Waynflete Presentation Evening - Round One - 6.30 pm

Oscar Archibald: How has progressive policy made Australian Aboriginals' lives worse?

Australia's Aboriginal peoples suffered greatly following white settlement. But since they received equal rights in 1967, the inequality between Aboriginal and non-Aboriginal people has only increased. Only one in three eight-year-olds meet national reading standards; suicide is the second biggest killer of men after heart disease. Petrol sniffing was so problematic in some areas that now only special odourless fuel is available. How has well-intentioned policymaking made their predicament so much worse?

George Chacksfield: The Prospects of Acoustic Cavitation in Chemotherapy in the Next Ten Years

Acoustic cavitation is a phenomenon where micrometre scale bubbles are exposed to an acoustic field, causing them to oscillate and in some cases, collapse. This Waynflete project explores one of the potential medical applications of cavitation – its ability to improve the uptake of chemotherapy drugs into certain tumours. This has the potential to revolutionise the field of cancer treatment, reducing side effects and costs whilst improving patient outcomes.

Dimitrios Coussios: Kinetic Architecture in Warmer Climates and the Carbon-Neutral Agenda

Kinetic architecture responds and adapts to its ever-changing environment, moving its components to better harness natural resources. Exploring technologies from the past, present and future, my research determined whether the implementation of kinetics is a viable solution for carbon-neutrality in warmer climates.

Waynflete Presentation Evening - Round One - 6.30 pm

Clement Jin: Music Generation with Deep Learning

Deep learning is highly effective at recognising patterns in data, to the extent that it can exhibit signs of "creativity". I explore deep learning in mathematical detail, digging into the design of neural networks and the algorithms that allow them to "learn". Due to the highly systematic rules that govern music composition and its scope for creative flair, I implement these algorithms into a neural network designed to extend melodies from J.S. Bach's Chorales with startling conclusions.

Hanna Lipman: Proteins and Vision - a Study of Rhodopsin in the Eye

The eye is a marvel of sensory engineering, seamlessly blending precision and speed in processes essential for daily life. Its functionality relies on shape-shifting proteins and its remarkable capacity to adapt to fluctuating ambient light conditions. My talk will explore how incident photons trigger a cascade of intricate molecular processes, ultimately leading to the brain's interpretation of electrical signals as vision.

Mantas Robinson: Faking Frames: AI Algorithms for Real-Time Raytraced Lighting Simulations

What do Finding Dory, architectural pitches, and product design all have in common? They are all applications of the latest development in computer graphics: Raytracing Algorithms. In this presentation, I will explain the theory behind their mathematically perfect representation of reality, the performance issues plaguing their current implementation, and how researchers, engineers, and developers are using artificial intelligence to solve these problems and make the technology accessible to the world.

Waynflete Presentation Evening - Round One - 6.30 pm

Hugh Rust: Could UK economy make a full switch to electric cars?

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Yifeng Yang: A New Propulsion System for Interplanetary Exploration

Interplanetary travel has long been a staple of science fiction. This project aims to bridge the gap between concept and reality by developing a new propulsion system, offering a new perspective towards SSTO spacecraft. Building on existing literature, I synthesize a new solid propellant and assess its properties using OpenMotor and ProPEP3, and construct a fully functioning liquid rocket engine, conducting test burns and static fires for numerical validation of the nozzle geometry and propellant characteristic estimations.

Waynflete Presentation Evening - Round Two – 7.00 pm

Judd Bayona: Fandom as a form of resistance?

While modern society's relationship with it has undeniably been rocky, fandom is demonstrably more than a trifle. I explore how fandom in the modern age could motivate personal resistance to socio-political counter-currents - "political empowerment", if you may. Chiefly exploring the theories behind fandom and media interpretation on a personal level, I then highlight the implications this has on a collective level - and how pop and politics could collide.

Wyatt Ip: Using AI to Determine Similarities Between Strategy Board Games

In this project, I created an artificial intelligence to play three strategy board games: Chess, Draughts and Othello. Using resources available online, I implemented a decision-making algorithm and an evaluation function for my AI. I then trained it using a learning algorithm to optimise its performance when playing each game. The objective was to compare the common principles and determine any similar strategies between the games.

Ruby Lin: Can bee venom be used to treat bacterial infections?

Bacteria are fighting back against antibiotics, but could bee venom (BV) unlock a bactericidal breakthrough? In this Practical Waynflete, I designed and conducted Kirby-Bauer and minimum inhibitory concentration assays on six selected commensal strains of bacteria in this Practical Waynflete. Despite positive results, it seems that the cytotoxicity of BV's melittin peptide might just outweigh its therapeutic benefits. Could the emerging nanoliposomal drug delivery system overcome this administrative barrier?

Waynflete Presentation Evening - Round Two – 7.00 pm

Sasha Lodh: Can Tesla stay ahead as an EV manufacturer in the coming decade?

In the last 20 years, Tesla has gone from an obscure startup to one of the worlds' most recognisable brands. But what lies ahead? Will Tesla fall by the wayside, or will it rise to the challenge of increased competition and tepid consumer demand? I believe that Tesla is unlikely to retain its' role as a leading EV producer in the coming decade. Join me to learn why.

Arush Panwalkar: Jester's March ~ a Composition

I aimed to construct a piece using concrete influences from postminimalism and orchestral modernism, and then elaborate on the creative ambitions which led me to make particular decisions in the piece. Rather than rigidly stick to the doctrines and compositional structures pursued by those schools of composition, I wanted to create an almost parodic combination of these techniques, while preserving their attitudes to dissonance, rhythm, orchestration and timbre.

Kaylan Parekh: Aircraft Engineering: Reducing Aviation's Environmental Impact

I outline aerodynamic and fuel related modifications to airplanes and evaluate each system. A few areas explored are drag reduction, hybrid or fully electric aircraft, and hydrogen fuel cells. With the aviation sector in danger of becoming a seriously large proportion of global greenhouse emissions, it seems the perfect time to try and tackle the issue of sustainable flight from an engineer's perspective, with careful consideration to financial constraints as well.

Waynflete Presentation Evening - Round Two – 7.00 pm

Lily Starling: Chernobyl and Fukushima: Their Impact on German and French Politics

This project dissects the political and economic repercussions of the nuclear disasters of Chernobyl and Fukushima on Germany and France. I analysed the impacts of these disasters alongside other factors that influenced nuclear policy between 1986 and 2023. Through investigating public opinion, individual politicians, and composition of political systems in these countries, I found that the interplay between cultural values and the parties's systems formed the basis for the divergence in nuclear policy.

Steven Wong: Can placebo treatment replace painkillers in a clinical setting?

The placebo effect is frequently observed in drug trials when a patient experiences positive effects despite only taking an inert substance. This project determines the effectiveness of placebo treatments in relieving pain by evaluating mechanisms of how placebos and painkillers suppress pain in the body, known placebo treatments such as the use of homeopathy, and the disadvantages of using placebos or painkillers, such as ethical issues and potential side effects.

Waynflete Presentation Evening - Round Three - 7.30 pm

David Balbus: Reconstructing the reign of Cambyses (530-522 BC)

Son of Cyrus the Great and ruler of the largest empire the world had ever seen, Cambyses' conquest of Egypt brought the Persian empire to new heights, but history mostly remembers him as a sacrilegious madman, cruel tyrant and the insane general who lost armies to his folly. Yet, sources on him are scarce, short and contradictory – this project aims to find out what we can actually know.

Yoonjun Choi: Cancer Immunotherapy: Evaluating Efficacy and Overcoming Challenges

Cancer is one of the leading causes of death worldwide, becoming increasingly prevalent and difficult to treat. Immunotherapy has emerged as a promising mode of treatment by harnessing the immune system's ability to recognise and destroy tumour cells, with immune checkpoint inhibitors (ICIs) being the most successful approach. However, challenges persist, particularly with 'cold' tumours that lack immune cell infiltration. My project explores the limitations of ICIs and novel strategies that could enhance immunotherapy, potentially paving the way for more personalised cancer treatments.

Shubhangee Das: Can a Machine Ever be Conscious?

The exact definition of 'consciousness' is widely debated among philosophers and scientists. My project explored whether machines could achieve consciousness, drawing on Gödel's Incompleteness Theorems and the Lucas-Penrose argument, which suggests human understanding of mathematical truths cannot be replicated by a machine. By integrating ideas from philosophy, mathematics, and neuroscience, I argued that if consciousness can be reduced to a computation, then machines could, in principle, exhibit consciousness.

Waynflete Presentation Evening - Round Three - 7.30 pm

Will Haywood: Can game theory shed light on political elections?

How powerful is maths? Can we use maths to decipher the world of politics? In this project, I examine whether it is possible to use maths (specifically game theory) to accurately predict the outcome of an election, and whether we can figure out an optimal strategy for a given voter so that they are most likely to be satisfied with the outcome of the election. I also look at whether it is possible for maths to tell us what the perfect voting system is.

Bea Huxter: Will neural implants be possible within this century?

My project questions the viability of new brain implants to "rebuild brains" - or cure severe brain injuries within this century. These implants would mimic complex brain functions through biological or technological means. Together we will look into the utilisation of stem cell research to grow brain organoids, new artificial intelligence models that mimic our neurones, and adapting surgical techniques to suit the needs of such implants, all within the next 100 years.

Sam Potter: Designing and making a liquid rocket engine

In this presentation, I will take you on a journey through my process of researching, designing, and testing my own liquid rocket engine inspired by early hypergolic technology. I will delve into the fascinating Physics and Chemistry underpinning liquid rocketry in addition to its controversial history. Using declassified defence documents and explosive test footage to help answer the question, "Can I successfully recreate a liquid rocket engine?