country has been colonised, much of its language, architecture, food, clothing, and formalities become similar to the imperial power.

Nowadays, these factors still hold relevance. If you were to search up the national dish of England, you might expect to find fish and chips, or bangers and mash. On the other hand, Chicken Tikka Masala, an Indian curry and proclaimed 'true British national dish', might be an unexpected result. This just proves how significant the exposure to different cultures can be in forming others.

Currently, tourism and migration also play a big role in cultural globalisation, as they are the key opportunities for exposure to different customs. The UN World Tourism Organisation reported that in 2019, international tourist arrivals reached 1.46 billion, having exponentially increased compared to only 25 million in 1950. This demonstrates how a larger population coincides with higher tourism rates, producing a similar outcome to social media. As people gain wider access to different countries, there is more global change in culture. The development of a country also factors into this, as more developed countries generally have more tourism.

Another aspect absolutely paramount in shaping culture is education. In Europe, 67% of the population is bilingual, as many people learn a different language and are from mixed backgrounds. The most studied language in the world is English, with 1.5 billion foreign learners. People often learn English to better understand popular media, gain wider access to global job markets, and participate in international business or entertainment industries; English has become globally standardised. As more people know it, more people use the idioms, customs and traditions that come with the language, leading to more people wanting to learn the language. This cycle occurs with many different languages, such as many wanting to learn Korean to listen to K-Pop, others wanting to learn Italian to learn about its food, and some learning Mandarin due to its usefulness in business.

To conclude, due to the rapid spread of certain trends or idioms from social media and a growing population, it would be remiss to expect cultures not to adapt and change quicker than even 20 years ago. Cultures are now not just influenced by the people of that nation but the entire world. Every culture is destined to change.

Bibliography

- *International Telecommunication Union. "Facts and Figures 2023 - Internet Use." www.itu.int, 2023. https://www.itu.int/itu-d/reports/statistics/2023/10/10/ff23-internet-use/.*
- *Newsdle. "The Most Studied Foreign Languages in the US, and in the World," July 21, 2022. https://www.newsdle.com/blog/most-studied-foreign-languages.*
- *Unwto.org. "International Tourist Arrivals Reach 1.4 Billion Two Years ahead of Forecasts | UN Tourism," 2019. https://www.unwto.org/global/press-release/2019-01-21/international-tourist-arrivals-reach-14-billion-two-years-ahead-forecasts#.*

Connections in Architecture

ANASTASIA, YEAR 7

There are connections nearly everywhere in our world, from language to culture to architecture. Architecture is always evolving, but it never leaves the past behind. New buildings often take inspiration from older ones, whether through design, materials, or construction methods. However, newly discovered technology and the focus on being eco-friendly add a new look to modern buildings. From historical landmarks to sustainable structures, architecture is a blend of new and old designs. This article explores these connections and how they shape the buildings we experience today.

One connection between old and new architecture is the way historical styles influence modern design. Many modern buildings incorporate elements from past architectural designs, such as Gothic arches, classical columns, or intricate ornamentation. This can be seen in government buildings, museums, and even homes that fuse different classical styles with modern materials and construction techniques. Many architects including Zaha Hadid, Rem Koolhaas, Santiago Calatrava, and Frank Gehry deliberately mix traditional and contemporary styles to create priceless pieces of architecture connecting the building with its surroundings.

As well as borrowing design elements from past buildings, architects also use traditional materials alongside modern and sustainable ones. For centuries, materials such as brick, wood, and stone have been widely used in construction, and they continue to be as popular today. However, modern designs also use materials such as steel, glass and reinforced concrete in their designs, helping to make the buildings to be more sustainable and complex. Architects use a mix of both in their designs to make buildings and homes strong yet sustainable.

Another important connection between old and new architecture is the preservation and repurposing of historical buildings. Instead of demolishing old structures, many architects instead use them to their advantage and repurpose them. Out-of-use factories have been transformed into apartments, crumbling churches into libraries, and abandoned warehouses into office spaces, which is a more eco-friendly solution than demolishing the buildings. These renovations not only preserve the building and its history but also reduce the environmental impact of new construction. Older structures can also inform us about the culture, history, and values of the past; new ones, much like a force of nature, have the ability to transform a community. Many refer to this as the Bilbao effect, a term coined after a Frank-Gehry-designed Guggenheim museum helped turn around the Spanish city's economy. The combination of old and new designs creates a unique and innovative building.

The connection between old and new architecture is very clear in design influences, material choices, and the preservation of historic buildings. Instead of forgetting about past architectural buildings, modern architecture blends old and new styles and creates sustainable and contemporary designs in doing so.

Bibliography

- *Mafi, Nicki and Bourgade, Noelann. '19 Beautiful Examples of Historic and Modern Architecture Coming Together', Architectural Digest, 9 December, 2022.*
- *https://www.architecturaldigest.com/gallery/beautiful-examples-historic-modern-architecture-come-together.*

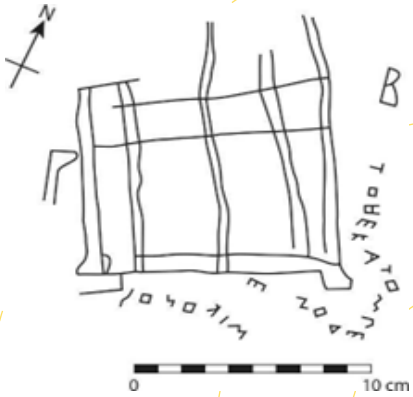
How Ancient Greek and Roman Graffiti Can Create Connections

ANNA, YEAR 10

Graffiti is a form of visual communication dating back 35,000 years which involves ‘the unauthorized marking of public space by an individual or group’. However, the first written graffiti, and perhaps the most significant, can be found in Ancient Greek and Roman archaeological sites, from a time when it was not considered vandalism in the same way it is today. Since its invention, graffiti has held importance, not only as a source for modern historians but as a method of connecting to others.

Graffiti can be a valuable source when exploring everyday experiences in ancient civilisations. Firstly, it allowed ordinary people to document their daily lives at a time when the most recorded accounts of everyday life were written by upper class historians who, in Ancient Rome, were often propagandists, and relied upon the emperor’s consent to publish their accounts. Furthermore, literacy was much rarer, so for those who could not read or write, drawn graffiti allowed them to document their experiences. Over 11,000 samples of graffiti have been discovered in Pompeii alone. It was usually scratched into a surface, and could range from people leaving their names (which forms around 37% of all of Pompeii's graffiti), to children’s drawings, messages, rude drawings, inventories, prayers, and poetry. Due to the range of subjects this graffiti has covered, it has given historians a wider idea of what life in Pompeii was like.

Moreover, graffiti was used as a method of connection and communication, giving us further insight into how people interacted. It was used to send messages, gossip, announce events, leave reviews of establishments, advocate for their preferred candidate for aedile (an elected office), and even exchange insults. Therefore, these inscriptions further consolidate and expand our knowledge about daily social interaction and what was deemed acceptable behaviour.



Ancient graffiti can also contribute to key archaeological discoveries and enhance our connection to the past. In June 2024, archaeologists in Athens confirmed that temples had existed on the Acropolis before the Parthenon when they discovered 6th century BC graffiti by a shepherd named Mikon carved into bedrock 12 miles outside Athens. Over 2000 drawings by shepherds and goat herds were found in the area, and Mikon's sketch depicted a large temple from the Archaic period, which he captioned, ‘The Hekatompedon of Mikon’ (‘τὸ ηεκατόμπεδον Μίκōνος’). The Hekatompedon (referring to a hundred-foot long temple) is estimated to be from the Archaic period, and was therefore built before the Parthenon, which was from the classical period, beginning after the second Persian invasion of Greece in 480 BC (likely when the Hekatompedon was destroyed). Using the alphabet with which Mikon signed his sketch, the graffiti was dated, and it was concluded that it was at least 50 years older than the Parthenon, which began construction in 450 BC. Graffiti can give us a greater understanding of sites with a complex history because it is long-lasting and capable of surviving the fall of a civilisation.

Although this graffiti was made thousands of years ago, it can still impact us today. Graffiti has always been a way of expressing identities and beliefs to the rest of the world, and in 2,000 years, our priorities have not changed as drastically as we might assume. In fact, the way in which it was used to connect to others could, in some ways, be considered similar to modern social media. Graffiti has been connecting people throughout its existence, and is evidence that humans have always been human. Perhaps if we can relate to people living thousands of years ago, today we can strive to find our similarities, rather than focusing on our differences.

Bibliography

- *Decker, Scott H , and Curry, Glen D. “Graffiti”. Encyclopedia Britannica. https://www.britannica.com/art/graffiti-art. Accessed February 23, 2025.*
- *Langdon, Merle K, and van Rookhuijzen, Jan Z. “Mikon’s Hekatompedon: An Architectural Graffito from Attica”. American Journal of Archaeology, Vol. 128, No. 3 (2024), 433-42. https://www.journals.uchicago.edu/doi/full/10.1086/729771*
- *Lohmann, Polly. "What the Graffiti of Ancient Pompeii Teach Us About Our Modern Selves", De Gruyter Conversations, January 18, 2018. https://blog.degruyter.com/graffiti-ancient-pompeii-teach-us-modern-selves/*
- *Ralph, Jordan. “Graffiti Archaeology”, Encyclopedia of Global Archaeology (2014), 3102–3107. https://link.springer.com/referenceworkentry/10.1007/978-1-4419-0465-2_551#chapter-info*
- *Sankaran, Vishwam. “Ancient Greek Shepherd’s Graffiti Helps Crack Long-Standing Mystery of Lost Temple in Athens”, The Independent, June 20, 2024, https://www.independent.co.uk/news/science/archaeology/ancient-greece-temple-parthenon-history-b2565829.html*
- *Wikipedia contributors. "Graffiti," Wikipedia, The Free Encyclopedia, accessed February 19, 2025, https://en.wikipedia.org/wiki/Graffiti#*
- *Wikipedia contributors. "Greco-Persian Wars," Wikipedia, The Free Encyclopedia, accessed February 19 2025, https://en.wikipedia.org/wiki/Greco-Persian_Wars#*
- *Wikipedia contributors. "Roman graffiti," Wikipedia, The Free Encyclopedia, accessed February 19, 2025, https://en.wikipedia.org/wiki/Roman_graffiti#*
- *Image : American Journal of Archaeology*

FIND OUR SIMILARITIES

The Puzzle of Life: Unveiling Connections in Only Connect

CHARLOTTE, YEAR 9

Only Connect is a popular game show on BBC Two in which players find connections between seemingly unrelated clues.

Each round in the show has a different aim and they are as follows: Round 1 involves figuring out the connection between four clues, with more points being earned the fewer clues are revealed. Round 2 requires figuring out what the fourth clue would be in a sequence of clue, again with more points being earned the fewer clues are revealed. In Round 3, contestants face a wall of 16 words, similar to the New York Times' Connections game. Once players have solved the wall, they get bonus points if they are able to identify the connection. Round 4 is a buzz-in round where four clues in a category are missing their vowels and contestants must buzz in to get the right answer. Whilst each of the rounds have different aims, the premise of them is the same and each one involves similar skills and general knowledge. The entire structure of the game revolves around the theme of connections and thinking outside the box.

In Only Connect, there are lots of types of connections between clues that involve different types of thinking. The connections vary from patterns to do with the physical construction of letters to the meaning of the word in question. For example, in the connections round of the game, the four clues could be 'Daniel, Emma, Rupert, Maggie'. These would all be linked, as they are the first names of actors in Harry Potter. However, another clue may be something more like 'shore, paroled, bolster, straying'. These are all anagrams of animals (horse, leopard, lobster and stingray, respectively). By having a range of types of connections, it allows players to think about every aspect of the clue and consider its elements in more depth.

The game show is not done individually; however, it is vital that the players work as a team to figure out the answer and build on each other's ideas. Not only this but some of the clues are very niche and require knowledge from lots of areas, so having people on a team that have different areas of subject specialism is better for the team. However, it is not only in the game that it is useful to get a wider range of perspectives on problems. In real-life situations, it is useful to have multiple people look at a problem, as they may see patterns where others are unable to and may be able to figure out connections. Just like the contestants on Only Connect, people in the real world can use teamwork and combine their knowledge to join the dots and make sense of a situation.

In conclusion, the skills from Only Connect are ones that can be used in many contexts, as teamwork, lateral thinking and spotting patterns are often crucial for finding solutions to the most pressing issues.

LATERALLY THINK

Connections and Cave People

COCO, YEAR 10

When the first humans appeared in eastern Africa around 300,000 years ago, they were trivial beings. They hunted, they ate the fruit off trees and never left the wetland that was their home. Nobody had heard of them and nobody cared about them very much. So how did they transform into the people that we are today? How did we make the evolutionary journey from stone tools to smartphones?

The social brain hypothesis (Dunbar, 1997) posits that our large brains are a byproduct of living in large social structures, where we need to keep track of the information and profiles of so many others in the group. We developed a memory and cognition that allowed us, in the earliest Paleolithic hunter-gatherer communities, to keep up with around 150 people with whom we lived and deduce when their behaviour was deceitful or suspect. The growth of cave people's communities beyond the sizes of other primates' led to new levels of advancement and productivity.

It follows that human connectivity was the key to our success: the more connections we made between people, the more neuron connections we evolved to have in the brain and the better we thrived.

So invested was the brain in our relationships that the social part of the brain, the 'social brain', became the default in our neural seesaw. The neural seesaw is when the social and non-social functions of the brain, associated with different regions of the brain, cannot both be switched on at once; but after performing a non-social task, the brain automatically flips back to the social side. Here, the brain made an evolutionary bet that social connections are what we should think about during our spare moments, highlighting their importance.

Finally, in the last leg of the evolutionary race, the body adapted to connect with people through further physical adaptations. In our inventory, we already had mirror neurons. We had pheromones, which encouraged attraction between partners, taking the edge off some connections. We had dance, which releases endorphins and has been shown to boost inter-brain synchronicity. In addition, from 10 to 16 million years ago, we also developed laughter. While plenty of animals laugh, humans are the only ones who can join in laughing from a physical distance, not only when, like gorillas and bonobos, they are engaged in 'play' with each other (which must involve physical contact, such as tickling), but spontaneously and contagiously during all types of moments.

Yet moving into the present day, we have yet to add to our arsenal of social glues something aimed at the rising online connections within our communities.

We are not meeting face-to-face with others as often, though biology dictates that that is how we should be making our connections: through physical interactions such as moving together (dancing), physical contact, or just being in the same space, which is proven to be good for a person's mental health. Connections through a screen can feel shallow. They benefit a person's well-being less. So, to conclude, why don't we get out of the house more and feel the connection in line with how evolution has made us? As we evolve in the digital age, we must not neglect the social connections that helped us thrive.

Bibliography

- *Barrett, Louise, S. Peter Henzi, and Robert A. Barton. "Experts in Action: Why We Need an Embodied Social Brain Hypothesis." Philosophical Transactions of the Royal Society B: Biological Sciences 377, vol. 1844 (2021). https://doi.org/10.1098/rstb.2020.0533.*
- *Harari, Yuval Noah. Sapiens: A Brief History of Humankind. Reprint, Random House UK, 2011.*
- *Cook, Gareth. "Why We Are Wired to Connect." Scientific American, October 22, 2013. https://www.scientificamerican.com/article/why-we-are-wired-to-connect/.*
- *Scott, Sophie K., Ceci Qing Cai, and Addison Billing. "Robert Provine: The Critical Human Importance of Laughter, Connections and Contagion." Philosophical Transactions of the Royal Society B: Biological Sciences 377, vol. 1863 (2022). https://doi.org/10.1098/rstb.2021.0178.*
- *Maslin, Mark. "Why Humans Are So Smart—and So Stressed Out." SAPIENS, September 21, 2017. https://www.sapiens.org/biology/human-brain-evolution-social/.*
- *Winship, Lyndsey. "'It's like Collective Daydreaming': The Giant Study Showing How Dancing Affects Our Brains." The Guardian. The Guardian, November 2024. https://www.theguardian.com/stage/2024/nov/01/dance-brain-neurolive-detective-work-vangeline-siobhan-davies.*

The Paradox of "Connected Isolation" in Big Cities

DASHA, YEAR 10

Currently, 55% of the world's population lives in cities, a figure expected to rise to 70% by 2050. However, nearly 46% of urban residents - over two billion people - report feeling lonely and isolated despite being surrounded by millions.

Loneliness is becoming an epidemic in urban places. Factors such as exclusive communities, population mobility, and the rise in single-occupancy households only exacerbate this problem. These trends not only threaten individual wellbeing but also erode the social fabric essential for cities. So, why is loneliness on the rise? While social, economic, and technological factors contribute, rapid urbanisation plays a critical role.

Cities like Tokyo, New York, and London are hubs of human activity, yet urban dwellers frequently report feelings of profound loneliness - a phenomenon termed "connected isolation." The recent COVID-19 pandemic didn't create urban loneliness, but it accelerated a problem that had been quietly growing for decades. Lockdowns and social distancing measures forced millions into isolation, removing the few in-person interactions that city life still provided. Even as restrictions were lifted, many of these changes remained, such as remote work replacing office culture, interactions moving online, and public spaces emptying out. Due to this, loneliness is now expected to reach epidemic levels by 2030.

Defined as the emotional pain of lacking strong connections, loneliness emerges when there is a gap between desired and actual social relationships. This feeling negatively affects mental and physical health, contributing to conditions such as depression, addiction, and even heart disease. Urban design doesn't aid this feeling, often prioritising efficiency over human connection. Skyscrapers and high-rise apartments house thousands yet rarely foster interaction among residents. Private elevators and isolated balconies replace communal spaces like courtyards and staircases, reducing the opportunities for casual encounters The lack of shared public spaces further aggravates the problem. Parks, squares, and community centres - places vital for social interaction - are often considered insignificant in city planning. Studies show that cities with fewer communal areas report higher loneliness levels. For instance, Moscow and Singapore, boasting 54% and 47% of public greenery respectively, report lower loneliness and higher happiness levels than cities like Dubai, which has only 2% green space.

Addressing this growing challenge requires rethinking cities to prioritise social well-being. One promising solution lies in the concept of "third places" - informal venues that facilitate social interactions in neutral settings. Sociologist Ray Oldenburg describes these as distinct from the "first" place of home and the "second" place of work or school. Examples include community gardens, libraries, farmers' markets or even your local Gail's. Big cities are now implementing more of these, which has been improving social connectivity between citizens; the Southbank Centre in London, Dilli Haat In New Delhi and Ibirapuera Park in São Paulo are just a few examples of cultural public "third" places that provide open-air concerts, markets, exhibitions and many other attractions.

As humans, we need to socialise, as it is something we thrive on. Psychologist Robin Dunbar poses the 'endorphin-mediated bonding hypothesis', where interactions activate the brain's opioid system, promoting feelings of happiness and belonging. The release of endorphins when socialising is similar to the physical response after exercise, reducing stress while boosting happiness.

Loneliness isn't just an unfortunate side effect of city life - it's a challenge we can actually do something about. While better urban planning can foster connection, no policy or design can replace the simple act of showing up. Perhaps the solution is deceptively simple: step outside, engage with a neighbour, be present in a third space. In a world where isolation has become the norm, choose connection.

Bibliography

- *Jain, K.K. "Synthetic Biology and Personalized Medicine." College, Emerson, and The New School. "The Global Cities with the Most — and the Least — Public Green Space." Treehugger, July 23, 2019. https://www.treehugger.com/global-cities-most-and-least-public-green-space-4868715.*
- *Dolley, Joanne, and Tony Matthews. "Many People Feel Lonely in the City, but Perhaps 'Third Places' Can Help with That." The Conversation, March 22, 2018. https://theconversation.com/many-people-feel-lonely-in-the-city-but-perhaps-third-places-can-help-with-that-92847.*
- *Manninen, Sandra, Lauri Tuominen, Robin I. Dunbar, Tomi Karjalainen, Jussi Hirvonen, Eveliina Arponen, Riitta Hari, Iiro P. Jääskeläinen, Mikko Sams, and Lauri Nummenmaa. "Social Laughter Triggers Endogenous Opioid Release in Humans." The Journal of Neuroscience 37, no. 25 (May 23, 2017): 6125–31. https://doi.org/10.1523/jneurosci.0688-16.2017.*
- *Mechelli, Andrea. "Loneliness Can Be Worse in Cities, Green Spaces Could Help." World Economic Forum, January 4, 2022. https://www.weforum.org/stories/2022/01/lonely-study-green-space-city/.*
- *Psychology Today. "Do You Get Exhausted in Crowds?," 2017. https://www.psychologytoday.com/us/blog/your-personal-renaissance/201708/do-you-get-exhausted-in-crowds.*
- *Steuteville, Robert. "Fighting Loneliness through Community Design." CNU, January 4, 2024. https://www.cnu.org/publicsquare/2024/01/04/fighting-loneliness-through-community-design.*
- *United Nations. "SDG Indicators." unstats.un.org, 2024. https://unstats.un.org/sdgs/report/2023/Goal-11/.*
- *Verduyn, Philippe, Julia Schulte-Strathaus, Ethan Kross, and Ute Hülsheger. "When Do Smartphones Displace Face-To-Face Interactions and What to Do About It?" Computers in Human Behavior 114 (September 2020): 106550. https://doi.org/10.1016/j.chb.2020.106550.*

Covid-19 and Its Connection to Isolation

DIYA, YEAR 8

The outbreak of Covid was a hard time for many people. It started in about December 2019, and some variants of it still exist today. After the very worst of Covid, a lot of things had changed: face masks became very common; more people started working from home; and the world felt more isolated and empty than ever. This article will cover what Covid actually is, the speculation about where it came from, and its implications for the connections between many people.

Covid is caused by a virus called SARS-CoV-2. This is spread by people breathing near the nose or mouth of the infected person, and has a range of symptoms. Symptoms can include: coughing, a high temperature, headaches and a sore-throat, like a regular cold. So what makes Covid different? First of all, when this had just started and cases of Covid were slowly appearing, it was widely misunderstood. People thought that it was spread through surfaces, not the air. This meant that it spread to most parts of the world from and to unknowing people. Secondly, after people realised that it was transmitted through the air, they started wearing face masks. But most of these masks were not woven finely or there were small gaps at the sides, meaning that contaminated particles could still penetrate through, causing them to get sick anyway. This also meant that the virus was easily able to spread and duplicate, as well as infect so many people.

No one truly knows where Covid originated. One suggestion is the lab-leak theory. This theory proposes that, accidentally or otherwise, it was leaked from a lab in Wuhan (Central China), where the first cases of the Covid started appearing. At this time, the lab was studying coronavirus in bats. The institute is close to the Huanan wet market, where the first cluster of infections emerged. However, China had a different theory. They thought that the coronavirus may have entered Wuhan in shipments of frozen meat from elsewhere in South-East Asia. There is a final theory, however. This is what scientists call the 'natural origin' theory. This argues that the disease was spread through animals without any labs or human interference. This theory is what the World Health Organisation thought most probable to have occurred.

Finally, what have been the implications? Many people in the Covid pandemic felt very lonely, not being able to see their family, and being cooped up inside during lockdown, with no one to talk to in person. Studies show that more people developed mental health conditions during the two years of ongoing lockdowns, fear and suspicion than other years in the twenty-first century. Cases of possible or probable mental health difficulties increased 12.8% in the pandemic group versus 4.5% in the pre-pandemic group. Girls and those who were initially at low risk of mental health difficulties experienced greater deteriorations during the pandemic. As a result of this, after the final lockdown had been lifted and the worst had reached its end, everything felt strange and unfamiliar, and as if people did not know how to act around each other when they were actually seeing them in the flesh. However, not all cases were like this. Some people felt as though Covid was a long dream, and they were waking back up to reality. Looking back at what happened five years ago, it is hard to believe that relatively recently we all were not with each other in person, but rather learning or working from home. To be isolated from each other is an experience we had that people born in the years to come will not have, and I think that this reality makes the implications of Covid even scarier.

In conclusion, Covid-19 was a bad time for us all: we might have lost many loved ones; we might have been isolated from our families; we might have gotten sick. But one thing is for sure - the connections it impacted will feel the effects for a long time.

Bibliography

- *"COVID-19." TravelHealthPro. Accessed February 2, 2025. www.travelhealthpro.org.uk/disease/221/covid-19.*
- *Worldometer. "Coronavirus Death Toll." Last updated April 13, 2024, 01:00 GMT. Accessed February 2, 2025. www.worldometers.info/coronavirus/coronavirus-death-toll/.*
- *Emerging Pathogens Institute, University of Florida. "COVID-19 Myths: Many Were Busted, but a Dangerous One Still Prevails." University of Florida, May 28, 2024. Accessed February 2, 2025. epi.ufl.edu/2024/05/28/covid-19-myths-many-were-busted-but-a-dangerous-one-still-prevails/.*
- *Oxford University Press. "Young People's Mental Health Deteriorated at Greater Rate During the Pandemic." University of Oxford, September 21, 2023. https://www.ox.ac.uk/news/2023-09-21-young-people-s-mental-health-deteriorated-greater-rate-during-pandemic*

The Technology Transforming How Humans Connect with Prosthetics

EVIE, YEAR 10

From Ancient Egyptian linen toes to Middle Age peg-legs, prosthetics have transformed the lives of disabled people for millennia. Until recently, their evolution has been measured by innovations in materials, such as rubber (allowing natural-looking prosthetics), plastic (allowing lighter prosthetics) and carbon fibre (allowing stronger prosthetics). But the latest prosthetic innovation involves the integration of computers and the wiring of prosthetics directly into the nervous system – allowing unprecedented connectivity with the user.

Over the past 20 years, highly specialised prosthetics have been developed, including high-performance responsive legs for navigating varying terrains, and motorised prosthetic hands. Meanwhile, the emerging field of "bionics" is revolutionising the user-prosthetic connection.

The LUKE (Life Under Kinetic Evolution) arm – a reference to Luke Skywalker and his futuristic bionic – is a dexterous arm and hand. Wireless signals from sensors worn on the feet allow the user to control multiple joints simultaneously and apply varying grip forces.

Following extensive testing with military veteran amputees, the LUKE arm was approved by the US FDA in May 2014 and is now manufactured on a commercial scale by Mobius Bionics. In June 2017, two veterans became the first to receive new generation LUKE arms, and eight months later, double amputee Ron Currier became the first person fitted with two of the devices.

In a 2014 study involving 37 upper limb amputees, at least 80% indicated that they wanted to receive a LUKE arm after being trained on the device. Additionally, over 90% of users said they could perform activities impossible with their existing prosthetic device.

The LUKE arm was a milestone in the field of prosthetics and leads the prosthetic arm industry, but even more advanced products are under development.

Hugh Herr, a biophysicist, engineer, and professor at MIT Media Lab, is a key figure in the field of bionics. At 17, Herr lost both lower legs in a mountaineering accident, inspiring his lifelong dedication to improving prosthetics. His team at MIT designed the BiOM ankle (the first commercialised robotic ankle-foot), which mimics the action of a human ankle by providing propulsion and reducing the effort needed to walk. Herr believes disability is not the result of the individual's condition but of poorly designed tools and environments; he advocates for technology to eliminate disabilities completely. By focusing on prostheses that feel and function like an extension of the body, Herr coined the term "bionics".

Modern artificial limbs contain sensors that detect electrical signals from muscles or the brain, using algorithms to decode these signals into commands for prosthetic movement. Emerging prototypes enhance the user experience further: for example, by allowing users to 'feel' through prosthetics that integrate electrodes into the nervous system within relevant muscles.

When the brain sends and receives signals this connection creates the illusion that the relevant interaction occurred on the non-existent limb, producing an artificially stimulated sense of touch. Other areas of future development include: operating prosthetics directly from the brain; full integration with the nervous system; hybrid models utilising AI; and regenerative medicine allowing prosthetics to grow from biological tissue.

Artificial limbs that are almost identical to biological ones in function and appearance contribute to societal inclusion, reduce stigma, and promote mental reconnection for individuals with disabilities. However, with the cost of advanced prosthetics exceeding £50,000, many cannot afford the latest technology. This creates inequity - cheaper silicone prosthetics serve well to mask disability aesthetically but lack function. Ultimately, how humans interact with these devices on a global scale will depend on accessibility to innovative technologies. But if advances in connectivity continue, and with adequate support from governments, Herr's vision of a world without disabilities may yet be realised.

Bibliography

- *University of Manchester (2012). Egyptian toes likely to be the world's oldest*
- *prosthetics. [online] Egyptian toes likely to be the world's oldest prosthetics.*
- *Available at: https://www.manchester.ac.uk/about/news/egyptian-toes-likely-to-be-the-worlds-oldest-prosthetics/*
- *Hernigou, P. (2014). Crutch art painting in the Middle Ages as orthopaedic heritage*
- *(part II: the peg leg, the bent-knee peg and the beggar). International Orthopaedics,*
- *[online] 38(7), pp.1535–1542. doi:https://doi.org/10.1007/s00264-014-2278-1*
- *Physical Medicine and Rehabilitation (2015). Timeline: Prosthetic Limbs Through the*
- *Years. [online] UPMC HealthBeat. Available at: https://share.upmc.com/2015/03/timeline-prosthetic-limbs-years/*
- *NIH (2023). Prosthetics through the ages. [online] NIH MedlinePlus Magazine.*
- *Available at: https://magazine.medlineplus.gov/article/prosthetics-through-the-ages*
- *MIT Media Lab. (2011). Person Overview ‹ Hugh Herr – MIT Media Lab. [online]*
- *Available at: https://www.media.mit.edu/people/hherr/overview/*
- *TEDMED. (2025). Hugh Herr. [online] Available at:*
- *https://www.tedmed.com/speakers/show?id=6494 [Accessed 6 Feb. 2025]. www.epo.org. (n.d.). Hugh Herr | Epo.org. [online] Available at:*
- *https://www.epo.org/en/news-events/european-inventor-award/meet-the-finalists/hugh-herr*
- *Darpa.mil. (2016). Revolutionizing Prosthetics. [online] Available at: https://www.darpa.mil/research/programs/revolutionizing-prosthetics [Accessed 6 Feb. 2025]*
- *Darpa.mil. (2017). Giving the Gift of Independence on Fourth of July: Veterans Receive DARPA's LUKE Arm. [online] Available at: https://www.darpa.mil/news/2017/veterans-receive-luke-arm [Accessed 6 Feb. 2025]*
- *www.research.va.gov. (2018). The LUKE/DEKA advanced prosthetic arm. [online] Available at: https://www.research.va.gov/research_in_action/The-LUKE-DEKA-advanced-prosthetic-arm.cfm*
- *Mobius Bionics. (n.d.). LUKE Arm Detail Page - Mobius Bionics. [online] Available at: https://mobiusbionics.com/luke-arm/www.businesswire.com. (2016). Mobius Bionics to Bring DEKA's LUKE Prosthetic Arm to Market. [online] Available at: https://www.businesswire.com/news/home/20160708005511/en/Mobius-Bionics-to-Bring-DEKA%E2%80%99s-LUKE-Prosthetic-Arm-to-Market*
- *www.youtube.com. (n.d.). How Mind-Controlled Bionic Arms Fuse To The Body | WIRED. [online] Available at: https://www.youtube.com/watch?v=Ipw_2A2T_wg*
- *BBC News (2024). The prosthetic arm controlled by your mind | BBC News. [online] YouTube. Available at: https://www.youtube.com/watch?v=73R6K3VBKE0 Accessed 17 May 2024].*
- *Matheson, R. (2014). Bionic ankle 'emulates nature'. [online] MIT News | Massachusetts Institute of Technology. Available at: https://news.mit.edu/2014/hugh- herr-bionic-ankle-emulates-nature-0417*
- *Smithsonian Magazine. (2014). Smithsonian Ingenuity Awards 2014: Hugh Herr. [online] Smithsonianmag.com. Available at: https://www.smithsonianmag.com/videos/category/smithsonian-ingenuity-awards/smithsonian-ingenuity-awards-2014-hugh-herr/ [Accessed 6 Feb. 2025]*
- *Dutchen, S. (2018). Life and Limb | Harvard Medicine Magazine. [online] magazine.hms.harvard.edu. Available at: https://magazine.hms.harvard.edu/articles/life-and-limb*

ELECTRICAL SIGNALS

HS2 - Connecting the UK or a Failure?

HONOR, YEAR 8

Our railways run on creaking old Victorian lines with equally ancient signalling systems, which means they can be very unreliable, with frequent delays for passengers. The HS2 aimed to be a new fast train line between London and Birmingham, with more trains racing north to Leeds, Manchester and on even further to Scotland. Its goal was to connect the north with the south; to create jobs; to regenerate areas on the route; to encourage people out of their cars; and to reduce regional flights and ultimately carbon emissions. It was an ambitious project.

The government approved the building of HS2 in 2012. Construction began in 2019 and it was originally meant to connect London with Birmingham, Manchester and Leeds. However, the link between Birmingham and Manchester was scrapped by Prime Minister Rishi Sunak in October 2023 because of rising costs. The sums involved are mind boggling. When construction started, it was thought HS2 would cost the UK tax payer around £32.7 billion. That's already a huge amount of money, but the latest figures suggest the actual cost to date is well over £70 billion. Why? The price of materials has gone up because of Brexit, Covid and inflation. Even the Ukraine war has meant the cost of steel has risen. What this means is that estimates quoted in 2012 are hugely different to those today and current estimates suggest the final cost could really be as much as £100 billion.

If you want to encourage people out of their cars, you need a reliable and inexpensive alternative. The promise of speed, with trains able to travel at up to 250 mph helped attract politicians to HS2, as well as the idea of linking the often forgotten north of England with the more prosperous south. Once built, according to the Department for Transport, London-to-Birmingham travel times would be cut from one hour 21 minutes to just 52 minutes.

However, faster trains need straight tracks and that is where the costs come in. Existing tracks were not suitable. Some people think that instead of building new ones, the existing lines should have been improved so less would go wrong with them. But reducing journey times overruled this option. Instead, hundreds of miles of new tracks have been built at a massive cost and they need completely new trains.

When completed, HS2 should deliver shorter journeys, better transport links, new jobs and have a long-term positive environmental impact. However, these improvements have come at a massive cost, and not just to the public purse. This project is not only over budget but it's also massively delayed. The digging of tunnels in areas of natural beauty and building high-sided cuttings to hide tracks have all added to costs and delays. There has been a significant impact to wildlife, too, through a loss of natural habitats. Some bat colonies have been saved but again at a huge cost, with new tunnels, specifically built to avoid them costing millions. Disruption to homeowners whose houses are on the route is ongoing and many others were forced to sell, with their homes then demolished. One upside is that HS2 has already resulted in some regeneration in and around areas where the lines and new stations have been built. The question remains: was HS2 value for money and will the country be better connected because of it? This debate is set to run and run, unlike the HS2 trains themselves - for now.

Bibliography

- *Bilton, Richard. 2024. "HS2 Blew Billions - Here's How and Why." BBC News. BBC News. September 16, 2024. https://www.bbc.co.uk/news/articles/c98486dzxnzo.*
- *Doherty, Caitlin. 2024. "£100m plus Bat Shed 'Tip of Iceberg' on HS2 Delivery 'Failure', Says Haigh." The Independent. November 9, 2024. https://www.independent.co.uk/news/uk/louise-haigh-hs2-treasury-transport-secretary-naturalland-b2644300.html.*
- *"Homepage Discover HS2." 2024. HS2. November 20, 2024. https://www.hs2.org.uk.*
- *Topham, Gwyn. 2023. "Why Has HS2 Ended up Being so Expensive?" The Guardian, September 25, 2023, sec. UK news. https://www.theguardian.com/uk-news/2023/sep/25/why-has-hs2-ended-up-being-so-expensive.*
- *2024. "Cost of HS2 Could Pass £80bn as Estimated Bill Jumps 15% in a Year." The Guardian. The Guardian. December 17, 2024. https://www.theguardian.com/uk-news/2024/dec/17/cost-of-hs2-estimate-euston.*

LINKING THE NORTH WITH THE SOUTH

The Hidden Connections in Chaos

IRIS, YEAR 10

Imagine a butterfly flapping its wings in Brazil. A few weeks later, a hurricane forms in Texas. Initially, these events can seem entirely unrelated, but according to Edward Lorenz and his concept of Chaos Theory, even the smallest actions can trigger vast and unpredictable consequences. Known as the Butterfly Effect, this principle highlights the hidden connections that shape our world - from natural disasters to everyday decisions.

The Encyclopaedia Britannica defines Chaos Theory as the study of apparently random or unpredictable behaviour in systems governed by deterministic laws. Determinism is the view that all events, including human decisions and actions, are ultimately inevitable and determined by forces regarded as external to will, so, in theory, small changes in these systems would have no large overall effect. However, mathematician and meteorologist Lorenz disproved this in 1963 when he observed the difference in results for runs of his numerical weather prediction model when the initial condition data was shortcut and rounded from 6 to 3 decimal places. In removing less than one thousandth from one piece of his data, the weather model produced drastically different outcomes over time. While the data initially repeated the same values, it soon differed and after the second month, less than a thousandth was the difference between sunny skies and violent storms.

Though Lorenz is credited with formally discovering Chaos Theory and the Butterfly Effect, other scientists and mathematicians had previously suggested similar ideas. In 1950, Alan Turing said that 'the displacement of a single electron by a billionth of a centimetre at one moment might make the difference between a man being killed by an avalanche a year later, or escaping'. Turing's idea closely mirrors Lorenz's later well-known analogy of how the ripple of air from one butterfly's wings in Brazil could, in theory, set off a tornado in Texas, showing that scientists had already suspected that tiny changes could have massive consequences. While it may seem overwhelming that such small actions can have impacts on such a large scale, we have to consider the metaphor in practice. While the Butterfly Effect is a powerful concept, in reality, it is virtually impossible to predict if a small system will lead to chaotic behaviour or not.

"We are living in a time when people, especially young people, can feel powerless and that their actions don't matter - Chaos Theory proves that this is not true."

Nevertheless, there are real-life examples of the Butterfly Effect causing massive consequences. In 1914, a wrong turn by Archduke Franz Ferdinand's driver placed him directly in the path of his assassin, leading to the assassination of both the Archduke and his wife, which triggered the start of World War I. Without the lingering consequences of this war, some historians argue that a second global conflict wouldn't have occurred. This is because Europe would have been stronger and less vulnerable to the rise of Nazi Germany, and France might not have been as eager to appease Hitler to prevent another world war. While we can never be sure how events would have unfolded, or what other devastating impacts could have altered our world, it could be argued that a wrong turn over 110 years ago was the difference between two world wars and none at all.

We are living in a time when people, especially young people, can feel powerless and that their actions don't matter – Chaos Theory proves that this is not true. The underlying connections between all actions in the world affect and shape our everyday lives, and highlight that no matter how unimportant you think you are, even the smallest actions can trigger major consequences, for better or for worse.

Bibliography

- *"Chaos Theory - Butterfly Effect, Applications." BYJUS, July 6, 2022. https://byjus.com/physics/chaos-theory/#:~:text=Chaos%20theory%20explains%20that%20within,similarity%2C%20and%20constant%20feedback%20loops.*
- *"Chaos Theory." Encyclopædia Britannica, January 15, 2025. https://www.britannica.com/science/chaos-theory.*
- *Oestreicher, Christian. "A History of Chaos Theory." Dialogues in clinical neuroscience, 2007. https://pmc.ncbi.nlm.nih.gov/articles/PMC3202497/.*
- *"The Butterfly Effect." The Decision Lab. https://thedecisionlab.com/reference-guide/economics/the-butterfly-effect.*

Myopia: Is There a Family Connection?

JESSICA, YEAR 8

Myopia is an eye condition that is caused by either the eyeball growing too long, or the cornea at the front of the eye being too curved, and it is increasingly common. Despite the commonness of the condition, there is no guaranteed way to prevent myopia from developing, although there are several ways to correct and treat the condition, such as glasses, contact lenses, and in some cases, even eye surgery. It is unclear exactly what causes myopia; however, many studies have shown that there can be both family tendencies towards short sightedness and links to the environment. So is there really a family connection?

There is much evidence to show that people can have a genetic predisposition to developing myopia, as genetics control the growth and development of the eye. Research has shown a link between parents' eyesight and their children's, particularly in cases of high myopia. Some races and ethnicities also seem to be more prone to developing myopia. In one study, the children of a woman with high myopia were studied. Both children also developed high myopia, showing a genetic predisposition in that family to the condition, and suggesting that there is a family connection between cases of myopia. High myopia is not very common, so the fact both children developed this condition shows that there is a strong predisposition to it, inherited through family. Several studies carried out on twins have also shown that a pair of twins are likely to develop a similar degree of myopia, which further suggests a strong genetic connection.

However, there are also studies that have shown that environmental factors can affect the worsening of myopia. There is also a

strong correlation between education and myopia rates: more highly educated people are more likely to have the condition. In a study from 2018, led by Cardiff University and the University of Bristol, results showed that for each year spent in education, on average, students became more myopic by around 0.3 dioptres. This shows that spending time in education causes myopia to worsen; a suggested reason for this is that when in education, people tend to spend more time indoors, reading, writing, looking at screens and overall looking at things at a closer range. This is known to cause the eye to grow longer, particularly when the student is under 20 and their eyes are still growing. Other studies have demonstrated the same thing: education worsens myopia. This is just one example of an environmental factor, but it shows that a person's environment can play a role in both the likelihood of them developing myopia, and existing myopia worsening.

To conclude, there is strong evidence for both sides of the debate, and, of course, myopia is not caused by a single factor. However, there is clear and powerful evidence to show that there is a family connection to myopia, as many families have an obvious predisposition to it. This is demonstrated, for example, in twin studies, as twins usually develop a similar level of myopia. There are also countless examples of children inheriting short-sightedness from their parents; even in cases when the parent has an unusually extreme level of myopia, the child will usually develop it to a similar degree. Although there is also evidence to demonstrate environmental influences, and myopia comes from several different factors, there is a clear family connection.

Bibliography

- *Goldschmidt, E, and Jacobsen, N. 2013. "Genetic and Environmental Effects on Myopia Development and Progression." Eye 28 (2): 126–33. https://doi.org/10.1038/eye.2013.254.*
- *"Study Suggests Education Causes Short-Sightedness." 2018. Cardiff University. 2018. https://www.cardiff.ac.uk/news/view/1199570-study-suggests-education-causes-short-sightedness.*
- *"Nearsightedness (Myopia) Tables | National Eye Institute." n.d. Www.nei.nih.gov. https://www.nei.nih.gov/learn-about-eye-health/eye-health-data-and-statistics/nearsightedness-myopia-data-and-statistics/nearsightedness-myopia-tables.*
- *"Is Myopia More Genetic or Environmental?" 2022. Allaboutvision.com. 2022. https://www.allaboutvision.com/conditions/myopia/genetic-or-environmental/.*
- *NHS Choices. 2019. "Overview - Short-Sightedness (Myopia)." NHS. 2019. https://www.nhs.uk/conditions/short-sightedness/.*
- *"Global Perspectives on Childhood Myopia: Addressing the Rising Epidemic | National Eye Institute." 2024. Nih.gov. 2024. https://www.nei.nih.gov/about/news-and-events/news/global-perspectives-childhood-myopia-addressing-rising-epidemic.*
- *Mirshahi, Alireza, Katharina A. Ponto, René Hoehn, Isabella Zwiener, Tanja Zeller, Karl Lackner, Manfred E. Beutel, and Norbert Pfeiffer. 2014a. "Myopia and Level of Education: Results from the Gutenberg Health Study." Ophthalmology 121 (10): 2047–52. https://doi.org/10.1016/j.ophtha.2014.04.017.*
- *Mudditt, Jessica. 2022. "Why Short-Sightedness Is on the Rise." Bbc.co.uk. BBC. October 5, 2022. https://www.bbc.co.uk/future/article/20220927-can-you-prevent-short-sightedness-in-kids.*

"Several studies carried out on twins have also shown that a pair of twins are likely to develop a similar degree of myopia, which further suggests a strong genetic connection."

Connections: The Importance of Early Synapse Formation

JULIA, YEAR 10

Human connection is a deep bond established between those with a strong sense of mutual understanding, trust, and shared vulnerability. We crave connections to know that we have people we can rely on when facing life's challenges, and they are fundamental to achieving a functioning society. Humans can form strong bonds with many different people, but of all the bonds that we tend to make throughout our lifetime, the maternal bond between mother and infant is one of the most compelling and natural that we can form.

During pregnancy, from the age of 16 weeks, babies can recognise their mother's voice, and from 20 weeks, they can recognise the voices of other family members. Parents are often advised to speak or sing to the developing foetus even before it is born. Throughout development, foetuses form connections with the voices that they are able to recognise, so that when they are born, they already identify a feeling of comfort and security.

Not only do developing foetuses make connections between themselves and those around them, but they also begin to make neural connections as their brains begin to develop. Foetuses move a lot while in a mother's womb, and with every kick and turn, synaptic growth is stimulated and new neural connections are formed. Synapses are the small gaps between neurons that allow different neurons to communicate with each other and allow signals to pass, and without their prenatal development, a baby would be born without any neural connections between their nerve cells.

Once a baby is born and begins to develop outside of the womb, the neural connections formed inside the womb are strengthened and multiplied. At first, the neural connections formed are very simple, but over time, more complex circuits and skills evolve. These connections are generally developed through positive interactions with their caregivers, and by using their senses to interact with the world around them.

Positive interactions include talking, playing and listening to lullabies, and can positively impact babies to be healthier and have long-term success at school and life in general. On the other hand, negative interactions involving experiences such as hunger, stress, isolation and neglect can weaken a baby's connections, impacting their brain's structure and future successes.

The brain undergoes synaptic pruning to regulate which neural connections should be retained and which should be discarded. Repeatedly used connections are strengthened and retained, as they are still relevant and necessary to an individual's experiences and learning, but those that are deemed irrelevant or are left unused are 'pruned'. This is why babies that are initially exposed to positive interactions but are then exposed to negative interactions are at risk of their brain 'pruning' the synaptic connections initially formed but now unused.

A baby is born with approximately 100 billion neurons, and a brain the size of a quarter of an adult brain. The most rapid neural growth occurs prenatally and for the first 20 weeks postnatally, and by the first year, a baby's brain has doubled in size. New connections are formed at a rate of over one million per second in the first few years, and by the time that a child reaches the age of three, approximately 100 trillion neural connections exist.

While babies are born with 100 billion neurons, there are very few synapses connecting them to each other at birth, and it is very difficult to cultivate these connections without a great deal of care and affection towards a child. These early connections teach problem solving, communication and motivation, skills that are much harder to learn later on and that are all needed for a successful adult life and a functioning society as a whole.

Bibliography

- *Center on the Developing Child at Harvard University. 2011. "Experiences Build Brain Architecture." YouTube. https://www.youtube.com/watch?v=VNNsN9IJkws.*
- *Center on the Developing Child at Harvard University. 2011. "2, Serve & Return Interaction Shapes Brain Circuitry." YouTube. https://www.youtube.com/watch?v=m_5u8-QSh6A.*
- *UNICEF. 2019. "Learn How to Boost Your Baby's Brain from a Harvard Professor | UNICEF." YouTube. https://www.youtube.com/watch?v=fpiYNkkNmEo.*
- *"Brain Development." n.d. Files.firstthingsfirst.org. https://files.firstthingsfirst.org/for-parents-and-families/brain-development.*
- *"Building Our Children's Developing Brain Some Ideas for Parents and Carers." n.d. https://setrust.hscni.net/wp-content/uploads/2020/08/Building-Our-Childs-Developing-Brain-V4-1.pdf.*
- *Thomason, Moriah E. 2020. "Development of Brain Networks in Utero: Relevance for Common Neural Disorders." Biological Psychiatry 88 (1): 40–50. https://doi.org/10.1016/j.biopsych.2020.02.007.*
- *"Brain Development." n.d. Files.firstthingsfirst.org. https://files.firstthingsfirst.org/for-parents-and-families/brain-development.*
- *"Brain Architecture - Center on the Developing Child at Harvard University." 2024. Center on the Developing Child at Harvard University. December 18, 2024. https://developingchild.harvard.edu/key-concept/brain-architecture/.*

The Connections Which Formed the English Language

KAYA, YEAR 8

Every language has evolved through the blending of different cultures and influences. Very few languages have remained the same over the course of hundreds of years. For example, most Icelandic speakers today would be able to read and understand the traditional sagas, written over 800 years ago. This is because of the country's isolation in the middle of the Atlantic Ocean. Britain, although also an island, has been exposed to many different powers and has experienced a lot of change due to conquests and invasions throughout its history. In contrast to the Icelandic language, Old English (written and spoken from around 450-1100 AD) is drastically different to the English we speak today. Exploring the different factors that created the English language not only gives us a clearer understanding of why English is such a versatile language, but also gives us a historical perspective on the Britain we know today.

From the Iron Age to around 40 AD, the people who lived in Britain spoke Celtic. When the Romans colonised Britain, the Celtic language began to die out. In its place, the Romans introduced their alphabet. Quickly, the inhabitants of Britain started to speak Latin. Many words used in Modern English originate from Latin, for example 'accept' from 'acceptare' or 'imagine' from 'imaginari'. Another thing that the Romans introduced was Christianity, which had a major effect on social structures and health. However, this religion was challenged when the Anglo-Saxons, originating from the north of Germany, invaded Britain in the 5th century. The Anglo-Saxons brought with them a variety of Gods, such as the god of thunder, Thor. This conquest was the starting point for the rapid development of Old English.

One notable contribution the Anglo-Saxons made to English was the introduction of grammatical genders. These genders had no particular pattern and each grammatical gender also had declensions. However, despite these early developments, English was to continue changing. At this stage, it would have been unrecognisable for any modern English speaker, as 85% of the language is not in use anymore. An example of the foreignness of Old English is the poem 'Beowulf', written by an unknown author around the 7th century:

Hwæt. We Gardena in geardagum,
þeodcyninga, þrym gefrunon,
hu ða æþelingas ellen fremedon.

But the grammatical genders brought by the Saxons didn't last for long. In the 8th century, the Vikings invaded Britain. The Vikings, who spoke Old Norse, could easily speak with the inhabitants of Britain, as Old English and Old Norse were very similar. The more the Vikings and the people living in Britain communicated with one another, the more English lost its grammatical genders. These genders first started to die out in the north of England, due to the higher numbers of Vikings, and didn't completely disappear until the 1300s in areas like Kent, which were more conservative and on the outskirts of Britain. At this time, English started to sound more like it does today, using words like 'it' and 'they' instead of grammatical genders.

From the fourteenth century to the present day, the English language has developed more gradually, with multiple influences from the many origins of Old English along with many words derived from French. Looking at the English culture and language today, it is evident how many cultures have enriched the way we understand, write and speak now and how the connections that were made many years ago changed our society for the better.

Bibliography

- *Andre, Sofia, online.utpb.edu. "From Old to New: How the English Language Evolved throughout History". UT Permian Basin Online. April 12, 2023. https://online.utpb.edu/about-us/articles/humanities/from-old-to-new-how-the-english-language-evolved-throughout-history/*
- *Brady, Lindy, Edge Hill University. "History Shows That Britain Has Always Been Multilingual - Edge Hill University." Edge Hill University, May 29, 2024. https://www.edgehill.ac.uk/news/2024/05/fears-that-english-is-disappearing-in-england-are-misplaced-history-shows-the-island-has-always-been-multilingual/*
- *Hann, Andrew, English Heritage. "Early Medieval: Religion | English Heritage," 2025. https://www.english-heritage.org.uk/learn/story-of-england/early-medieval/religion.*
- *Upward, Christopher, and George Davidson. The History of English Spelling. Oxford: Wiley-Blackwell, 2011.*
- *Zui. "When English Lost Its Grammatical Genders." The Language Closet, July 9, 2022. https://thelanguagecloset.com/2022/07/09/when-english-lost-its-grammatical-genders/*
- *N.d. Cambridge.org. Accessed February 15, 2025. https://www.cambridge.org/elt/blog/2021/06/22/the-influence-other-languages-english/.*

Six Degrees of Separation

KIKI, YEAR 8

The six degrees of separation theory is the concept that everyone on the planet can be connected by six or fewer social connections. The theory was first introduced in 1929 by Hungarian writer and poet, Frigyes Karinthy, in his short story Chains. Throughout the story. Karinthy repeatedly references a 'shrinking world', for example: 'Planet Earth has never been as tiny as it is now. It shrunk - relatively speaking of course - due to the quickening pulse of both physical and verbal communication.' This tells us that the world was becoming increasingly connected through trading and growing technological advances, as well as transport.

In the 1960s, a social psychologist named Stanley Milgram conducted an experiment called the 'small world experiment'. It involved Milgram sending 160 letters to people in Nebraska and Boston; the letter contained the name and address of a stranger in Boston. Their task was to get the letter to the target by sending it through a chain of friends. The number of times the letter was sent was predicted to be high, but the actual average was only around five or six. When delving deeper into his findings, Milgram realised that for at least half of the letters, the same three people had sent it directly to the person in Boston. These few people are known as the Connectors, a small group who are connected to a large number of people.

Although Milgram's experiment was discounted because he used a small amount of packages, the theory was later popularised by three Albright College students in 1994 who made a game called the Six Degrees of Kevin Bacon. The game involves picking an actor and linking them to Kevin Bacon through a chain of movies, where each actor in the chain has worked with the next one. The goal is to find six or fewer links. The theory became further popularised with the release of the 1990 play Six Degrees of Separation by John Guare, which was adapted into a film in 1993.

The six degrees of separation can be used advantageously when spreading ideas, information, and trends. This is shown in the book The Tipping Point by Malcolm Gladwell: 'The tipping point is that magic moment when an idea, trend, or social behaviour crosses a threshold, tips, and spreads like wildfire.' Knowing that everyone can be connected through six or fewer intermediaries brings the entire population much closer together, and with the growing rise of social media, technology, and travel, everything can spread even faster.

On the other hand, the six degrees of separation can be a double-edged sword. This is seen through pandemics such as COVID-19. We all saw how a small disease from China spread around the world and turned into a worldwide pandemic. Without a globe closely connected through travel, communication and trade, this wouldn't have been possible. The same networks that allow for the sharing of ideas, technology, and culture also make it easier for diseases to spread quickly. In a tightly linked world, a single outbreak can leap across continents within days, as with the pandemic.

Since I began researching this theory, I wondered why there are only six steps. Recently, a team of researchers have uncovered a mathematical explanation for the six degrees phenomenon. They show that this fascinating idea is linked to the common approach of weighing cost versus benefit when creating new social connections. It is natural, as humans, for us to create social connections that help to improve our position in the network, as long as the benefits outweigh the costs. This explains why social networks normally have a small average number of connections between individuals.

Through the rise of technology, social media and globalisation, our world can only become more connected - whether this will be the rise or downfall of the human race, no one can know. In the future, though, the six degrees of separation theory will remain an essential way of understanding change and human connections.

Bibliography

- *Bonette, Julie, 'As Generative AI Advances, Princeton tries Gladwell, Malcolm. The Tipping Point: How Little Things Can Make a Big Difference. Boston: Back Bay Books, 2000.*
- *Holpuch, Amanda. "Six Degrees of Kevin Bacon: Scientists Expose the Seedy Underbelly." The Guardian. The Guardian. (September 14, 2012.) https://www.theguardian.com/science/us-news-blog/2012/sep/14/six-degrees-kevin-bacon-science.*
- *Inglis-Arkell, Esther. 2014. "Stanley Milgram's Chain Letter Experiment." Gizmodo. (2014). https://gizmodo.com/stanley-milgrams-chain-letter-experiment-1586778899.*
- *Karinthy, Frigyes. Chains. Translated by Norman Denny. The Viking Press, 1929.*
- *Ma, Feicheng.. "'Six Degrees of Separation' and 'Small World.'" Springer EBooks, (January 2015) pp77–78. https://doi.org/10.1007/978-3-031-02293-7_8.*
- *Morse, Gardiner. "The Science behind Six Degrees." Harvard Business Review. (February 2003.) https://hbr.org/2003/02/the-science-behind-six-degrees.*
- *Munez, Everett. "Kevin Bacon | Biography, Movies, Nominations, & Awards." Encyclopedia Britannica. (July 7, 2023.) https://www.britannica.com/biography/Kevin-Bacon#ref358231.*
- *Samoylenko, Ivan, David Aleja, E Primo, K. Alfaro-Bittner, Ekaterina Vasilyeva, Kirill Kovalenko, Daniil Musatov, "Why Are There Six Degrees of Separation in a Social Network?" Physical Review X 13 (2023). https://doi.org/10.1103/physrevx.13.021032.*
- *Smith, David. 2017. "Microsoft Proves There Are Just Six Degrees of Separation between Us." The Guardian. The Guardian. December 2, (2017.). https://www.theguardian.com/technology/2008/aug/03/internet.email.*

SOCIAL CONNECTIONS

The Connection Between Using Headphones at a Young Age and Getting Dementia When Older

KITTY, YEAR 7

Research and news articles have suggested that using headphones when you are younger can lead to noise-induced hearing loss and that hearing loss increases your chances of getting dementia. This article explores whether we can say that using headphones at a young age can lead to dementia.

Firstly, I will consider if using headphones in childhood and adolescence leads to noise-induced hearing loss. Kids and teenagers use headphones to listen to music, watch videos or chat with their friends. There is an increased risk of hearing damage if the volume is turned up too loudly. Studies have shown that about one in six or one in eight senior school students have hearing damage, most likely resulting from too much exposure to noise. Research suggests that, for some people, most hearing loss comes from using in-ear headphones. However, using semi-open or open headphones has no influence on hearing damage. Almost 15% of participants in one study had their hearing thresholds shifted upwards, meaning they could no longer hear very low or quiet sounds. Hearing loss prevalence rates have increased in the last ten years and the most common cause of hearing loss is excessive exposure to loud noises. While it's hard to find any evidence that suggests wearing headphones in childhood doesn't lead to hearing loss, there are specific conditions that need to be in place for the hypothesis to be true.

Secondly, I will contemplate if hearing loss leads to dementia. Studies have demonstrated that the risk of dementia is higher if you have hearing loss, and if you do have hearing loss, wearing a hearing aid lowers the risk of dementia, compared to if you don't wear hearing aids.

Treating hearing loss (using hearing aids or getting a cochlear implant) may lower the risk of dementia, although it depends on genes, lifestyle and any long-term health conditions. In a study, the use of hearing aids was associated with a 32% lower prevalence of dementia in the participants that had moderate or serious hearing loss. Hearing loss and dementia often occur together and whilst it hasn't been proven that hearing loss causes dementia, hearing loss is seen as a risk factor for dementia. This may be explained by understanding that isolation and misery are risk factors for dementia and that hearing loss may cause the parts of the brain that decipher speech and sound to work harder. This extra effort could lead to problems remembering things and reduced thinking capabilities. Overall, this suggests that whilst in some cases hearing loss leads to dementia, it depends on a variety of factors.

In conclusion, I have found that wearing headphones as a child leads to hearing loss under specific conditions. Research has suggested that these conditions are: the type of headphones (open headphones as opposed to semi-open headphones); the volume; and your age (the younger you are, the more susceptible you are to getting noise-induced hearing loss). Hearing loss certainly influences the development of dementia, but further research would have to be done to determine whether it is a cause of dementia. Based on my theory of using headphones at a young age leading to dementia when older, whilst it seems likely that using headphones increases your chances of dementia, further research would have to be done to confirm this hypothesis. I would suggest doing a study from infancy to old age to see the likelihood of using headphones at a young age leading to dementia when older, and what other factors might be influential.

Bibliography

- *AlQahtani, Abdulaziz S., Ahmed N. Alshammari, Eyad M. Khalifah, Akram A. Alnabri, Hadi A. Aldarwish, Khaled F. Alshammari, Hamad F. Alshammari, and Abdulkarim M. Almudayni. "Awareness about the Relation of Noise Induced Hearing Loss and Use of Headphones at Hail Region." Annals of Medicine and Surgery 73 (January 1, 2022): 103113. https://doi.org/10.1016/j.amsu.2021.103113.*
- *Dobrucki, Andrzej B., Maurycy J. Kin, and Bartłomiej Kruk. "Preliminary Study on the Influence of Headphones for Listening Music on Hearing Loss of Young People." Archives of Acoustics 38, no. 3 (September 1, 2013): 383–87. https://doi.org/10.2478/aoa-2013-0045.*
- *Manuella Lech Cantuaria, Ellen Raben Pedersen, Frans Boch Waldorff, Lene Wermuth, Kjeld Møller Pedersen, Aslak Harbo Poulsen, Ole Raaschou-Nielsen, Mette Sørensen, and Jesper Hvass Schmidt. "Hearing Loss, Hearing Aid Use, and Risk of Dementia in Older Adults." JAMA Otolaryngology--Head & Neck Surgery 150, no. 2 (January 4, 2024). https://doi.org/10.1001/jamaoto.2023.3509.*
- *publichealth.jhu.edu. "New Study Links Hearing Loss with Dementia in Older Adults | Johns Hopkins | Bloomberg School of Public Health," January 10, 2023. https://publichealth.jhu.edu/2023/new-study-links-hearing-loss-with-dementia-in-older-adults.*
- *Ray, Manisha, Tom Dening, and Brian Crosbie. "Dementia and Hearing Loss: A Narrative Review." Maturitas 128 (October 2019): 64–69. https://doi.org/10.1016/j.maturitas.2019.08.001.*
- *Tomiyoshi, Tricia. "Are Your Child's Headphones Causing Permanent Damage?" news. UC Davis Health, March 2023. https://health.ucdavis.edu/news/headlines/are-your-childs-headphones-causing-permanent-damage/2023/03#.*
- *www.alzheimers.org.uk. "Hearing Loss and the Risk of Dementia | Alzheimer's Society - Connected Content," n.d. https://www.alzheimers.org.uk/about-dementia/managing-the-risk-of-dementia/reduce-your-risk-of-dementia/hearing-loss.*

NOISE-INDUCED HEARING LOSS

Connections Between Friends

LEIGH, YEAR 7

The word connections can be used to describe lots of things, including the connections between friends. Did you know that friends are more similar genetically than strangers? Did you know that babies as young as nine months old recognise that friends tend to have similar interests? Let's dive deeper into the connection between friends.

Friendships are formed in many different ways but they are usually formed by common interests. People often make friends at school, work or social gatherings where they meet frequently. Over time, friendships deepen as people discover more about each other and find that they have similar interests, goals and hobbies. Conversations and laughter strengthen bonds and build trust. Trust plays an important role in friendships: when people feel they can rely on each other, they tend to stick together more, so they can always have each others' backs.

A good friend will support and encourage you and celebrate your successes. Friends comfort each other in hard times and knowing someone is there for you creates a sense of security and safety.

Friendships change over time. Some fade as people change and get older but some, quite rarely, last a lifetime. Experts say if a friendship has lasted longer than seven years, there is a good chance it will last a lifetime. Friendships that fade can be caused by moving away to a different place, starting a family or changing jobs or schools, but strong friendships can withstand these shifts.

Friends have been found to be more genetically similar than strangers and about two-thirds are as similar as the average married couple. The reason for this is because people might form relationships due to shared characteristics, such as body build (being short, tall, heavy, light), which can come from similar genes. Also, people often make friends with people who have something in common with them and that could include hair colour, eye colour and disabilities, which would make them more genetically similar.

Babies from a very young age can recognise friends from similar characteristics and interests, which shows we learn from a very young age what you have to do to make friends. Babies can recognise familiar faces and voices, but they prefer to see and hear people they know will keep them safe, such as their mother or father.

If you have few friends, you probably have a very strong bond, while if you have loads of friends, it is more likely that you aren't as close, as you need to spend time with each of them and you probably aren't always all together at the same time, so you don't see any individual friend as much. You still have a friendship but it just isn't as strong.

Overall, there is a lot to discover about friendship, from it being one of the first things you learn to understanding why your friends slowly fade away - hopefully, this will help you keep your friends as close as possible. Keeping your enemies closer would be a whole other article!

Bibliography

- *Yellowstone Valley Woman*
- *Radleys*
- *Stanford Cepa*
- *PNAS*
- *Quora*

If Life Is Inherently Meaningless, Are Connections Worth Having?

MARINA, YEAR 10

"Everything happens for a reason," reads the hoodie I was thinking of buying. And as I place it back on the rack, I can almost imagine Jean-Paul Sartre chuckling. Sartre, along with the other existentialists, believed that life is inherently meaningless. That only as individuals can we create meaning in our own lives. So, whilst it's comforting to think that a higher power will guide us to make the right decisions in life, I think I'll stick with Sartre on this one. Sorry, Brandy Melville.

Yet, as I boarded the bus home, I began regretting my decision. By conforming to the beliefs of the existentialists, had I condemned myself to a life of solitude? I was moving from Sartre to Heidegger, and his theory of existential isolation: the idea that we are born alone and we die alone, so we are ultimately isolated. Following this theory, since no one experiences birth and death with us, no one can truly understand us or experience things in the same way we do. But if that's the case, is human connection futile? Can I ever truly empathise with someone? Will I leave this Earth utterly alone, without having given my life meaning?!

I looked around me to observe my fellow companions on the journey home. Would the man sitting opposite ever truly understand me? Would my own mother even? 'No two people have ever sat in the same room' is a phrase often attributed to Sartre. It states that because of our genetic makeup, our life experiences and our beliefs, we all perceive the world around us differently. Not earth-shattering news, right? But that's exactly what existential isolation (yes, the thing that had me questioning my existence earlier) is. It's the theory that no matter how much time you've spent with someone or how much they know about your life, they will never truly understand what it feels like to be you.

Now, at this point, you may be feeling quite alone and may potentially want to fall into a pit of despair - like I did - but there's a bright side in all of this. If we were all the same and shared the same experiences, there would be no point in connecting with each other. But our differences, and in turn existential isolation, allow human connection to exist and are the precise reason why it's so fulfilling. Imaginative empathy, too, is a main driver of connection. And whilst in terms of existential isolation, we can never truly empathise with someone, I would argue that the power of empathy lies in the attempt to understand how someone else feels, rather than the success of that attempt. In fact, there's something more meaningful about empathy in this new format because someone choosing to try and empathise with you, despite knowing that ever completely achieving it is impossible, is infinitely more difficult to do and infinitely more meaningful.

So maybe everything we make happen is for a reason: our desire for connection.

Bibliography

- *Cave, Peter, Humanism: A Beginner's Guide. Oxford: Oneworld Publications, 2011.*
- *Cleary, Skye, Existentialism and Romantic Love. New York City: Palgrave Macmillan, Cop, 2015.*
- *Heidegger, Martin, Being and Time. Translated by John Macquarrie and Edward Robinson. 1927. Reprint, Oxford: Blackwell, 1927.*
- *Sartre, Jean-Paul, Being and Nothingness. Paris: Éditions Gallimard, Philosophical Library, 1943.*
- *Sartre, Jean-Paul, "Existentialism Is a Humanism." Edited by Philip Mairet. Presented at Club Maintenant, 1946.*
- *Sartre, Jean-Paul, No Exit and Three Other Plays. New York City: Vintage International, 1944. Reprint, 1989.*
- *Simons, Margaret, Beauvoir and The Second Sex Feminism, Race, and the Origins of Existentialism. Blue Ridge Summit Rowman & Littlefield Publishers Ann Arbor, Michigan Proquest, 2001.*
- *Yalom, Irvin, Existential Psychotherapy. New York: Basic Books, 1980.*

Divine connections within the Odyssey

MARINA, YEAR 7

Throughout the Odyssey, Odysseus, the hero of the story, interacts with many gods, but it is Athena with whom he has the strongest connection. She favours Odysseus for his wisdom and cunning and is by his side at nearly every moment, from when she persuades her father to help him escape Calypso, to when she strengthens his allies in their fight against the suitors who pursue his wife in his absence.

Athena's affection for Odysseus becomes clear early on in Homer's version of the story. We see the respect she feels for him as she persuades her father, Zeus, to allow him to leave Calypso's island, where he has been held prisoner. She reminds her father of Odysseus' services to the Gods and the Greeks, particularly his plan of using the wooden horse during the Trojan war. Zeus is reluctant to release Odysseus, knowing that it will anger Poseidon, but eventually agrees, sending Hermes to order his release. Even at the beginning of the Odyssey, we see how Athena respects Odysseus as a wise and efficient leader.

Athena also helps Odysseus' family, particularly his son Telemachus. At the beginning of the story, she visits him disguised as a soldier named Mentes and advises him to journey to Pylos and Sparta to seek news of his father. King Nestor of Pylos remarks that he is 'now sure that you [Telemachus] will be a hero, since the gods are on your side'. Athena accompanies him to Pylos, now disguised as the aged Mentor, before flying away in the form of an ossifrage (a bird). Telemachus travels on to Sparta, where King Menelaus tells him that he captured Proteus, the old man of the sea, on his return to Sparta, and forced him to reveal the fates of the Greek kings. The god told him that Odysseus was alive, but Calypso's prisoner. Telemachus returns to Ithaca, but some of his mother's suitors are lying in wait at the port to kill him. However, he narrowly escapes when Athena comes to him in a dream and tells him to come ashore on the east side of the island, laying a false trail for the suitors who believe that he was with his men on the ship.

Athena is always by Odysseus' side, carefully watching but not interfering directly. She comes to his aid many times: for example, after he lands on the shore of Ithaca after being placed there by the king of the Phaeacians. She tells him about the suitors and disguises him as an old beggar so 'no human will recognise you'. After discovering that the swineherd Eumaeus may be trusted, Athena temporarily removes Odysseus' disguise so his son will recognise him. Odysseus manages to gain entry into the house and he and Telemachus gather weapons and hide them from the suitors. Finally, Odysseus reveals himself and Athena imbues him and his allies with extra strength. Although Odysseus vanquishes the suitors, their families seek vengeance by continuing the fight. Athena then appears to the people of Ithaca and tells them to 'stop this war', instructing Odysseus himself to live a peaceful life from now on.

The connection between Odysseus and Athena is unusual. Odysseus was not young, nor was he of divine ancestry. But he won Athena's favour with brilliant ideas like that of the Trojan horse. The goddess respects and protects Odysseus, almost like a mother. And she mentors him, providing wisdom and guidance when he most needs it, as when she tells him to stop fighting the suitors' families, showing that their bond was truly stronger than that between most mortals and gods.

Bibliography:

- *Homer. The Odyssey. Translated by E. Wilson. New York: W.W. Norton and Company, 2018.*

"The connection between Odysseus and Athena is unusual. Odysseus was not young, nor was he of divine ancestry."

Human Connection: Are We Wired To Socialise?

ROSE, YEAR 9

Human beings are very social creatures, due to our brains being designed to respond to and be influenced by others. However, the question of whether we have been wired to socialise from the beginning of our existence has fascinated scientists, psychologists, and anthropologists for a long time. The study of neuroscience, evolution, and psychology shows that social connection is beneficial and essential to human life. From our ancient ancestors who depended on cooperation when feeding themselves to our modern age, where the internet shapes our interactions, the need for human connection has remained throughout history.

Social bonding has been significant for the survival of our species. Early humans relied on their ability to form groups for protection, hunting, and reproduction. Those who could effectively cooperate and communicate had a higher chance of survival, leading to the development of social skills. Talking and connecting with others is embedded in our genetics, with the release of hormones like oxytocin playing a vital role in reinforcing human bonds. The ability to form alliances and friendships assisted early humans in enduring different environments and also laid the foundation for the development of civilisations.

The observations of neurological studies further support the idea that human brains are wired for connection. Experiments show that social interactions activate the brain's reward system, releasing dopamine and reinforcing positive emotions. The prefrontal cortex is responsible for decision making, maintaining social appropriateness and expression among other things. All of these attributes are linked to requirements for social bonding. Additionally, an international team led by Mount Sinai School of Medicine has shown that the anterior insular cortex controls empathy and makes us sympathise with others' emotions, a key social skill. This ability to recognise and relate to the emotions of others is fundamental to forming meaningful relationships and cooperating.

Psychological research also highlights the effects of social connection on mental and physical health. Mental illnesses caused by loneliness and a lack of bonding include depression, anxiety, and panic disorder. The NIH studies said that loneliness and social isolation were correlated with increased risks of cardiovascular heart disease by 29% and stroke by 32%. Conversely, strong social ties have been shown to improve life expectancy, boost immune function, and benefit overall well-being. The desire to belong is so powerful that social rejection can activate the same brain regions associated with physical pain, emphasising the critical role of connection in human life. In modern society, the rise of digital communication and social media has transformed how we connect, making relationships more accessible yet also raising concerns about the depth and authenticity of online interactions. While technology has provided new ways to maintain relationships across great distances, studies suggest that in-person interactions remain pivotal for emotional bonding and psychological well-being.

In conclusion, the science of human connection provides overwhelming evidence that we are wired to socialise. From our evolutionary history to the way our brains process social interactions, it is clear that relationships and connections are fundamental to our existence. As we navigate an increasingly online world, prioritising genuine social bonding remains essential for maintaining our well-being and bringing together and strengthening groups, reinforcing the fact that humans are social by nature.

Bibliography

- *Terrell, Lorraine, 'The Science of Being Social'. https://omnia.sas.upenn.edu/story/science-beingsocial#:~:text=%E2%80%9COur%20brains%20are%20wired%20to,moment%20interactions%20with%20other%20people. https://www.drugdiscoverynews.com/social-interaction-a-basic-human-need-15564 https://www.ncbi.nlm.nih.gov/books/NBK554483/#:~:text=The%20prefrontal%20cortex%20is%20known,and%20other%20complex%20cognitive%20behaviors.*

Mycorrhizal Connections Between Trees

TILLY, YEAR 9

IAs one would expect, connections are essential for healthy lives, even in those of trees. Through extensive research, it has in fact been proven that trees communicate through networks of mycelium in order to warn each other of danger and share nutrients. Better known as mycorrhizal networks or the Wood Wide Web, these networks are essentially large fungal webs found underground, which are made of thin threads of mycelium, also called hyphae, that wrap around the roots of trees. Mycorrhizal networks can stretch for metres, and in some cases, miles. Whilst they may seem underwhelming as a whole, mycorrhizal networks are in fact key to an ecosystem's survival. Firstly, they provide a means of communication between trees in distress, allowing trees to warn each other of danger. The trees also benefit from their ability to transfer and receive nutrients to and from one another through the network.

As mentioned before, mycorrhizal networks provide a means of communication between trees that can be essential to their survival. Through both chemical and electrical signals, trees can effectively talk and warn each other about a range of threats, including drought, insect infestations and harmful fungi - this warning will cause the warned trees to divert energy used for growing into producing chemicals or retaining nutrients to resist the threat. For example, in the event of drought, trees can warn others not yet affected to store their nutrients, and in return the warned trees can provide nutrients to the trees affected by the drought. This ensures the survival of the trees and maintains the ecosystem's balance.

Another important feature of mycorrhizal networks is their ability to transport nutrients across entire forests. Furthermore, trees can also absorb extra nutrients from the soil through the hyphae (in particular nitrogen, phosphorus, zinc, manganese and copper), which are crucial to a tree's development and survival, whilst the increase in root absorption allows for healthier and faster-growing trees. Some scientists even suggest that older trees, who tend to have more connections than younger trees, act as 'parents' to younger trees and saplings, transferring nutrients to them as they grow, as without these extra nutrients, the saplings would struggle to develop. The same is true with plants growing in the shade, which cannot perform sufficient photosynthesis.

Interestingly, the presence of mycorrhizal networks is much higher in less populated areas; studies have found that farmland areas using pesticides, insecticides or fertilisers host fewer networks, if any at all. Additionally, the use of machinery that disrupts the soil, such as harvesters, can destroy mycorrhizal networks. This can cause serious problems for ecosystems, as trees cannot warn each other of dangers, meaning that in the event of an insect infestation, say, many more trees will be killed, as they will not have adequate warning in order to protect themselves. The halting of nutrient transfers and absorption will also affect trees' wellbeing as they often rely on the networks to absorb adequate nutrients. Trees will be rendered more vulnerable to threats such as drought or pathogens. Another threat to mycorrhizal networks is the increasing frequency of wildfires due to climate change; these can completely destroy entire mycorrhizal networks, and thus entire ecosystems. Every plant and animal depends on something else, and so if even one part is lost, the entire ecosystem will collapse. In this light, it seems prudent to value both organic farming and cleaner forms of energy; it is incredibly important to preserve mycorrhizal networks and their corresponding forests. After all, trees produce 28% of the oxygen we breathe and supply food to countless people, meaning the ecosystems they grow in need protecting.

Bibliography

- *Berkeley Executive Education (2022). The Importance of Connections on Our Well-Being. [online] Berkeley Exec Ed. Available at: https://executive.berkeley.edu/thought-leadership/blog/importance-connections-our-well-being.*
- *Dunn, B., Leckie, R. and Singh, H. (2017). Mycorrhizal Fungi - Oklahoma State University. [online] extension.okstate.edu. Available at: https://extension.okstate.edu/fact-sheets/mycorrhizal-fungi.html.*
- *Grant, R. (2018). Do Trees Talk to Each Other? [online] Smithsonian. Available at: https://www.smithsonianmag.com/science-nature/the-whispering-trees-180968084/.*
- *Hampshire (2020). The secret world of fungi | Hampshire and Isle of Wight Wildlife Trust.*
- *[online] Hiwwt.org.uk. Available at: https://www.hiwwt.org.uk/blog/guest-blogger/secret-world-fungi [Accessed 20 Feb. 2025].*
- *Holewinski, B. (2019). Underground Networking: The Amazing Connections Beneath Your Feet - National Forest Foundation. [online] Nationalforests.org. Available at: https://www.nationalforests.org/blog/underground-mycorrhizal-network.*
- *learn.genetics.utah.edu. (n.d.). Plant Defenses. [online] Available at: https://learn.genetics.utah.edu/content/herbivores/defenses/.*
- *Pappas, S. (2023). Do Trees Really Support Each Other through a Network of Fungi? [online] Scientific American. Available at: https://www.scientificamerican.com/article/do-trees-support-each-other-through-a-network-of-fungi/.*
- *Rasheed, M.U., Brosset, A. and Blande, J.D. (2022). Tree Communication: the Effects of 'Wired' and 'Wireless' Channels on Interactions with Herbivores. Current Forestry Reports, 9(1), pp.33–47. doi:https://doi.org/10.1007/s40725-022-00177-8.*
- *Service, M.T. (2024). Things Trees Tell Us & How Trees Communicate with Each Other. [online] Monster Tree Service. Available at: https://www.monstertreeservice.com/monster-tips/tree-care-tips/things-trees-tell-us-how-trees-communicate-with-/.*
- *Trees for Cities. (2019). Can trees communicate? | Trees for Cities. [online] Available at: https://www.treesforcities.org/stories/war-and-peace-through-the-internet-of-trees [Accessed 20 Feb. 2025].*
- *www.spun.earth. (n.d.). Threats. [online] Available at: https://www.spun.earth/networks/threats.*

Coincidences: The Role They Play in Forming Connections

ULA, YEAR 10

Coincidences are a common yet fascinating aspect of human experience. Whether it's thinking about calling someone, only to check your phone and see that they've just called you, or just sharing a birthday with a stranger, coincidences are often explained by probability or chance. So why do we sometimes wonder about their deeper meaning?

As humans, we have an innate tendency to seek patterns in the world around us, allowing us to process information more efficiently, assess situations, and form connections. A psychological mechanism that is often discussed in relation to this is 'confirmation bias'. Essentially, this refers to the tendency to notice and remember events that align with our personal beliefs and expectations, while ignoring the ones that do not. This bias reinforces the perception that coincidences are meaningful because when we selectively focus on those that confirm our existing perceptions, it causes us to overlook the vast sea of randomness. When coincidences involve specific people, places or events that hold personal significance, they naturally take on a more heightened sense of meaning. This makes them feel less random, and more closely linked to our personal narratives, while those without such salience are often dismissed as unremarkable.

On the other hand, mathematics provides substantial support for understanding coincidences. In such a vast network of people, places, and events, coincidences are statistically inevitable. Probability theory is used to explain why certain events that seem rare or improbable are actually mathematically predictable. A well known example of this is 'the birthday paradox.' Effectively, this probability theory states that in a room of just twenty-three people, there is a 50% chance that at least two of these people will share a birthday, and in a group of 180 people, the probability is extremely close to 100%. Although somewhat counterintuitive, this result illustrates how coincidental connections naturally arise, even in small populations, due to the number of overlapping possibilities that are able to occur.

"As humans, we have an innate tendency to seek patterns in the world around us, allowing us to process information more efficiently, assess situations, and form connections."

Coincidences are also often viewed as catalysts for human relationships – whether through unexpectedly bumping into an old friend or meeting a stranger who has many mutual connections. Because coincidences are so frequently viewed as meaningful, encounters like these can often result in the formation of strong personal bonds. The Swiss psychoanalyst Carl Jung proposed a more philosophical explanation for these occurrences, which he called 'synchronicity'. This theory describes events that appear

to be meaningfully related, by coinciding in time and place, for example, but are lacking an obvious causal connection. According to Jung, these synchronicities are unable to be purely explained by cause and effect, randomness, or probability; rather, they reflect an individual's subconscious communicating with the conscious mind.

Jung suggested that these seemingly random encounters indicate an underlying physiological connection between individuals. He believed that the unconscious mind aligns with external events, bringing people together through coincidence. Jung's idea of synchronicity reminds us that the formation of human connections is not always purely logical, often emerging from remarkable, unplanned events.

Ultimately, coincidences may often just be the outcome of probability and human perception, but our inclination to assign meaning to them highlights their emotional salience. Mathematical probability shows us that even seemingly rare events are statistically inevitable, while theories like Jung's synchronicity offer alternative ways of understanding these experiences. Regardless of how they are viewed, the way in which we interpret coincidences reflects our deep-seated desire to seek order, meaning, and connection in an otherwise unpredictable world.

Bibliography

- *Beck, Julie. "The Atlantic." The Atlantic. theatlantic, May 6, 2016. https://www.theatlantic.com/health/archive/2016/05/the-most-common-kinds-of-coincidences/481503/.*
- *Broks, Paul. "Are Coincidences Real?" The Guardian, April 13, 2023, sec. World news. https://www.theguardian.com/world/2023/apr/13/are-coincidences-real.*
- *Casad, Bettina J., and J.E. Luebering. "Confirmation Bias." In Encyclopædia Britannica, November 9, 2023. https://www.britannica.com/science/confirmation-bias.*
- *Farnworth, Richard. "The Birthday Paradox Explained | Built In." Built In, 2024. https://builtin.com/articles/birthday-paradox.*
- *Yusim, Anna . "Exploring the Fascinating Concept of Synchronicity: A Carl Jung Perspective - Anna Yusim, MD." annayusim.com, December 26, 2023. https://annayusim.com/blog/exploring-the-fascinating-concept-of-synchronicity-a-carl-jung-perspective/.*

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Cover artwork by Maya, a Sixth Form Art Scholar who plans to study Geography at the University of Cambridge. Her oil painting of a building uses varied exteriors to symbolise how diverse individuals - each with their own stories, experiences, and identities - are ultimately connected, unified by the very structure that holds them together.