THE HARROVIAN

VOL. CXXXIII NO.11 *November 28, 2020*

SCIENTIFIC SOCIETY

Dr Chiara Marletto, Wolfson College, "Beyond Quantum Computation"

Dr Chiara Marletto, a research fellow at Wolfson College, Oxford, took the Scientific Society along a riveting ride through quantum computation and beyond. The lecture began with a brief explanation of quantum theory and computation. A quantum computer utilises quantum phenomena such to perform almost mystical levels of calculation and processing. A handful of highly inventive pioneers including R Feynman, C Bennett, G Brassard, D Albert, P Benioff and D Deutsch proposed the idea in the 1980s. Quantum computers are theoretically superior to classical computers relying on classical Newtonian theories and general relativity in whatever form. Due to their supremacy, many large organisations and states have invested significant amounts of money into their research and commercialisation. For Dr Marletto, quantum computation is interesting as it is a field which allows in-depth research into quantum theory itself. Quantum computation entirely relies on an approach that may soon have to change as it cannot describe fundamental parts of the universe, such as gravity.

Our current best theories about the universe are Newton's laws, Maxwell's equations, general relativity, and quantum theory. Of these, the first three are classical, intended to apply universally (i.e. everywhere no matter the circumstances). The theories are based on dynamical laws, starting points and trajectories. Dr Marletto, with David Deutsch, has developed the constructor theory of information which formulates fundamental laws of physics in terms of possible, impossible and why.

Quantum theory differs from classical approaches in many ways. Quantum superposition is possible as a quantum particle (e.g. an electron or a photon) passing through a double slit produces wave-like interference, meaning a particle can interfere with its path of travel, whereas in classical particles distribution is individual. A simple experiment involving two mirrors and two beam splitters shows how a photon can be in a quantum superposition of path 0 and path 1. A photon passed through a beam splitter travels along two different pathways although only one exists, very much like the Schrodinger's cat experiment where there is only one cat but multiple states in which it can be. Quantum superposition leads to Heisenberg's uncertainty and incompatible observables, where none can be sure exactly where the photon is when it is travelling across both path 0 and 1. The outcome of a measurement of the position is unpredictable.

Dr Marletto then briefly explained quantum entanglement, where objects (e.g. electrons) correlate in a different way from classical correlation. Entanglement requires two particles and, to confirm entanglement between two systems, one needs to measure at least two 'incompatible observable' not simultaneously. When a person observes superposition, the observer now gets entangled to each different pathway as they see a photon in both path 0 and 1, where another observer observes the original observer watching the superposition, they also get entangled into the two systems. Therefore, in theory, the branching never stops and produces the possibility of a quantum multiverse where any possible outcome happens.

However, there is a significant catch in the form of gravity for quantum theory. Currently, general relativity is our best theory on how gravity works, which states that gravity does not have superpositions or entanglement. Both quantum theory and general relativity are universal theories; therefore, either both must be wrong or only one right. To answer the question (unanswered to date), scientists have continued to argue about whether gravity is quantum or classical and, arguably, are quite stuck. Richard Feynman posed the question of how to test if gravity is quantum; this is where Dr Marletto started explaining beyond quantum theory.

By conservation of energy and by the 2nd law, quantum theory is impossible; however, by the newer computability of nature, it is possible. Dr Marletto used the constructor theory's programme to show how laws are expressed as scale-independent principles, not dynamic. Her paper into gravitational entanglement as a test of quantum gravity was an act of spark. If gravity can entangle two masses, then gravity must contain at least some qualities of quantum. If the test proves true, scientists have ground to refute all classical theories of gravity, including Einstein's general relativity. Current technology is not far from enabling this experiment. A mass of 10^-12kg is needed to observe gravity in superposition; our current limits of macro-superpositioning is right below the threshold. It will soon be possible to see the laws of physics being rewritten. Dr Marletto then emphasised the importance of our engagement with physics and the scientific world to bring this to reality.

Several excellent questions wrapped up Dr Marletto's brilliant and insightful lecture. A question about the gravitational experiment ended up with an explanation of gravitons, a hypothetical quantum of gravitons, which will in gravitational superpositioning serve as a channel that runs across the two masses and propagates the qualities of one to another. A few other questions delved into the realms of quantum biology, including whether there are limitations on the size of superpositioning and its effects on living beings. We also dipped a toe into Schrodinger's bacterium, where light and bacteria, two different substances, were so strongly entangled that two different materials got entangled. Ending on this exciting note, the invaluable lecture by Dr Chiara Marletto fully engaged the audience.

ORIENTAL SOCIETY

Tamir Zolboo, The Head Master's, "From Genghis Khan to today: the rise and fall of the Mongol Empire",MLS, 10 November

On Tuesday afternoon, Tamir Zolboo, *The Head Master's,* gave a lecture to the Oriental Society titled 'From Genghis Khan to today: the rise and fall of the Mongol Empire'. He gave a detailed description of what Mongolia was like pre-empire and how Genghis Khan united tribes across the region to form one of the strongest empires in history.

Guiding us through the medieval ages, Tamir talked about how the once large empire began to contract, and eventually split into four territories. By the 17th century, the once great Mongol empire had become the smaller Northern Yuan dynasty. He then proceeded to talk about the modern-day integration of country and city life, as well as the heritage and impact that Genghis Khan's great empire still has on the world today.

Tamir's passion was evident throughout the talk especially when naming Genghis Khan's ancestors and he impressed us with his accuracy of speaking the Mongolian language and reciting historical accounts.

DEBATING SOCIETY

Harrow v Eton, Online, 10 November

On Tuesday 10 November, the culmination of an age old rivalry met its climax. When face to face with 'the other place', how would the courageous members of the School hold up in the most competitive of fields? No, this was not the Lord's match, neither was this the 1st XV battling on the Sunley. This was debating.

The motion before the house was '*This house believes that a stable dictatorship is better than an unstable democracy*'. The first speaker for Harrow, who were proposing the motion, was Edward Blunt, *Elmfield*, who argued that stable dictatorships bring benefits in longer-term thinking and planning. In contrast to elected officials whose only priority is getting a quick kick in the polls before the next election, stable dictators are able to see the bigger picture, making moves that will sacrifice success in the short term in order to gain long-term advantages. Moreover, Blunt spoke of how stable dictatorships allow longer-term negotiation, both with significant stakeholders and international entities. This can allow for more effective trade deals, the expedited use of advantageous opportunities and a more reliable ground to stand on, without the risk of being undermined. Stable dictators can get better deals for their people than unstable democracies. Finally, Blunt spoke about how governments can become more efficiently technocratic when dictators are in charge, rather than relying on arbitrary popularity restrictions to become a member of the political establishment.

Aakash Aggarwal, *Lyon's*, then continued the discourse by outlining his arguments against unstable democracies. Firstly, unstable democracies often lead to gridlock. The filibuster system in the United States serves as clear evidence of the difficulty of passing meaningful legislation. In democracies, we see government shutdowns, failure to pass common-sense rules and other unproductive opposition-based politics. Due to the competitive nature of democratic systems, the opposition are incentivised to dissent against a government position, even if it is reasonable, practical and beneficial. Similarly, the oppositional nature of democratic politics can often lead to factionalisation, which in turn can cause unrest and civil war. On the other hand, dictators are able to put down any protests, in order to stop the country from going into damaging and destructive acts of internal violence.

The third speaker from Harrow was co-captain William Wauchope, *The Knoll*, who argued that democracy leads to majoritarianism, and thus can result in severe genocidal incidents. Because democracy places an emphasis on the majority being in power, it means that minorities are often under-represented, with their interests being pushed to one side. One example of this is the underlying reasons behind the Rwandan Genocide. By way of contrast, this effect does not occur to such an extent under dictatorships. Take Attaturk for instance: despite facing a simlar situation to that of Rwanda, it was under this dictator that much of the progressive rights agenda that exists in modern secular Turkey was founded today.

Finally, the other half of this year's leadership team, (Dylan Winward, *Lyon's*) wrapped up by offering his customary set of rebuttal to some of the more obscure "truism"-based points from the Etonians and evaluated the metrics upon which the debate was won. Winward managed to bring the Harrow argument to a close with some gusto, leaving a tight adjudication ahead.

The Harrow First Team (and indeed the other Harrow teams) should be commended on their ability to keep places and trade blow for blow against the national champions and should be optimistic about their prospects in a rematch post-Covid. Thanks must also be offered to SMK for kindly hosting the event, and boys in the Lower Sixth for running the Debating Society coaching this term, along with all those Harrovians who gave up their time to participate in the four debates.

HOUSE DEBATING

House debating is always a dramatic affair: some even suggest that this House activity can be comparable to a boxing match of the mind and mouth, with some low blows being swung and often the odd competitor left exhausted and bruised. This week's line up included some formidable competitors including former junior champion team Aakash Aggarwal and Dylan Winward, both *Lyon's*, a ferocious team known for their well-articulated and cut-throat speeches; and from Moretons, Gareth Tan and Q Sun, well known debaters and speakers who had preformed strongly in this competition in the previous year. Newlands produced Edos Herwegh-Vonk and Alexander Morrison, both also among the School's intellectual elite. And finally, from West Acre, Marcus Tung and Ryan Naskau. Indeed, the motion was certainly a good one: '*This house believes wokeness is just empty virtue signalling'*. An often-debated topic among the School's students now took to the debating chamber, with Newlands and Lyon's proposing and Moretons and West Acre opposing.

Aggarwal was first speaker and with his ever fine line of rhetoric, attacked the very idea of wokeness like it was the conception of evil, shaking his fist in anger as though if the house did not accept this belief then it would be a true crime against society. He elaborated upon his initial outrage, explaining that wokeness put a label upon people and made them conform to a strict set if beliefs that could not be infringed lest they be cancelled. Indeed, he argued, people attempt to appear woke to stay socially acceptable. Tan, with all his wit (and incredible courage) dared to question Aggarwal as to how people could act by not being woke when they were asleep. This comment seemed to throw Aggarwal off guard, albeit only momentarily, and in hindsight can be viewed as a warning of Tan's barrage of other comments.

Next came Tung, who outlined how wokeness was not virtue signalling at all but positively benefits society. In fact, he believed that wokeness propagates equality and diversity. All seemed lost for the Lyonians and Newlanders only two speeches in, but then, like Gandalf ascending from the dire abyss of Middle Earth, Winward dared to unmute. Anyone who's ever debated Winward knows well that allowing him to take the podium is a fatal error, for once you do the debate is all but lost. Winward told the horrifically sad story of Jimmy Fallon, who had dared to do black face in the 1990s and was subsequently threatened with cancellation. Of course, Winward failed to mention that Fallon never was cancelled and he remains with a net worth of 60 million and cult popularity status, which was perhaps a fault in his otherwise excellent arguments.

The second West Acrean, Naskau took the virtual podium next, and though his rebuttal and emphasis that wokeness was not empty virtue signalling was strong, he struggled to be able

to rebuke Winward and Aggarwal's points. He was further hindered by the barrage of points of information (the tactical foul of house debating), which came in faster than boys to the Shepherd Churchill when salmon teriyaki is on for lunch.

Morrison rebuilt the points made by Winward well from the Newlands library, making a strong show of himself and the Newlands team, who would take over the proposition for the second half of this debate. With Moretons and Tan leading the charge for the opposition, some strong points were made. However, much was overshadowed by Tan's dismissal of Morrison's claims on the grounds of his 'whiteness giving him the privilege to criticise wokeness'. When Tan uttered these words all four proposition speakers shouted POI at the same time. Tan, in his attempts to dismiss his opponent as regardless, had inadvertently given the proposition the opportunity to strike a killer blow and Herwegh-Vonk certainly made the most of it. He doggedly shredded Tan's statement as though he were the true defender of diversity and equality.

Unfortunately, Q Sun, the final Moretons speaker, was plagued both by having to explain his partner's unfounded comments and poor wifi (always a blessing to a team facing a strong opposition in the Zoom era). However, despite his disadvantage he argued (when audible) to a very high standard.

The turnout from audience was slightly lower than anticipated this week. However, I'm sure you will note that Debating Society is more about the quality of its attendees than the quantity, and in the former we had rather enough. With members of our quality audience sending in questions, a floor debate ensued questioning Tan's wokeness, whether Winward is the next Laurence Fox and the key themes of wokeness. It also gave Tan the opportunity to explain himself and justify his earlier comments, a much-needed line of reasoning which contextualised and gratified the situation to the audience and brought some sort of closure to the mortified Morrison.

To conclude, this was a excellent debate with strong speakers from all sides and I do not envy the judging panel who have to make these tough decisions.

Many thanks to SPS for hosting House debating in its first-ever online form and allowing this activity to continue even when many others are not.

MATHS CHALLENGE

In the Senior Maths Challenge, which took place just after half-term, Harrovians earned a very impressive 25 gold, 38 silver and 16 bronze certificates. Special mention is due to Arvind Asokan*, Bradbys,* Leo Jiang and Daniel Zhang (both *The Knoll*) who came joint top of the School with a score of 120/125. Twenty-five boys have qualified for the follow-on rounds later this term.

METROPOLITAN

HOME

London Academy of Excellence, Tottenham

London Academy of Excellence Tottenham, who are in partnership with Harrow School, recently held a poetry competition on the theme of 'Home', inspired by life during lockdown. It was externally judged by the author Ben Markovits, and the winners are published below.

1st Place

searching for my mother

i look for her in the kitchen
in the crevasses of the cupboards
the stacks of spices on the shelves
she left her touch on the pots and pans
but i forgot i washed them the other day

i look for her in the bathroom
in the disarray of makeup
kajal, concealer, the chalkiest pink blush
the stacks of bhindis on the mirror surface
i hid them away the other day

i look for her in her bedroom
in between the silks, chiffons and georgettes
from Dhaka to Calcutta to Banaras
the colours of the south bleeding through the wardrobes
i packed them all up the other day

i look for her in the living room
dust circles on the coffee table top
remnants of her on the tv remote, the numbers 6 7 and 8 rubbed off
pictures half hung on the wall
i took them down the other day

i look for her in the garden
i see her love in each rose, every petal as soft as her
the colours of the rainbow washing into the soil
fluorescent reds, pastel yellows, the purest of whites
all cut off the other day

mother,
i can't bear to see you everywhere
but the one place i can't erase you from is
myself

Bela Khandker (Year 13)

Second Place

Arriving Home

Your hand clasps the cold metal of your front door
Fumbling for your keys in the winter cold
Clicking, it opens, then clicking, it shuts.
Eager to be home.

You slip your shoes off quickly and place them neatly
Beside the Converses, light up trainers, heels and dress shoes
Surrounded by a familiar warmth of burning essence and roasting dinner.
Finally you are home.

Your younger siblings giggle and clatter upstairs
Your older sister hums to the rhythmic buzzing from her earphones.
You squirm under the roughness of your father's beard as he kisses your cheek.
This is home.

Samira Mohamed (Year 12)

Third Place

Letters under my pillow

I can't paint a pretty picture of home in black and white
Once you strip it down to its most basic parts you find you've lost all parts of
Your culture

You mould it into a more desirable product that can blend more seamlessly
God forbid it stand out too much,
Appear too colourful
You see everything in my life's been between black and white
Is that why I scarred my scalp straight for your approval?
Or practiced my poise and polished my pronunciation for you?

The American Dream is a lie
You only make it if you lose all parts of yourself
You mould yourself into a more desirable product that can blend more seamlessly

God forbid you stand out too much,
Appear too colourful.
You see nothing about my life has ever been black and white

I find myself stuck in the grey area
Where the weight of history hangs heavy on my shoulders
Restless is my mind when I cross campus

Is this all they see when they look at me?
The grey walls begin to collapse in on themselves forcing the binary choice
Black or white

I'm black in a white world no matter how stripped down
But I soon learned I couldn't fit back into the black world
As I've lost all parts of my culture

Chantay Thomas (Year 12)

JOHN LOCK ESSAY

Ben Swan, Moretons, "What is the socially efficient level of crime?"

Crime imposes immense costs on societies across the world. In the US, expenditures on the criminal justice system in 2012 were over 210 billion dollars. In the UK, reports estimate the total cost of crime to be 50 billion pounds. Economists often frame their discussions with a simple question: how do we minimise the social cost of crime, given the social cost of crime equals the cost of crime plus the cost of crime control. To address this question, we must construct a method that interprets where an equilibrium between the cost of crime and the cost of crime control sits. In order to do this, we must consider the following questions: How much crime control is too much, and how much crime is too much? It is given that a country would be failing to protect its citizens if it let crime run rampant. Alternatively, a 'big brother' style regime, where the inspector implements omnipresent control, will be highly inefficient because crimes will decrease to a minimum and crime control activities will no longer amortize. Utilizing game theory, we can theoretically demonstrate where the socially efficient level of crime would sit and see that no one dominant strategy exists for either the offender or inspector.

Nash Equilibrium

The underlying mechanism is the game theoretical concept of Nash equilibria, which is demonstrated through a model of interdependent decision-making between offenders and control agents in the so-called inspection game. Inspection games are 2x2 games in which one player must decide whether to inspect the other player, who must in turn decide whether to infringe a norm or a regulation. The inspection game has been theoretically developed by Tsbelis (1989, 1990) and further by Holler (1993), Rauhaut (2009)and Andreozzi (2010) who looked at the experimental and mathematical properties of the inspection game. The inspection game works off the idea that both participating parties are at odds, where the success of one party implies the failure of another. Rational and selfish offenders will commit crimes if they believe they can't be caught while rational and selfish control agents will make active efforts to inspect when they believe offenders will commit crimes. More specifically, criminals and inspectors are in a so-called discoordination game. The underlying payoff structure is similar to the zero-sum game, where one participant's gain or loss of utility is balanced by the other agent's gains or losses of utility respectively. In a pure strategies, normal form matrix between these two parties, one would expect to see a dominant strategy equilibrium where each player chooses their own dominant strategy. In this question, there is an absence of said dominant strategy equilibrium in pure strategies as the optimum strategies for each party is conflicting with each other.

Inspection Game

To view an inspection game specific to this question, I will be using offenders as agents for crime and inspectors as agents for crime control. The game can be formalized in the paper Game Theory by Rauhaut (2015). Offender i will decide to either commit a crime, gaining the payoff y but also punishment p if caught; or not commit a crime, in which his payoffs will remain unchanged regardless of the inspector. Inspector j has the choice to inspect, where he will have to pay inspection costs k regardless of the other agents' action. If the inspector does catch the offender for having committed a crime, the inspector will receive the reward r. If the inspector doesn't inspect, his payoff is zero. In this model, we will assume that undetected crime is favourable to the criminal, and the punishment is a real threat to the offender. Therefore, we can assume that $p > y > 0$. In addition, we can expect $r > k > 0$ as inspectors are assumed to gain more from successful inspections.

Rauhaut presents a model of the inspection game – as seen below.

Mixed Strategy Nash Equilibrium

The absence of a dominant strategy is elucidated by the circling arrows in the table above. Seeing as there is no combination of pure strategies where both players have no incentive to change their strategy in equilibrium, no pure strategy Nash equilibrium exists, meaning only a mixed strategy Nash equilibrium can exist. This means that they assign a certain probability to each of their possible actions, which in turn determines which action they perform. If both parties look to optimize their expected payoff, the equilibrium in mixed strategies is such that each players' probability distribution makes all others indifferent between their pure strategies. In other words, the equilibrium sits where offenders choose the probability for crime at the indifference point of inspectors and inspectors choose the probability of inspection at the indifference point of offenders. This point of equilibrium is called the mixed strategy Nash equilibrium.

		inspector j		
		inspect		not inspect
offender i	crime	$y-p\ ,\ r-k$	$\Leftarrow$	$y\ ,\ 0$
		$\Downarrow$		$\Uparrow$
	no crime	$0\ ,\ -k$	$\Rightarrow$	$0\ ,\ 0$

(*Above*: Rauhaut's model)

If one player is not indifferent in their options, they will take advantage and exploit their opponent. This would give the incentive for the opponent to change their strategy so as not to get exploited, and this continues. The only way in which this question works is where the probability combination makes each player indifferent between both of their alternatives.

This equilibrium can be established as follows. We can let si denote the probability that the offender i commits the crime and cj denote the probability that inspector j inspects offender i. The value of 0 means that no inspection and no crime has occurred. A value of 1 means either inspection or crime has taken place. However, a value that sits between zero and one means that the actor chooses a mixed rather than pure strategy.

The payoff function (δ)for offender i against the inspector j can be defined in the following way:

$$\delta i\ (si, cj) = si\ (y - cjp)$$

The payoff function (μ)for inspector j against the offender is defined as:

$$\mu j\ (si, cj) = cj\ (sir - k)$$

If the offender decides to commit a crime, and the inspector decides to inspect at the same time, then the payoff for the inspector will be r – k while the payoff for the offender will be y – p. Although arbitrary, assigning certain utility values to the outcomes of either the inspector or offender's decision can help to conceptualise the payoffs. For example:

Let 1 denote a positive payoff when $y - cjp > 0$ and 0 denote a negative payoff when $y - cjp < 0$. If the payoff is positive, offender i's best response is to commit a crime as the reward for the crime (y)is greater than the perceived loss from being caught (cjp). Alternatively, if the expected payoff is < 0, a rational offender would not commit a crime as the reward gained is less than the expected loss from being caught.

However, if the overall payoff of $y - cjp = 0$, it suggests that offender i is indifferent to committing the crime and not committing the crime as he perceives his payoff from committing the crime, y, to be equal to the punishment he will receive if caught by inspector j. This indifference suggests that whatever probability there is to commit a crime, offender i's payoff will remain the same. We assume that offender i is trying to maximise his payoff in this instance; therefore, any payoff that is below 0 is unfavourable. Thus, we can conclude that offender i will commit a crime whenever he has the probability of a positive payoff, i.e. $(0 < si \leq 1)$.

We can model inspector j's best responses similarly.

Let 1 denote a positive payoff when $sir - k > 0$ and 0 denote a negative payoff when $sir - k < 0$. When the expected benefits of inspecting outweigh the costs of inspecting, one would expect inspector j to inspect and vice-versa.

When $sir - k = 0$, it suggests that the inspector is indifferent to the payoff for inspecting (sir) and the inspection costs of k. We can deduce that inspector j would respond best to crime with some probability of inspection between 0 and 1 $(0 < cj \leq 1)$.

From this analysis, it's clear that no answer to this question exists in pure strategies and there lacks a clear dominant strategy for either player. If offender i were to choose to commit a crime for sure $(cj = 1)$, the inspector would rationally choose to inspect $(si = 1)$. At this point, the offender's new best response is to not commit the crime $(cj = 0)$for which the inspector will respond by not inspecting $(si = 0)$. Therefore, the only feasible way to look at this question is through a mixed strategy Nash equilibrium. The only stable option where both parties aren't exploiting each other is where they are indifferent to their choices, thus the best response for offender i and inspector j is indicated by $y - cjp = 0$ and $sir - k = 0$ respectively. The combination of indifference points will yield the equilibrium in mixed strategies.

Expected Crime Rate

To deduce the expected crime rate, we can model the predicted probability of offender i to commit a crime. The aforementioned equilibrium implies that offenders will choose to commit a crime with the probability of

$$si^* = k/r$$

This exemplifies that the crime rate only depends on the payoffs of inspector j, therefore on the inspection rewards and costs. Thus, when costs of inspection are greater than the rewards, there is a greater probability that the offender will commit a crime and vice-versa.

Expected Inspection Rate

The expected probability of inspectors to undergo inspections can be viewed by the probability

$$cj^* = y/p$$

We can see that the probability of inspection is dependent upon the payoff of the offender, thus on the payoff gained from the crime and the punishment cost. This suggests that when the payoff for crime is greater than the punishment, inspections should take place.

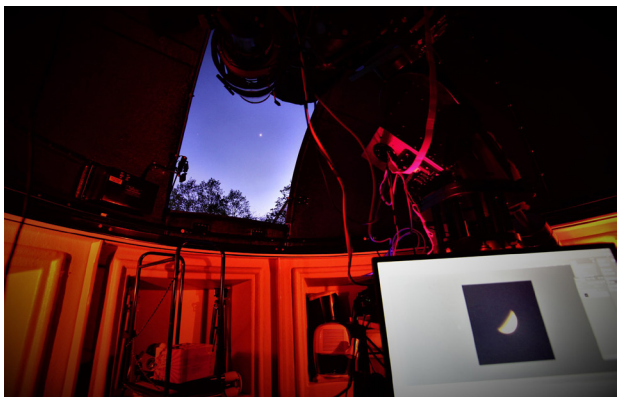
The socially efficient level of crime is where offenders will commit a crime k/r proportion of the time and the inspector will inspect y/p proportion of the time. One could add numbers as payoff values; however, these would merely be arbitrary as the payoff values would be unique to each situation. This conclusion can be useful to deduce the different equilibrium strategies for different crimes, i.e. the difference between petty theft (which would have a fairly low reward but also a low punishment) and corporate fraud (which has a much higher reward and punishment). Moreover, this could help economists to see impacts that real-world actions have on the crime rate. For example: the advent of CCTV cameras, which allows greater inspection by police but drastically reduces the cost of preventing crime which would lower the probability that offenders will commit crimes, by this conclusion. Similarly, a change in jail sentences can have a significant impact on the propensity to commit crime and the cost of prevention. The socially efficient level of crime is therefore dependent on the payoffs of punishments for getting caught, the reward of committing crimes, the cost of policing and incentives offered to crime fighters. These factors will be influenced by technology advancements, policy and other factors. Ultimately, the socially efficient level of each type of crime is unique and, furthermore, these levels of socially efficient levels are constantly being changed.

PHOTO COMPETITION

Night Photography

Winner: BJDS

'Wembley Bladerunner' was taken as the night came to an end and a new day in London began. The silhouetting of Wembley and the harsh yellow light behind creates both a feeling of darkness yet excitement. The darkness of Wembley creates a message that as the business side of London begins in the morning, the activities surrounding Wembley sleep before coming alive again that night.



Runner Up: CMC

Dr Crowe's astronomy-based pictures are real eye-catchers. The first image, taken inside the Rayleigh Observatory showing the process of observing Venus, has a nice contrast in colour between the red and orange on the inside of the observatory and the blue night sky. The second image, taken in the summer as the Moon rose over London in the dusk sky, has a really nice contrast between the light and dark areas of the moon and creates areas of effective negative space.

Ulrico Zampa, *The Head Master's*

Zampa has captured a really beautiful scene of a man paddling through a lake at sunset. The simplicity of the image with the reflection, shallow forest, and the single figure is really eye-catching.

Harry Owens, *Rendalls*

This photo has everything you want from a photograph taken in an urban area at night. The shadows of the railing, the streetlights directing the eye down the road, people walking around, and the moody sky all combine to create a frame with a lot of different points of interest.

Brandon Chang, *Druries*

Once again, the reflection of the different colours on the water, this time from an urban scene, is really effective. The way the ripples in the foreground distort the reflection help draw the eye towards the main buildings.

Ilyas Qureshi, *The Park*

Slow-shutter tracking of cars really isn't easy, but here it has been done really nicely and has resulted in the car being the immediate point of focus for anybody looking at the image. It also creates a dramatic scene with a real sense of motion as the surrounding scene is blurred in the direction of the car's movement.

Mrs Shryane

This early morning view of Newlands among the trees creates a really nice reflection on Park Lake and it is really beautifully captured. The lights coming from a few windows of the boarding House show life in between the trees.

Thank you to everyone for their entries. The next competition will run over the Christmas break with the theme 'Winter is Coming'.

SUDOKU

Persevera per severa per se vera

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OPINION

CORRESPONDENCE

Dear Sirs,

Many readers may expect me in this letter to critique the arguments Aggarwal made in his previous letter. However, it is with utmost regret I inform you all that we have unfortunately settled our differences. You may think that this is perhaps a rather boring ending, but take a moment to consider my own disappointment. Just when I was about to write an extremely inflammatory (but rational) letter, Aggarwal and I came to an understanding. Now there is almost a void in me that is impossible to fill because of this, and I apologise to everyone who was anticipating my response. However, I would like to propose a poll of what you readers think about this.

Let us all remember why we are here – in pursuit of truth. All of us. What really is truth? I don't know. That's why we're pursuing it. The purpose of living is to experience the unknown future. But how can we experience something that isn't the present? Where did the word "present" (the gift) come from anyway? Aggarwal was right. I am both a "man of science" and "man of philosophy".

Not to worry. If anyone writes an illogical letter in the future, disrespecting these wonderful pages of *The Harrovian*, I will be the first to critique it.

Stet Fortuna Domus,
Brandon Chang, *Druries*

Dear Sirs,

During this time of Covid restriction, with the buses, trains and other forms of communal transport unfortunately incapacitated, I am reminded of the tale of Sir Alex Allan, who was recently sacked by our dear prime minister. Sir Alex Allan, a senior civil servant, started his career during the reign of Baroness Thatcher. When London was struck by the rabble of righteous rioters, who refused to let anyone into parliament, Sir Alex Allan concluded that he would, instead, windsurf, into the Palace of Westminster. Below is the image of Sir Alex cruising down the Thames.

Sir Alex was congratulated by Baroness Thatcher for his ingenuity and was made the founder, first member and only ever member of the Parliamentary Windsurfing Club.

So in the event that Extinction Rebellion does go full 1917 Russia on us, windsurfing has been, and always will be, a viable option for transport in modern society.

Your sincerely,
Henry Ridley, *The park*

PROPOSED STATISTICAL EXPERIMENT

Given the number of boys sent home out of Harrow's abundance of caution relating to COVID-19, it has struck many boys that they may be faced with the possibility of sitting Trials from home. These Trials are of considerable importance: as the Head Master so eloquently explained in this week's Speech Room, they form the basis for Lower Sixth predicted grades, and may even be used in determining this year's GCSE and A level results.

Considering the unique circumstances in which Trials will be conducted, it would be interesting if the School were to conduct a statistical analysis of grades achieved from home against grades achieved at School in each subject. It would shine an illuminating light on several pressing queries: how academically damaging is a week of online lessons? Is studying for exams at home more effective than at school? Do students perform better without a physical invigilator disturbing their thought process?

This could be used as "control data" for future experiments at other institutions. After all, we are confident boys will adhere to the Harrow values of courage, honour, humility and fellowship while sitting these examinations, rendering the experiment a fair test as the only difference between sitting Trials at home and at School would be a student's location. The study's conclusion could have pronounced consequences on important matters, such as students' attitude towards study leave. Given that this is a once-in-a-lifetime opportunity to conduct such a study, with so many boys sitting Trials from home, surely it is an opportunity the School should not pass up?

As boys are sure to respect the Harrow values regardless of where they sit Trials, it raises an interesting question: should boys sit Trials from their rooms in their Houses? It would offer a unique opportunity to minimise inter-House contact for an entire week, bolstering Harrow's efforts to flush out COVID-19. At the very least, this circuit breaker is certainly worth considering.

In summary, the School should not pass up this rare opportunity to answer some of the biggest questions in education and exam preparation, and it would be statistically intelligent proceed with this enlightening study.

SPORTS

HOCKEY

9 November

Torpid House Hockey last Sunday was a competitive afternoon. The pool stages saw Rendalls, Elmfield, West Acre and Newlands head into the Cup semi-final.

There was fierce competition between Rendalls and Elmfield, tying three-a-piece after full time, but Elmfield progressed from their pool due to goal difference. West Acre narrowly missed out on a place in the final, as Newlands progressed with a 3-2 win.

The Plate final saw The Head Master's against Moretons in a 2-2 tie breaker, where The Head Master's utilised the extra time played to win 4-2. There was an equally tense final in the Cup competition, with both teams scoring three goals each in the 12-minute match. Elmfield took advantage of the five minutes of extra time to score two more goals, winning the competition with the final result at 5-3.

Congratulations to all teams involved.